Brew Your Own®

February 1997, Vol.3, No.2
Niche Publications Inc.

THE HOW-TO HOMEBREW BEER MAGAZINE

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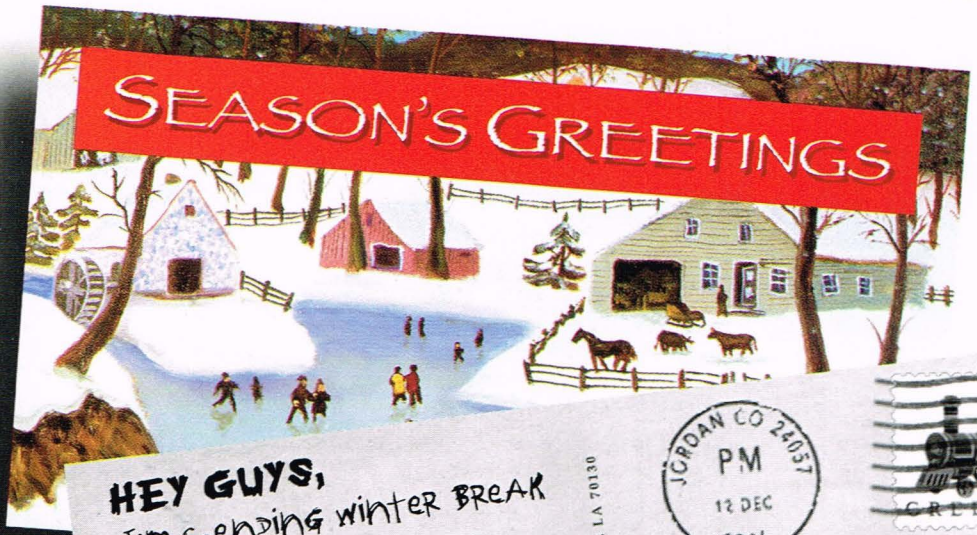
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HEY GUYS,
I'm spending winter break at my Mother-in-Law's. It's pretty painful. Good thing I brought my Wicked Winter Brew. Even she loves the nutmeg and raspberry taste. My Winter Brew won't be here for long. And fortunately, neither will I. PETE

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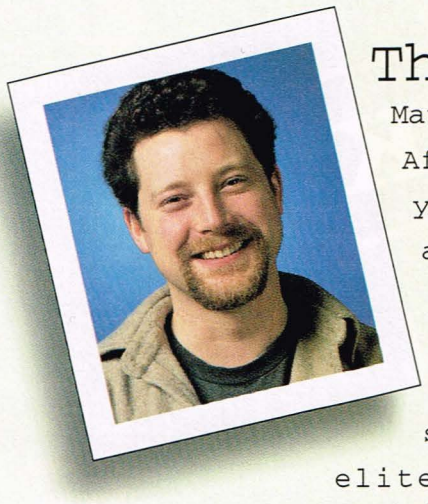


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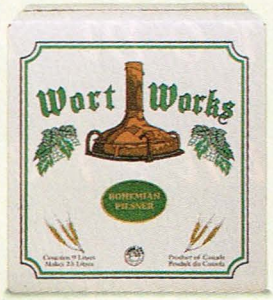
PETE'S WICKED. YOU HAVEN'T TASTED ANYTHING YET.

CIRCLE 46 ON READER SERVICE CARD



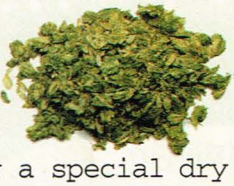
This is Sean. He's our beer guy.

Matter of fact, around Brew King, we call him "The Beer Guy". After all, he knows a thing or two about beer. And as you can see, he's pretty happy right now. Why? Because after months of self-imposed exile in Brew King's (windowless) brewing lab, Sean has emerged with Wort Works, an all-malt brewing kit of pure perfection - even by Sean's standards. You see, Sean belongs to that elite group of home brewing purists - the ones that scoff at most commercial brews and insist on choice natural ingredients for their own brewing masterpieces. With Wort Works, Sean would never cut corners. So what has Sean created? A totally unique, bag-in-a-box packaged product offering 9 litres (2 gallons) of concentrated wort made from 100% barley malt with naturally processed hops and filtered Canadian water, fully boiled in our 1000 gallon brew kettle. Sean even insisted on including a special dry hop package for extra aroma and flavour. And true to form, his instructions are comprehensive, even with information on the specific ingredients used. Sean's no dummy. He made Wort Works with his fellow homebrewers in mind, but he also made sure that its user friendly, no-boil method would be perfect for beginners too. Keep Sean happy. Make his Mom proud. Try Wort Works. The results will make you (and your friends) happy too.











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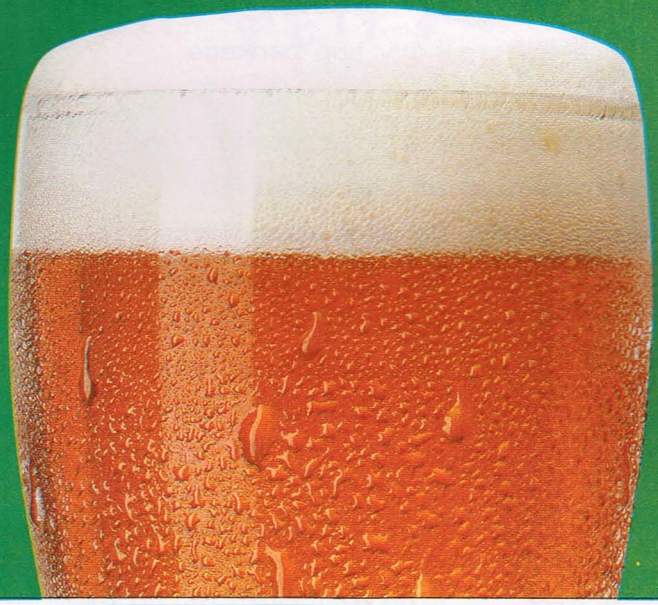
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CIRCLE 39 ON READER SERVICE CARD

Contents

FEATURES

27 Radar Range Beer *Sal Emma*
With the help of a temperature probe, mashing in your microwave can save you time and mess.

