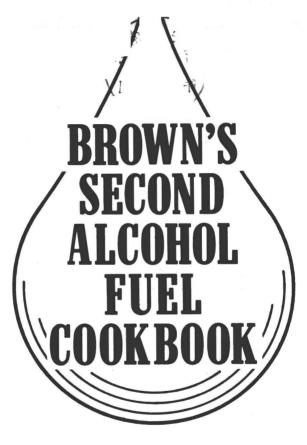
# BROWN'S SECOND ALCOHOL FUEL COOKBOOK

Practical, money-saving guide to making your own alcohol motor els . . . and adapting your car engine for its use!

BY MICHAEL H. BROWN



BY MICHAEL H. BROWN



#### **FIRST EDITION**

**FIRST PRINTING** 

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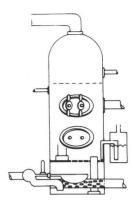
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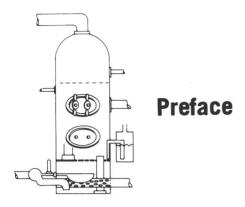


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A lot of folks—especially farmers—have become extremely discouraged at the apparent lack of progress in developing motor fuel from farm crops and organic waste. As my grandmother used to remind me, if you want something done right—do it yourself.

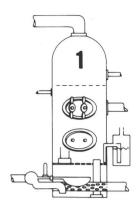
This book will enable you to do it yourself. If the rest of the world wants to walk or drive around in cars the size of a postage stamp, that doesn't mean you have to join them.

I will teach you how to build a commercial-type still, make diesel fuel from soybeans, make motor fuel quality alcohol without using a still, and much more. I've done all the foregoing in the laboratory. It's easier than you think.

I will also teach you the proper ways to modify carburetors so that they will run alcohol and how to build dual-fuel units that—with the flip of a switch—will convert your engine fuel source from gasoline to alcohol while you are 55-ing it down the interstate. There are sections on drying the leftover mash, turning carbon dioxide into dry ice, and more.

And if you don't think we're making progress, read the testimony from the 95th Congress. I have included it as Appendix B.

Michael H. Brown



## **Building A Column**

Everyone and his brother are apparently trying to get into the still-building business. On my last round of seminars through the Midwest, I saw some of the most amateurish junk imaginable being palmed off on the unsuspecting as "column stills." This included such things as pipe filled with metal scraps. In some cases, people who (apparently) know what they're doing won't let you have a set of plans until after you have purchased a complete distillery from them.

If you want to build a column still, maybe I can remove some of the mystery from it. If my approach seems a little over-simplified bear with me. If my directions seem so simple a child could understand them and you feel insulted, don't. I'm merely trying to protect myself from "free department" engineering requests over the telephone.

Start with the overall column. It is merely a long pipe (temporarily) sealed at both ends. See Fig. 1-1. There are more efficient ways to build a column than starting off with a pipe sealed at both ends, but I believe this is the simplest way to teach a concept.

## **THREE SECTIONS**

Next divide this column into sections. The three main sections will be the *steam chamber*, the *stripper plate section*, and the *rectifying section*. It's put together as shown in Fig. 1-2.

In case you're wondering where the second column you see in all the ads went, that's the rectifying section. Most of the stuff you

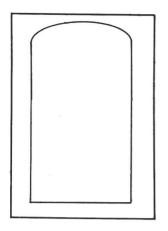
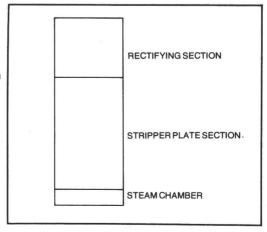


Fig. 1-1. The overall column.

see in the magazines consists of a steam chamber and stripper plate section in the first column with the rectifying section in the second column. In the distillery business, the second column is known as an *alcohol column* because the object is to get 190-proof alcohol out of it, 160-proof alcohol and below, technically, is whiskey. However, if I lay out a double column set-up here, it would be necessary to go into reflux lines and other subjects that might get confusing this early in the game.

With the column split up into the three main sections, add the pipes (or lines) going to and from the column. Ignore the reflux lines because that requires a separate explanation. Concentrate on the main lines only, the steam line to the steam chamber, the slurry line away from the steam chamber, the beer feed line to the

Fig. 1-2. The three main sections of a column.



stripper plate section, and the vapor line away from the rectifying section. Your lines will appear as shown in Fig. 1-3.

The way it works is that steam from a steam boiler is pumped into the steam chamber. Initially, the slurry line remains closed. You will see how and why in a bit. The superheated steam, 550 F at 1¾ pounds pressure, rises through the column and heats it up. When the column surpasses the boiling point of alcohol, normally determined by a thermometer plugged in halfway up the column, beer is pumped in from the mash tube and allowed to fall through the stripper plate section. Normally, you will have 16 to 23 stripper plates. See Figs. 1-4A, 1-4B, 1-4C and 1-4D.

