EMERGENCY COOKING METHODS

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Introduction

We are encouraged to store fuel, in addition to food, for a year. While it would be difficult to impossible to store enough fuel to heat even one room through winter, it may be possible to store enough fuel to cook for a year. Various methods of improving efficiency of utilization of fuel will assist.

Fuels

Different fuels are capable of producing different amounts of heat, based on what is known as their heats of combustion. The heat of combustion of various fuels is shown in the following table. Also shown is the ratio of the heat of combustion relative to that of gasoline (which, of course, you would NOT want to try to store!).

fuel	heat of combustion, kilocalories per gram	percent of heat of combustion to that of gasoline
gasoline	11.5	100%
kerosene	11.0	96%
paraffin	10.3	90%
charcoal	7.2	63%
alcohol	6.4	56%
coal	4.4-7.5	38%-65%
wood	4	35%

The value for charcoal is for “pure” charcoal, not the briquettes you can buy. These contain additives to make them stick together in the manufacturing process, so their heating value will be somewhat less. (These additives end up as the grey powder that is left when briquettes burn.)

Fuel safety

It is quite obvious that the liquid fuels are more dangerous to store than solid ones. Gasoline is particularly dangerous, and should not be considered. Alcohol also is very flammable. Kerosene is less flammable, but still would be risky to store, and it deteriorates with age.

The safest of the solid fuels are charcoal, wood and coal, though paraffin is nearly as safe.

Paraffin cannot burn unless melted and vaporized, which happens in a candle flame. It would only be a problem if your house caught fire, and then the amount you might have would not contribute much to the combustion of your house. Its high heat of combustion and relative safety makes it an attractive fuel for emergency cooking. It can be stored anywhere inside or out, even buried in the ground, and will not deteriorate with time.

Cooking with charcoal, wood and coal

These fuels require special stoves with stovepipes leading outdoors if they are to be used indoors since they produce carbon monoxide because of incomplete combustion, and wood and coal produce smoke as well. Outdoors, in open fires, they are very inefficient, meaning that a relatively small percentage of the heat of combustion is actually absorbed by the food being cooked.

The Dutch oven is one of the most versatile items for outdoor cooking, provided an adequate supply of fuel is available. It can be used for boiled dishes such as stews and soups, but it also can be used for baking bread, pies, cakes, pizza, etc. Many books on Dutch oven cooking are available.

The basic method of cooking with the Dutch oven consists of putting it in a low fire. If it is to be used for baking, a fire is also built on top, and the bottom fire must be very small to avoid burning the bottom of the bread or whatever. A good rule of thumb when using charcoal to bake in a 12" oven is to place 25 briquettes on top and 8 underneath. It should be quite obvious that a lot of heat is wasted using this method.

Cooking with paraffin

A single candle flame provides a little light, and a little heat. A single votive candle burns about 2.7 grams of paraffin per hour. This equivalent to about 33 watts based on the heat of combustion. For comparison, a typical electric slow-cooker consumes about 75 watts. The burner described below has a somewhat higher heat output per flame.

An efficient paraffin cooker can be made easily using aluminum flashing available at hardware stores to make a shroud to keep the heat of the flames close to the pot.

Caution: Smoke from candles, like all smokes, is carcinogenic. Candle and cooker wicks should be trimmed to avoid smoke. Also, the flame must not touch the pot, or soot will be deposited and carbon monoxide released.

Shroud

1. General notes on dimensions
   a. The diameter of the shroud should be about a half inch greater than the diameter of the pot.
   b. The height of the shroud, and the pot support structure, should be sufficient to keep the pot above the flames of the burner, since incomplete combustion and sooting will result if the paraffin flames touch the pot.
   c. The top of the shroud should reach the top of the pot for maximum heating efficiency.
   d. The dimensions given below are for a 1 quart Revere pot.

2. Cut a piece of aluminum flashing (nominally 0.0092" thick) 6" wide and 21" long (it is best to buy 6" wide flashing). This will leave a ¼" gap between the pot and the shroud. There should be about 3" between the bottom of the pot and the bottom of the shroud. The 6" width works with a 3" deep pot.

3. Punch (a hand paper punch works well with this thin aluminum) or drill a row of ¼" diameter holes about ½" apart an inch above what will be the bottom edge of the shroud. These holes will allow the air needed for combustion to enter.

4. Fold over ¼" at each end of the aluminum, folding one end up and the other down. These will interlock to form a cylinder out of the strip of aluminum.

5. Form the cylinder by interlocking the folds at the ends and pinching the folds tightly together. This can be done by slipping the cylinder over a piece of pipe and tapping with a hammer. It is also a good idea to use a nail or center punch to form some dimples in this seam to lock it.