32 Lager: Pale Pilsner to Malty Munich *Kirk Fleming*
A step-by-step guide to brewing great lagers. Recipes included!

38 Percolator Doppelbock *Scott Russell*
Combining your favorite brews — coffee and beer — can create the perfect nightcap.

42 Start Your Own Brewery *Sal Emma*
Three industry insiders offer advice on opening and running a successful microbrewery or brewpub.

49 Brew Beer that Matches Your Water *Ashton Lewis*
Using your neighborhood's unaltered water as a base, you can build a beer that is the perfect "home" brew.



p. 32

DEPARTMENTS

4 Editor's Note
Holiday dilemma.

6 Pot Shots
My favorite gadget.

11 Mail
One reader finds an innovative source for cheap vessels.

64 Last Call
A messy beginner's tale.

56 Homebrew Directory

63 Classifieds

63 Advertiser Index

COLUMNS

13 Recipe Exchange
Kindle a romantic red ale.

17 Help Me, Mr. Wizard
The ace of adjuncts zeros in on mill settings and Trappist ale.

21 Tips From the Pros
Add character with specialty grains.

23 Style of the Month
Brew a smokin' rauchbier.

59 Microbreweries You've Never Heard Of
Growing hops at Healdsburg Brewing Co.

Cover photo: Kent Lacin

Holiday Dilemma

Lately, I've been thinking a bit about holidays. Not "The Holidays," that season that stretches roughly from Halloween through the Rose Bowl. There are laws against talking about "The Holidays" once they're over. Especially in January and February (at least around my house), when absent-mindedly humming "Rockin' Around the Christmas Tree" or "Jingle Bell Rock" invites very justifiable homicide.

No, I've been thinking about smaller holidays; the ones that don't get much attention. Not even second-tier holidays such as Labor Day or Memorial Day, when people at least have the time to barbecue and drink a few beers. What I mean are the days like Columbus Day or Veterans Day. Holidays that once meant a day off from school. Now they mean another White Sale or New Car Sell-a-Thon.

Once upon a time, there were two great holidays in February: Lincoln's Birthday and Washington's Birthday. Now there's only one: Presidents Day. I'm not sure how this came about, but I think it must have happened when I was in college and, thus, not paying attention (probably somewhere between Elizabethan Poetry and Biochemistry for English Majors).

Was there some great research finding that Washington and Lincoln were only half as good as we thought, so they deserved one day rather than two? Maybe Washington really only served one term while his cousin Barney secretly ran the country from his Georgetown estate during the second four years. Who knows?

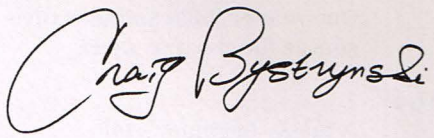
The problem with cutting back on presidential celebrations is that it focuses attention on that other February event, Valentine's Day. Now, I enjoy a little romance as much as the next guy, but there's just too much pressure on Valentine's Day.

Last year some guy sent a bouquet of 40 roses to his wife, who just happened to work for my wife's company. Forty. I came merrily trotting home with my standard (admittedly small) box of chocolate-covered cherries that, for years, had seemed perfectly thoughtful and adequate. No more. The stakes had been raised. (Side note: A group of husbands blind-sided Mr. Romantic at the company Christmas party 10 months later. He had forgotten. We hadn't.)

There's another guy whose wife works in my office. He's always sending her flowers and doing nice stuff, even when there's no special occasion. I'm worried about what elaborate plan he's going to cook up for V-Day that's going to make all the women in the office go home mad and the men hope their wives won't find out. (Consider this a warning, Ray!)

I haven't decided what I'm going to do yet, but I know one thing. I'll be buying the *large* box of chocolates this year.

If you're like me, looking for a recipe for romance, check out Scott Russell's St. Valentine's Red Ale in this month's Recipe Exchange. It's on page 13.



P.S. We're now accepting entries for the Second Annual BYO Gonzo Label Contest. Lots of great prizes will be awarded for the best submissions, and the winners will be featured in our May issue. The entry form is on page 29.

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MANAGING EDITOR Gailen Jacobs

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ART/PRODUCTION Kristine Bybee, Meagan Greenberg, Stephanie Miller

TASTER Katie Landau

CONTRIBUTING WRITERS Sal Emma, Jeff Frane, Nico Freccia, Tom Fuller, Steve Johnson, Scott Russell

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WEB MASTER Heidi Larson

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My Favorite Gadget

Big Bill Foster
Vacaville, Calif.

I've been brewing for about three years, after my boss's experience sparked my interest. Like most beginning brewers, I began by brewing from extract. I quickly found that five gallons of homebrew at a time was just not enough. I had to think of a way to brew more beer and spend fewer bucks.

After doing a lot of homework and talking to various brew-supply folks, I devised a three-level infusion-mash brew tower. The tower includes a 15.5-gallon strike-water kettle, a 48-quart ice chest mash/lauter tun, and a 15.5-gallon cook kettle. I cool the hot water by recirculating my swimming pool water through an immersion chiller. I can cook 10 gallons of beer in about five hours.

After getting tired of bottling 10 gallons of beer every two weeks, I decided to invest in a kegging setup. It made serving my homebrewed ale so much easier. There was only one problem: how to give samples of my homebrew to friends and neighbors. I had to find a way to mobilize my five-gallon kegs.

I simply took a $12 hand cart, bolted a quarter barrel to it, and fabricated a rack for the five-pound CO_2 bottle. All that was left to do was connect the CO_2 bottle and hand-held tap to the keg, then add ice to the barrel. The result was a perfect "Keg-Kaddy."



Bill Foster demonstrates his elaborate homebrew setup: a three-level infusion-mash brew tower and "Keg-Kaddy."

I take five gallons of my homebrew to parties, picnics, and camping.