#### **BEER FEEDING**

When the beer is fed onto the second stripper plate down (feed it onto the first plate and you stand a good chance of clogging your rectifying column), it consists of three materials: alcohol, water, and slurry. You want the water and slurry to go down into the steam chamber and the alcohol up into the rectifying section. Due to the laws of chemistry, you will be doing good if you get half alcohol and half water out of the top of the rectifying column. You get the proof

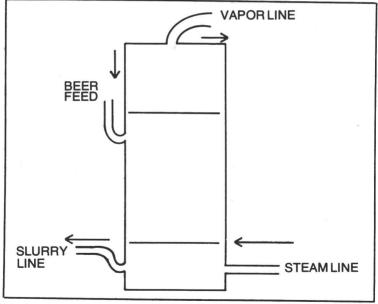


Fig. 1-3. The main lines.



Fig. 1-4A. Stripper plates. Holes should be 13/32" in diameter and comprise 15 percent of the surface area of the plate.

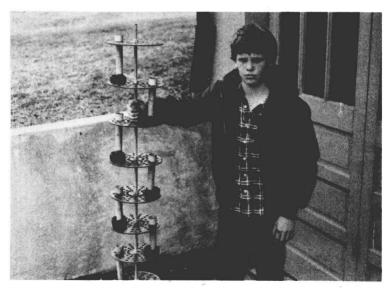


Fig. 1-4B. Stripper column internals. A threaded rod allows the stripper plates to be moved up and down for adjustment. Nuts on each side of the plate hold them in place. Caps on the downpipes are for protection during shipping. The downpipe entrance must be lower than the liquid seal to make it work.

to 190 by refluxing. This is explained later. If your beer was 10 percent to start with don't get greedy.

Once the beer hits the second stripper plate, here's what happens. As the beer (or mash) drops down through the column (Fig. 1-5), steam from the steam chamber rises up through the column. The mash flows down through the *downcomer* (or downpipe), fills up the cup known as the liquid seal, and then flows onto the stripper plate. Mash travel is represented by the straight arrows in Fig. 1-6. Steam travels up through the holes on the stripper plate. At each stage, or plate, the steam heats the alcohol to its boiling point and carries it upward, or "strips" the alcohol from the plate. Hence, "stripper plate." Alcohol and steam travel is represented by the curved arrows in Fig. 1-6. This process is

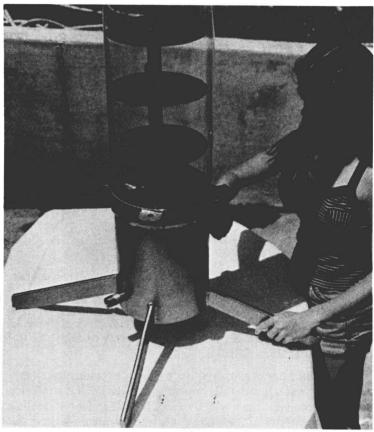


Fig. 1-4C. A stripper column used for demonstrations.

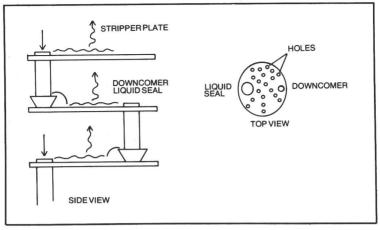


Fig. 1-4D. Stripper plates.

repeated until all the alcohol has been stripped from the mash and the slurry winds up in the steam chamber.

A word of caution to would-be buyers of distillery equipment. A lot of columns represented as "10 gal. hour" or "20 gal. hour" production rate are based on maximum feed rate. That means you will only strip out  $1\frac{1}{2}$  gallons of alcohol per bushel of corn instead of the  $2\frac{1}{2}$  gallons it should yield.

Pump the mash in too fast and almost half your alcohol gets pumped out with your slurry (or what you would *think* was spent mash). You can increase the number of gallons of 190-proof that your column puts out per hour this way, but it's extremely wasteful.

## THE STEAM CHAMBER

Before going any further, I want to cover the steam chamber. There are three major parts in it; the *steam line*, the *float*, and the *slurry line*. Let's start with the steam line (Fig. 1-6). All there is to it is a pipe with oblong holes in it from the steam boiler to the far side of the steam chamber. The holes are merely to distribute the steam evenly through the falling liquid.