6. Cut out a slot in the top of the shroud for the handle of the pot to fit. This should be deep enough that the top of the pot is about even with the top of the shroud.

7. Cut four or five tabs 3/8" inch wide and ¼" deep and fold them inward to provide an even spacing of the shroud around the pot.

8. Cut a small window near the bottom of the shroud through which to view the flames.

9. For added rigidity trim a disposable pie plate to fit snugly inside the bottom of the shroud and fasten it with high temperature epoxy (JB Weld).

10. Form a pot support using heavy wire, such as clothes hanger wire. This should include three or four vertical supports.

Burner

1. Start with a large tuna or chicken or cat food can (4" diameter x 1 3/4" deep).

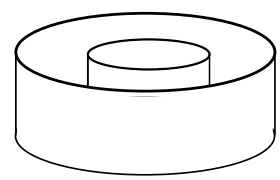
2. The paraffin will melt all the way to the bottom of the can during operation so it will be necessary to hold the wicks vertical.

   A simple wick holder can be made from corrugated cardboard. Cut a strip 8 3/4 inches long and about 1/2 inch wide across the corrugations. Peel off one side. Wrap the strip around a standard Mason jar lid ring, with the corrugations on the outside, and secure with a rubber band or string.

   If you are using zinc core wicking (see below), cut 2 inch lengths of wicking and bend the bottom 1/4 inch into a U shape–this will help hold the wicks securely in the cardboard corrugations. Insert wicks into the holes in the cardboard.

3. You can buy wicking, or make your own using COTTON string. The string should be stiff enough to stay vertical when held in the wick holders since it needs to remain vertical when the wax has all melted. The best wicking has a thin zinc wire in the middle to hold it straight. This is readily available in craft stores. Be sure to NOT use wicking with a lead wire (this is not on the market any more).

4. Position the wick holder in the can, fill the can with liquid paraffin, and allow the paraffin to harden.



The above burner works well with four wicks, but with more wicks the flames begin to be starved for oxygen, and also they are swept toward the center by the air. This can be obviated by constructing an air channel in the center of the burner using a 2" diameter juice or tomato paste can.

1. Cut the juice can to the height of the 4" diameter tuna fish can.

2. Cut a hole in the bottom of the tuna fish can to fit the cut end of the juice can. This can be done with sharp tin shears or with a high speed cutter (Dremel).

3. Fasten the juice can in the hole using high temperature epoxy (JB Weld).

4. The wick holder described above is just the right size for this burner.

5. This burner needs to be propped up a half inch or so with three supports to allow air to enter the center hole from the bottom.

Operation

1. Place the burner in the shroud and light the flames. You may wish to provide a means of lowering the burner in place after the flames have been lighted.

2. The heating rate will depend upon the number of flames. As a guideline, 4 flames will heat 3 cups of water at about 5.5º F per minute, so it will take just under half an hour to boil this much water. Of course, more flames will give higher heating rates.

3. If simmering is required, extinguish all but 3 or 4 flames.

4. Four flames consume about 10 grams an hour. At this rate, a pound of paraffin would last about 45 hours. A 6 flame burner with zinc wire reinforced wicks and a central air hole as described above burns 26 grams/hour, the equivalent of 311 watts. A pound of paraffin would last about 17 hours. A 55 pound case of paraffin would supply 935 hours of cooking with this burner. This much paraffin has a volume of just under one cubic foot, so it can be stored in a relatively small space.

Paraffin sources

A 55 pound case (five 11 pound slabs) costs $50 at http://swanscandles.com. Other suppliers can be readily found on the Web, but most tend to charge more. The volume of 55 pounds of paraffin is about one cubic foot.

Free cooking – solar cooking

Solar cooking is finding more widespread use in third world countries where fuel is scarce. A broad range of designs has been developed. See Solar Cooking Archives at http://solarcooking.org. A square collector design made of cardboard boxes and capable of baking bread can be found at http://www.backwoodshome.com/articles/radabaugh30.html. Prof. Steven E. Jones of BYU developed a funnel cooker described at http://solarcooking.org/plans/funnel.htm.

Energy conservation: the *kochkiste* – retained heat cooking

Energy consumption for cooking can be minimized by using retained heat methods. Several years ago a German friend of ours described the *kochkiste* (cook-box) used in Germany during times of scarce fuel. The box was filled with sawdust which was isolated from the pot by waterproof oil cloth. The pot full of food was brought to a boil in the morning and placed in the box and covered with the upper half, also filled with sawdust sealed behind oilcloth. In the evening the food would be cooked and hot for supper.

Further details can be found at the Retained Heat Cooking link at http://solarcooking.org.