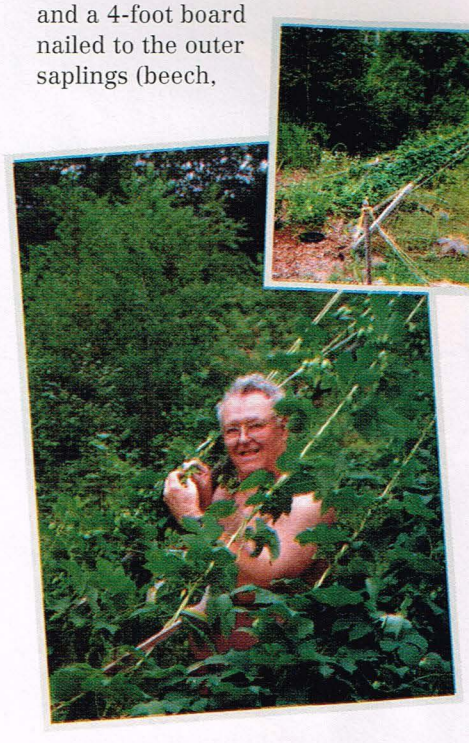
From my three years of brewing experience, here's my best piece of advice. It's about the best way to keep plenty of homebrew for myself: Find out what neighbors don't like and brew lots of it.

Easy Hops

When I decided to grow my own hops, I built a Haller-tower: a tripod about 18 feet tall, with the top ends pivoted on a horizontal, half-inch rod, and a 4-foot board nailed to the outer saplings (beech, about 4 to 5 inches at the base).

Strings hang from holes in the board, and the (Hallertauer) hops love it. It pivots down for picking. It's cheap and easy.

Robert Smart
Hartland, Vt.



Robert Smart's Hallertower allows for easy hop picking.

Bottle Tree on the Cheap

My favorite piece of brewing equipment is my bottle tree, which I built in about two hours. It cost $3 in parts. Of course a bottle tree is a trivial piece of brewing equipment compared with higher-priority items such as a stainless-steel kettle or a jet bottle washer. But it is convenient and helps bring some order to the bottling process.

I homebrewed for 11 years without owning a bottle tree, because I could not bring myself to spend $30 for something so simple in concept, of little ingenuity, and made of plastic. I knew there had to be a way to at least build something makeshift but functional using simple materials. While taking advantage of one of our rare rainy days in Seattle, I decided to stay inside, take in some liquid inspiration (a.k.a. James Brown Ale), and do some initial brainstorming. The outcome was a few empty bottles and the plans for a bottle tree. It ended up being just as sturdy and reliable as the store-bought

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Kings get all the credit. First there was the Bohemian brewery that called its lager the *"Beer of Kings."* Now the biggest brewer claims its lager, which has a similar name, is the *"King of beers."* Both brewers would have been wise to study their history. They would find that there is a good woman behind every great beer. Women, not men, have brewed beer throughout most of recorded history. Beer queens have reigned from the Egyptian era, when they were served only the finest beers through golden straws, to medieval England and Elizabeth I, who established a connoisseurship for beer that her subjects quickly followed, to Catherine the Great, Queen of all the Russias. For shipping to Russia, brewers had to make their beer powerful, with lots of malt and hops. So great was Catherine's taste for the majestic stout that Imperial Russia became England's biggest export customer. The beer was titled, Imperial Stout.

The crown jewel in the Samuel Smith line-up of great beers, each brewed in square slate fermenters, is their finest, biggest, darkest and longest-lasting beer—Imperial Stout. In the hierarchy of beer, Samuel Smith's Imperial Stout reigns supreme. Served in a snifter after a banquet, or even a biscotti, Imperial Stout is as classic a digestive as single-malt or aged brandy. Crowned with a head of tiny bubbles like fine Champagne, her robe is black velvet, with the nature of a benevolent queen—gentle, yet powerful.

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CIRCLE 43 ON READER SERVICE CARD

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John Marioni's makeshift but functional bottle tree cost $3 to make.

variety, and mine was modifiable to accomodate more bottles if necessary.

Parts: one 3-foot section of 4-inch PVC pipe; 60 plastic coat hangers; one Christmas-tree stand.

Production: 1) Using a 5/16-inch drill bit, drill 12 to 14 holes in a ring around the PVC. 2) Drill another ring of holes two inches below the first to match up with the top ring. 3) Cut through the hangers in two places so the result resembles an L-shaped hockey stick with a hook on the end. 4) Feed the hook end of the hanger into the bottom hole. Push it in and up, so that the tip of the hook fits (from inside the pipe) into the hole above. You will need to reach inside the PVC with one hand to help push the hanger tip back out the top hole. The result is a secure plastic rod extending upward out of the PVC at the perfect angle on which to hang any 12- or 22-ounce bottle. 5) After placing the hangers, set the PVC (bottom end) into the tree stand and secure.

John Marioni
Bothell, Wash.

Stop Boilovers Forever!

My favorite piece of equipment is something truly special for the pot. After a couple of boilovers, I found this little jewel in a supermarket. It is called a pot watcher.

It is placed in the bottom of the boiling pot and concentrates the boiling wort in the center of the pot. It is now a pleasure to watch the hot break. I haven't had a boilover since I began using the pot watcher. The wort also seems to boil quicker with a little less heat.

It has made my brew days easier and has saved a lot of cleanup time. My wife, who used to dread brew day, now borrows my pot watcher.

James G. Jack, Jr.
Gautier, Miss.



James Jack's pot watcher stops boilovers.