The slurry line is a must or you will have a column that simply fills up with water and distills nothing. See Fig. 1-7. On a full size commercial column, the top of the slurry line (T) and the steam line are usually parallel to each other. On small homemade jobs the setup is more like what is shown in Fig. 1-8. The elbow in the

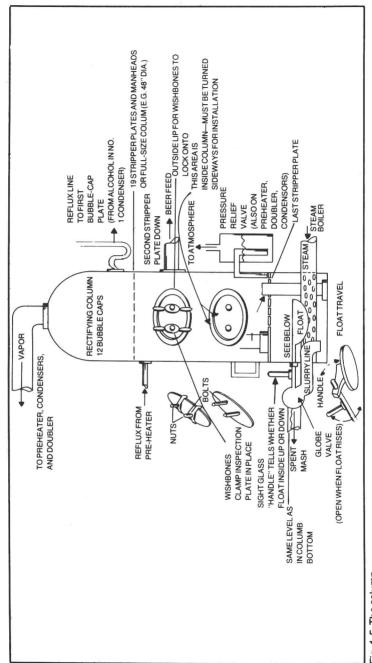


Fig. 1-5. The column.

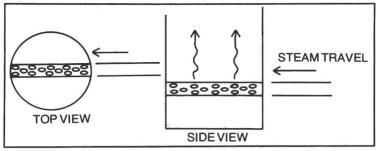


Fig. 1-6. Mash and steam travel.

slurry line acts as a liquid seal to keep excess heat from escaping from the steam chamber.

On a commercial or automated column, you will want to have a float (Fig. 1-9) and butterfly valve connected to your slurry line. They operate much the way the contraption in your toilet tank does to keep the water at a given level. In this case, when the slurry reaches a certain level, you want it to leave automatically via the slurry line.

The only function the float has is to rotate the bar it is attached to. The bar, in turn, is connected to a valve in the slurry line (usually a butterfly valve). When the bar is rotated clockwise (in this case anyway), the valve closes. When it is rotated counterclockwise, it opens. Water pressure pushes the float up to rotate the bar counterclockwise and when the water level drops the weight of the float rotates the bar clockwise. The whole steam chamber winds up looking like Fig. 1-5. In real life, most of this stuff goes in at an angle and it is not as sanitary looking.

The dotted line in Fig. 1-10 represents the bottom stripper plate. The last downpipe and liquid seal should be obvious. If you want to know what's going on inside your steam chamber at all

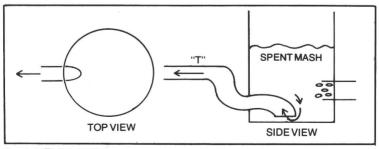


Fig. 1-7. The slurry line.

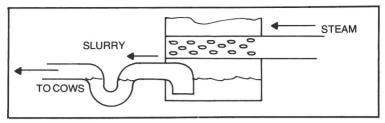


Fig. 1-8. A small column.

times, it is relatively easy to weld on another bar on the bar connecting the float and the slurry line valve on the outside of the column. When the float is as high as it will go and the valve is open, the bar should be sticking straight up. As the valve closes, the bar should "droop." See Fig. 1-11.

## **CONVENIENCE ITEMS**

There are a couple of other convenience items that, while not absolutely necessary to the function of a column, might save you a lot of grief later on. One is a sight glass. It goes on the bottom stripper plate section on the outside of the column. See Figs. 1-12A and 1-12B.

If the water is at the levels indicated by the arrows inside the column, then the water in the sight glass will be at that same level. It is not uncommon for a column without a sight glass at that level to fill completely up with water before anybody figures out that something isn't kosher.

The other nice touch is a pressure relief valve. The idea here is that it is much more economical to blow excess pressure into the atmosphere than it is to send your column into orbit. A pressure relief valve will look something like the one in Fig. 1-13.

A pipe goes from about an inch above the bottom stripper plate into the pressure relief valve Fig. 1-14. A sight glass on the side of the valve indicates the water level in the valve (and valve only).

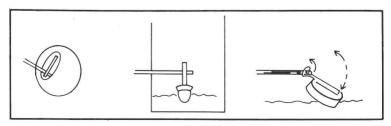


Fig. 1-9. A float.

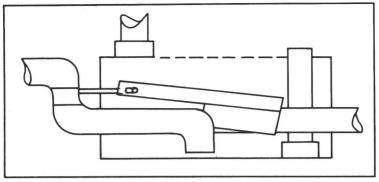


Fig. 1-10. The steam chamber.

The pressure of the water in the valve keeps normal steam pressure and heat from escaping. However, once the steam pressure exceeds a certain point the water pressure will no longer contain it and that steam then forces itself past the water in the pressure relief valve. Normally, the steam is vented outside of the distillery building well off the ground so that no one accidentally gets hit in the snout with it. Mounting on the column and venting arrangements are as shown in Fig. 1-15.

The last section of the column internals is the rectifying section. It consists of wine plates, bubble caps, and a stabilizing section. In the 19th century, this consisted of 12 sections with the vapor and reflux lines connected to a type of condenser called a "goose." Today, we use reflux pumps and an alcohol column

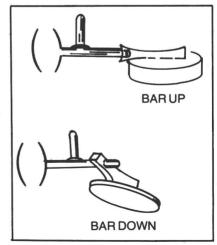


Fig. 1-11. The bar should "droop."