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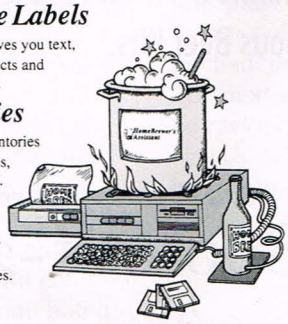
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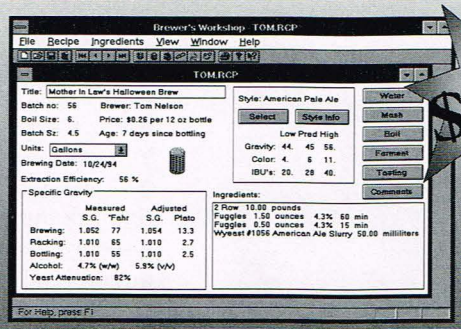
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Cheap Stainless Steel

Dear Brew Your Own,

I have a tip that will surely benefit many homebrewers. I have a 13-gallon stainless steel kettle and a 13-gallon stainless steel mash/lauter tun, in addition to two 8.5-gallon stainless steel fermenters. These four stainless steel vessels cost me a total of $50! That's right, type-304 stainless steel, in great condition. I know where homebrewers all over the world can get these great vessels at ridiculous prices! These vessels were discarded oxygen tanks. Brand-new, they cost several thousands of dollars. After a few years of use they are discarded and sold for scrap. At today's prices these tanks are being scrapped for about $5 to $10 each! It brings a tear to my eye to think about it.

Any homebrewer who wants a great deal on stainless steel tanks should contact his local hospital-supply businesses. These companies scrap literally thousands of these tanks every year. Even in the small town of Casper, they are readily available in large numbers. My tanks are small. The larger ones can easily exceed 50 gallons. With a little elbow grease, a cutting torch, and a grinder these tanks are easily transformed into brewing vessels.

Jeff Sturman
Casper, Wyo.

Cut Brew Time

I've found a great way to cut brew time — multiple batches. Using four porcelain canning kettles, two propane burners, and a few pots from the kitchen, I can brew four batches in about six hours. Setup and cleanup are about the same as for one batch and are done easily because I brew outside. An outside hose faucet on the house connected to a hot-water line helps a lot. Spills or boilovers (I never do that!) are simply hosed off, and pots and pails are quickly washed or set to soak with bleach. No time is wasted waiting for a pot to boil because there are always several things to do.

Using malt extract and steeped adjunct grains (always some crystal), I set aside a pleasant winter Saturday to make some lager. A gallon jug three-quarters full of yeast starter begun from a single packet of liquid lager yeast about three days before is already waiting in my 55° F basement fermenting room. Hops and grains are premeasured and labeled, and notes and a clock keep additions to the pots correct.

Hopefully snow is deep enough to cool each covered canner. Otherwise, they are set into a small stock tank with cold water. After being cooled for 30 to 45 minutes, the wort is poured through a large restaurant strainer (sterilized) to remove the hops, set over a sterile six-gallon plastic pail, which becomes the primary fermenter. The residue in the strainer is washed with cold water directly from my well into the fermenter to bring it to a five-gallon mark on the pail. I don't bother with a thermometer or try to adjust the temperature of the wort. The pail is then immediately covered with plastic (new, white wastepaper bag), held tightly to the rim with a large rubber band, and taken to the basement.

The next morning the yeast and four pails of wort are within five degrees of each other, and the yeast is pitched, one-quarter of it to each pail. The next weekend the beer is ready to be racked to a carboy fitted with an airlock, where it will stay until I bottle it. This method gives me great beer.

Lee R. McCarty
Star, Idaho

Graduates of Brew School

Dear BYO,

Is it just my imagination or has brewing sciences program at the University of California, Davis, turned out a number of brewpub brewers? I noticed that Bill Cherry (Boulevard Brewing Co., Kansas City, Mo.) and Drew Goldberg (Alcatraz Brewing Co., Indianapolis) are graduates of the program. I think Luke DiMichele of River City Brewing Co. (Sacramento, Calif.) is also a graduate of the program. Just makes me wonder. Know of others?

P.G. Torrez
Eureka, Calif.

The UC Davis brewing program is part of the school's Food Science and Technology Department. The program has been in place since 1958 and has turned out more than 100 brewers with undergraduate and advanced degrees.

Cherry, Goldberg, and DiMichele are all former graduate students at UC Davis. Many former students can be found at large breweries, such as Anheuser-Busch and Miller Brewing Co., as well as at microbreweries, such as Sierra Nevada Brewing Co., and brewpubs across the nation.

UC Davis also has an extension program called the Master Brewers Program.

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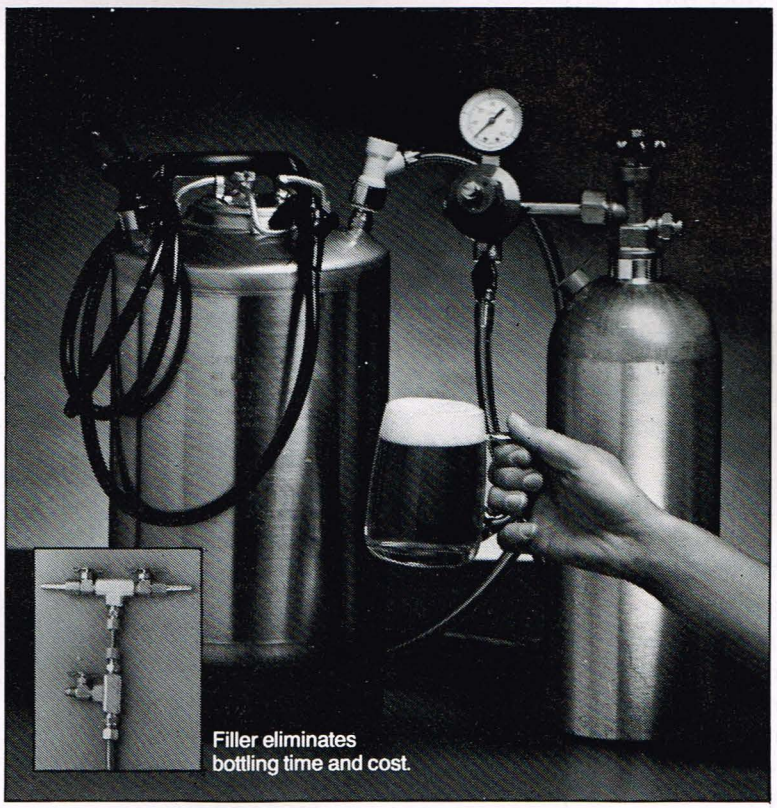
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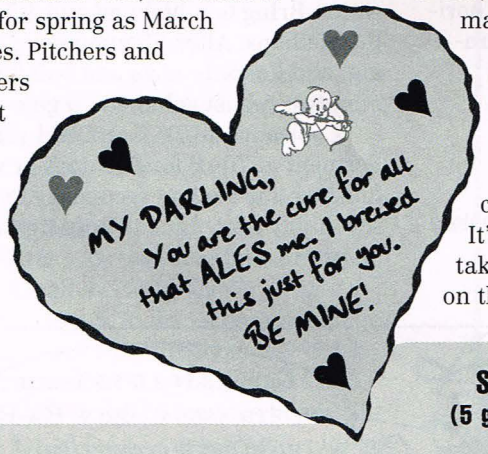
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Kindle a Romantic Red Ale

by Scott Russell

Ah, the romance of February. Truly one of my favorite months of the year. Besides offering us Lincoln's and Washington's birthdays, Groundhog Day (which is also my aunt Fran's birthday), Valentine's Day, and other assorted holidays, February is the shortest month of winter. Yes, after only 28 days this ghastly, wet, cold, miserable month is over, and there is hope for spring as March arrives. Pitchers and catchers report to Arizona and Florida, people start talking about the NCAA hoops tournament, and the bocks make their seasonal appearances. Unfortunately, before all those things happen, we have to deal with February. So we might as well make it bearable.



This brew, a strong Irish red ale with a kink (Bond's martinis have twists; my brews have kinks), will make February or any month a little warmer. If you believe old wives' tales, cinnamon is an aphrodisiac like, curiously enough, many other spices that begin with "c" — chile peppers, cardamom, cumin. So beware. It's not nice or politically correct to take advantage of your sweetheart on the holiday dedicated to romance and love. I bottled red ale once with one of those miniature cinnamon heart candies in each bottle, but they dissolved and made a mess. So I recommend you don't do that. However, the candy may be put into the bottom of the glass as you serve it to your sweetheart on the 14th or to your aunt Fran on the 2nd.

Reader Recipes

Biere de Garde
(5 gallons, partial mash)

This beer originated in the farmhouses in the north of France near the Belgian border. Biere de garde literally means "beer to keep" and was brewed in late winter to be laid down for the brewing-unfriendly summer months.

Saint Valentine's Red Ale
(5 gallons, extract and specialty)

Ingredients:

- 1 lb. crystal malt, 60° Lovibond
- 2 oz. roasted unmalted barley
- 8 lbs. unhopped amber dry malt extract
- 1 oz. Northern Brewer hops, whole or pellets (7 to 8% alpha acid), for 45 min.
- 0.5 oz. Perle hops, whole or pellets (4 to 5% alpha acid), for 15 min.
- 2 whole cinnamon sticks
- 2 pinches ground cinnamon
- 10 to 14 g. dry ale yeast or 1 pt. liquid culture slurry (Wyeast 1728 or 1084 recommended)
- 2/3 cup corn sugar for priming

Step by Step

In 2 gals. of cold water, steep crystal malt and roasted unmalted barley. Raise heat gradually to 170° F, remove grains, and add unhopped dry malt extract. Boil 15 minutes, then add Northern Brewer hops. Boil 30 minutes. Add Perle hops, boil 15 more minutes. In the cooling wort steep two broken cinnamon sticks for at least 15 minutes. Cool and top off to 5.25 gals. with pre-boiled and chilled water.

At 75° F pitch dry ale yeast or slurry, seal, and ferment relatively cool for 10 days. Rack to secondary, sprinkle a pinch of coarsely ground cinnamon on top, and age three weeks. Prime with corn sugar (boil in a pinch of cinnamon with your sugar syrup if desired) and bottle. Age in bottles six to eight weeks.

OG = 1.075

Options

For all-grain brewers, mash 12 lbs. pale malt with 1 lb. 60° Lovibond crystal malt in 3.5 gals. at 155° F water for 90 minutes. Sparge at 168° F to get 6.5 gals. Steep 2 oz. roasted barley in runnings. Add hops, boil, and steep cinnamon as above.

Don't like cinnamon? Well, what do you like? This same brew could be made with almost any "sweet" cooking spice (ginger, cloves, allspice, nutmeg), but be careful of proportions with some of the stronger spices.

To make a lighter version cut back the dry malt to 6 lbs. (or pale malt in all-grain version to 8 lbs. and 2.5 gals.) for an OG of about 1.058. Same hops, same yeast, same spice patterns.

For an amazingly hot cinnamon treat, prime with 500 ml. cinnamon schnapps and 1/3 cup corn sugar, bottle condition for six weeks, and serve mulled (i.e. gently warmed to about 120° F) with added spices. That's the sure cure for February!

With this style the mashing temperatures tend toward the dextrinous, and a protein-developing rest is recommended. The wort is boiled for at least 90 minutes and for up to two hours, which is more typical for this style.

Michael Hoopes
Camarillo, Calif.

Ingredients:

- 5 lbs. Vienna malt
- 12 oz. Belgian aromatic malt
- 4 oz. Belgian biscuit malt
- 6 oz. Belgian caravienne malt
- 4.5 lbs. Australian pale dry malt extract
- 0.84 oz. Perle hops (8.4% alpha acid), for 60 min.
- 1 oz. Tettnanger hops (4.2% alpha acid), 0.5 oz. for 15 min., 0.5 oz. for 2 min.
- BrewTek Saison CL-380 yeast
- 3/4 cup corn sugar for priming

Step by Step:

Mash with 8.3 qts. of water at 130° F, strike at 122° F for 30 minutes, 157° F for 55 minutes, and 168° F for five minutes. Sparge.

Add malt extract and water (adjust volume to 5.5 gallons before boiling) and bring to boil. Boil 60 minutes and add Perle hops. Boil 45 more minutes and add 0.5 oz. Tettnanger hops. Boil 13 minutes and add the rest of the Tettnanger hops. Boil two more minutes. Total boil is two hours.

Pitch yeast when wort has cooled to between 65° and 75° F. Ferment at 65° to 70° F for 48 hours. Rack to secondary when gravity has dropped below 1.025. Continue secondary fermentation at 50° to 60° F for 14 days. Prime with corn sugar and bottle, preferably in corked 750 ml. champagne bottles. Store horizontally and serve at cellar temperature, between 50° and 55° F.

OG = 1.071
FG = 1.016

Black Kitty Brown

(5 gallons, extract with specialty grains)

This is an incredibly easy but favorite recipe among friends.

William R. Saksa
Long Beach, Calif.

Ingredients:

- 1 lb. crystal malt, 80° Lovibond
- 1 lb. light dry malt extract
- 6 lbs. dark malt extract
- 1.5 oz. Fuggle hops, for 60 min.
- 0.5 oz. Cascade hops, for 5 min.
- British Wyeast

Step by Step:

Add dark malt extract and light dry malt extract to water and adjust total volume to 5 gals. Heat to 180° F and steep crystal malt. Remove grain bag and rinse with 0.5 gals. of 180° F water. Bring to a boil and add 1.5 oz. Fuggle hops. After 55 minutes of boiling, add Cascade hops and boil 5 more minutes. Adjust volume to 5 gals.

Cool wort to 70° F and add yeast. Ferment at 70° F for five days or until finished and rack to secondary for a seven-day rest. Rack to bottling bucket, prime, and bottle.

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Sour Mash
(10 gallons, all-grain)

I sour the half of the mash that has a high percent of wheat. The other half is straight infusion. I do, however, make an effort to minimize heat loss by using an ice chest and sealing the lid with duct tape. If it smells rotten, it is okay. The bacteria at work are for the most part aerobic. If it looks bad, it's okay. After 14 hours no matter how bad you think you screwed up, it's okay. Just see the whole thing through; it's worth it.

Micah Millspaw
Denver

Ingredients:

- 15 lbs. two-row klages malt, divided
- 12 lbs. wheat malt, divided
- 2 oz. Centennial hops (12% alpha acid), for 60 min.
- 1/2 oz. freshly crushed coriander
- Chimay yeast and Chico yeast
- corn sugar for priming

Step by Step:

Mash 5 lbs. two-row and 10 lbs. of wheat malt at 158° F for 14 hours. Infusion mash 10 lbs. of two-row klages and 2 lbs. of wheat malt at 155° F for 1.5 hours. Combine mashes for mash-out at 170° F for 15 minutes. Sparge at 170° F. Boil for 15 minutes and add hops. Boil 60 minutes more. Total boil is 75 minutes. Cool. Split into two carboys.

Pitch a Chimay culture into one and a Chico ale yeast into the other. Add 0.25 oz. coriander to each. After seven days fermentation blend the two batches in a larger vessel. Ferment seven more days. Keg with 1/4 cup corn sugar per five gallons. Counterpressure bottle after two weeks.

OG = 1.060
FG = 1.008

Fat Old Guy in a Dress Scottish Ale
(5 gallons, partial mash)

This is a rich and malty ale with a strong flavor. Give it a couple of months to age for best flavor. It's a little dark for the style, but this can be changed by using less chocolate malt.

Vince Weibert
Dallas

Ingredients:

- 7 lbs. light malt extract syrup
- 1 lb. light dry malt extract
- 0.25 lb. British toasted malt
- 1 lb. crystal malt, 60° Lovibond
- 0.5 lb. chocolate malt
- 1 cup light molasses
- 1.25 oz. Willamette hops (4% alpha acid), 1 oz. for 60 min., 0.25 oz. for 2 min.
- 1 package Wyeast 1728 Scottish Ale

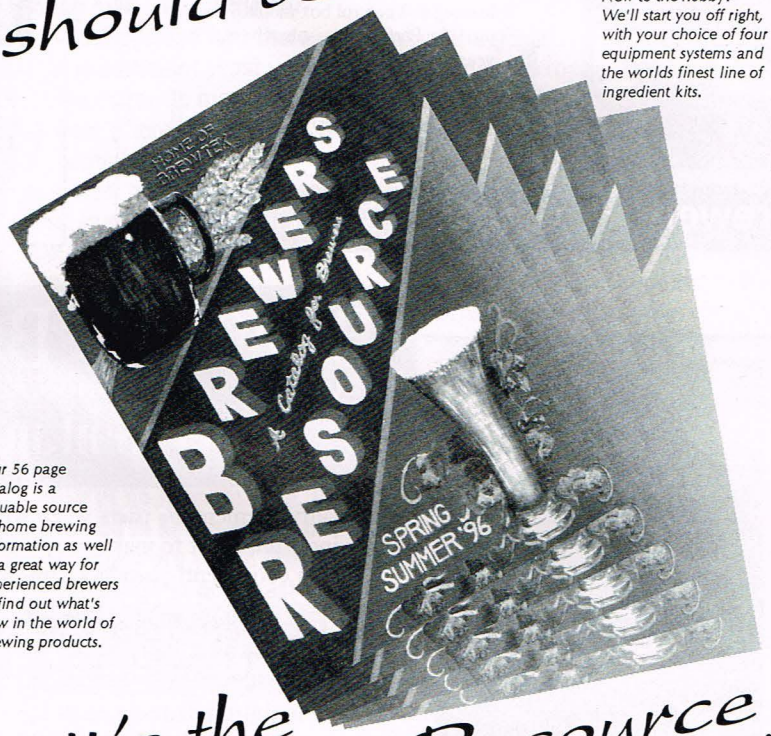
Step by Step:

Steep toasted, crystal, and chocolate malts in 3 gals. of 155° F water for 30 minutes. Sparge with 1 gal. of 170° F water. Add malt syrup, extract, and light molasses. Adjust volume to 5.5 gals. Bring to a boil and add 1 oz. hops. Boil 58 more minutes and add 0.25 oz. hops. Boil 2 minutes more. Cool to 70° F and pitch yeast. Ferment to completion and bottle.

OG = 1.070
FG = 1.017 ■

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CIRCLE 25 ON READER SERVICE CARD

Figuring Grain-Mill Settings

Mr. Wizard

After reading Mill Your Own Grain (September '96 BYO), I thought that building a mill would not be that difficult. What would you recommend for optimal distance between rollers, and does it depend on the particular grain being milled?

Mike Funk
Akron, Ohio



The gap between rollers in a malt mill does depend on the type of grain being milled as well as the roller size and surface texture. In general most commercial mills with large-diameter rolls (six to eight inches) have a gap setting of 1 to 1.2 millimeters. This setting is typically used for pale malt and may be set tighter for smaller grains, such as wheat and rye malts, and special malts for which husk integrity is not an issue. In fact very fine milling of roasted barley and roasted malt is preferred by some brewers because less grain is needed to provide a given color. This may also have a flavor benefit because less roasted/burnt husk material is added to the mash.

If you do build your own mill, the best way to determine the best gap setting is to start with coarsely milled malt and gradually tighten the gap over time while monitoring the ease of wort collection. The best gap setting is one that gives good extract yield while also allowing for easy wort recovery during lautering.

Mr. Wizard

In trying to brew an "authentic" Belgian Trappist ale, I tried culturing some "authentic" Belgian yeast. I used Chimay Red for culturing because it is a bottle-conditioned brew. I let the yeast settle to the bottom. I made a one-quart yeast starter, pouring in the bottom one-half to three-fourths inches of beer/yeast sediment into the quart starter. After a few days I saw visible aspects of the yeast propagating in the form of white sediment at the bottom of the yeast starter, but the lack of head formation and bubbling made me a little nervous. I decided that there was sufficient yeast within the starter to make the beer (there was more white sediment in this starter than any of the other starters that I've made using Wyeast smack packs).

Two days after pitching my "authentic" Belgian yeast I became very disturbed at the apparent total lack of fermentation. After two more days of no fermentation, I pitched in seven grams of Muntons dry yeast. Before pitching the dry yeast I took a hydrometer reading. There was no indication that any fermentation took place (final gravity was 1.068, the same as my original reading). I decided my "authentic" Belgian Trappist ale was going to become an English strong ale.

Within 24 hours there were vigorous signs of fermentation. I fermented for about a week and bottle conditioned for two weeks before trying my experiment. Much to my surprise my brew had a very distinctive Belgian taste! It is quite tasty. Apparently there was some life left in the Chimay yeast. I shouldn't look a gift horse in the mouth, but how did I end up with a Belgian Trappist ale? Is there any way I can improve my yeast-starter technique with respect to culturing yeast from bottles to avoid the lag time problem I experienced in this batch?

Jack P. Horzempa
King of Prussia, Pa.

Not only should you not look a gift horse in the mouth, but you shouldn't ask questions that stir Mr. Wizard's cynical mind! The term that gets me on this query is "Belgian taste," because many brewers outside of the great brewing nation of Belgium freely call any beer that is the least bit funky "Belgian tasting." In fact many non-Belgian European brewers, such as German brewers, consider most Belgian ales funky. So my question to you is: Are you calling your beer a Belgian Trappist-style ale because it is big, malty, and funky or because it tastes very similar to a Trappist ale?

My guess is that it wouldn't have a true Chimay character even if you had not added the dry ale yeast, because the yeast in the bottom of a Chimay bottle is different than the strain used in fermentation. I'm not exactly sure why this is done, but Chimay conditions with a different strain than that used in fermentation, according to a Belgian brewing microbiologist who is very familiar with Trappist breweries (he helps them with microbiological problems). Because there are only five Trappist breweries in Belgium and one in Holland, you could try culturing yeast from all of the breweries to find a good fermenting strain. I don't know if they all use a separate conditioning strain.

I have brewed beers using the stuff at the bottom of Chimay bottles and the beer had a pronounced phenolic off-flavor. This flavor is very similar to the smell of Chloraseptic or some really peaty scotches, such as Laphroig. This phenolic character is also frequently associated with wild yeast strains and Bavarian weizen strains but is not a distinguishing feature of Trappist ales.

Because dry yeast sachets are often contaminated with wild yeast, it is not beyond reason to tie the "Belgian flavor" in your beer to the dried yeast. Because you did not see any signs of life when you propagated the Chimay yeast nor did the wort seem to ferment when it was pitched, I find it unlikely that the few cells that may have been living in your fermenter could produce any pronounced flavor. It seems to me that the white stuff in the bottom of your propagation bottle was simply dead yeast. This would not be uncommon if the Chimay was bought from a store shelf in the United States, because it doesn't take long for yeast to die when they are in a bottle of beer sitting on a liquor-store shelf.

Conditioning yeast versus fermenting yeast aside, the best way to use yeast from a bottle-conditioned beer is to do some true microbiological selection before propagation. Essentially, this involves streaking a small sample of the yeast sediment onto a petri dish containing some type of microbiological medium. Once yeast growth is visible, it is now possible to select a single colony to propagate into a volume large enough to pitch into a fermentation. This method is preferred because there may be some bacterial contaminants or non-brewing yeast in the yeast sediment that could ruin the beer being brewed. This technique will usually give better control over the yeast concentration in the propagator because the colony that you start with is known to be living and of high concentration. Yeast concentration, viability, and purity are not known if you simply add a volume of yeast sediment to a quart of wort for propagation.

In the mean time, enjoy that Trappist ale!

Mr. Wizard

As we all know, beer from Sierra Nevada Brewing Co. is bottle conditioned and contains a small amount of yeast sediment in each bottle. It can be harvested and used.

But a local master brewer from a brewpub advised me that the magicians at Sierra Nevada filter their beers after fermentation, then add a very small amount of yeast with some wort and allow it to bottle condition in this manner. The product is then, obviously, clean tasting, crisp, and clear with little or no visible sedimentation. If at all possible, could you please outline a practical method on how a homebrewer could accomplish this in the kitchen or garage?

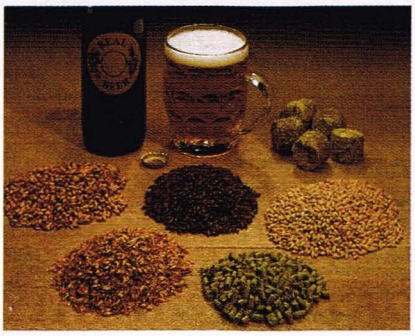
Edward P. Kelly
Freehold, N.J.

There are some methods that homebrewers can use to emulate this technique. However, before I outline some of these strategies I want to touch on why a brewer would want to go to so much trouble.

Contrary to popular belief, bottle conditioning is not the cure-all to the problems of bottling. It is true that yeast can scavenge some oxygen from bottle-conditioned beer and perhaps ward off oxidation. However, yeast in bottle-conditioned beers are also very capable of causing a deterioration of flavor. This process begins when yeast cells autolyze and release intracellular enzymes and yeasty flavors into beer. Some of these enzymes, called esterases, break down esters (esters contribute fruitiness to beer) and alter the beer's aroma profile. Other enzymes, proteases, chew up foam stabilizing proteins, resulting in reduced foam stability over time. The flavors released when yeast autolyze can make a good beer taste like dead and decaying yeast. Yum! So there are some good reasons to control the amount of yeast in a bottle-conditioned beer. The idea is to have enough yeast to allow for conditioning while keeping the level low enough to minimize the negative effects of yeast autolysis.

At Sierra Nevada beer is clarified by a combination of centrifugation and sheet filtration. The resulting beer is brilliantly clear but is not completely carbonated. To carbonate the beer some fresh, clean, healthy yeast is added to the beer along with priming sugar. To ensure a uniform mixture of yeast and sugar the tank

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CIRCLE 58 ON READER SERVICE CARD

holding the beer prior to packaging has an agitator inserted in its side, which gently combines the beer, yeast, and sugar mixture. The mixing process continues until the content of the tank has been racked into kegs or packaged into bottles. Bottles of Sierra Nevada ale spend about one week in the brewery before being released for distribution. This hold period ensures the beer is fully conditioned before any consumer purchases a six-pack.

This process could be copied at home by first clarifying your homebrew. Several clarification methods are available that do not require filtration. Beer naturally clarifies if held cold, 31° to 32° F, from five days to several weeks. Cold storage not only gets rid of most of the yeast but chill-proofs the beer, which guards the beer from subsequent chill hazes caused by the co-precipitation of proteins and tannins in cold beer. Fining agents, such as isinglass and collagen, can be used to quickly remove yeast from the beer. These finings also provide some protection from chill hazes, although they are not as effective as cold storage. Another technique is to select yeast that have good flocculation properties. These kinds of yeast will naturally drop from the beer at the end of fermentation. Of course flocculent yeast coupled with cold storage or finings makes for the easiest clarification if filtration is not an option.

If you do have a filter, then use it to filter cold beer. It is always best to filter beer colder than the anticipated minimum serving temperature to guard against unwanted chill hazes.

After your beer is clarified, it is time to add yeast and priming sugar to it. Remember that the quantity of priming sugar depends not only on the desired carbonation level in the finished beer but on how much beer you are bottling. A bottling bucket with a volumetric scale is always best. The tricky part of this process is adding the yeast, because not much yeast is needed. The target concentration in the beer is between 250,000 and 500,000 cells per milliliter of beer. This is between 25 to 50 times less than the amount added to wort before fermentation. If you're using dry yeast, about 0.25 to 0.50 grams per five gallons of beer will do the trick. If you want to use a liquid slurry, the amount will be a bit more inexact, because the yeast concentration of liquid yeast is not consistent as it is in dry yeast. A rule of thumb is to use 0.66 milliliters of thick yeast slurry per liter of beer or about 12.5 milliliters of yeast slurry per five gallons of beer. I define thick slurry as the consistency of yeast harvested from the bottom of a fermenter.

If you really want to go all the way with this process, you can kraeusen the beer in the bottle. This requires a very good knowledge of how much fermentable extract is in the kraeusen beer (beer in active fermentation) to predict how much carbonation will be produced and how much beer you are attempting to carbonate. Bottle conditioning with kraeusen beer should only be tried by very experienced brewers, because bottle bombs are easy to produce if too much kraeusen is added.

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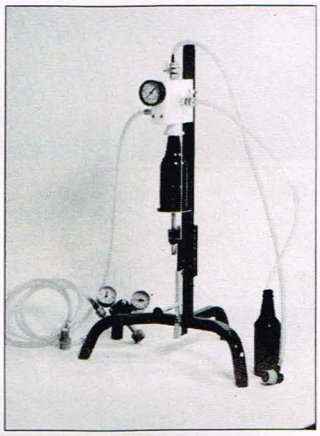
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CIRCLE 35 ON READER SERVICE CARD

Mr. Wizard

I recall that adding salt to beer was a common practice by the old timers who enjoyed a "near beer" in the back room of our local pool hall. I was too young to know for sure what was going on. These fellows would take a good swig out of a newly opened near beer. Then they would refill the empty space with "white lightnin'." When they had drunk about half the bottle, some would shake a little salt into the bottle to make it fizz again. Surely this changed the flavor, and the foam probably did not contribute anything. If the beer was flat it was flat, wasn't it? Adding salt would dispel what little CO_2 might be left. Why did they do it?

John Holmes
Birmingham, Ala.

It is fond memories of beer like this that keep me going! You have my gustatory senses primed for what sounds to be one of the true greats of malt beverages: near beer-n-hooch!

Your question of why these old timers added salt to their blend of near beer and moonshine probably has more to do with covering up the foul taste of this concoction rather than doing anything to the foam, although the beer would certainly foam if it weren't flat. It almost sounds as if you're implying the beer was flat. That sounds even more repugnant! The salt additive was probably just a flavor modifier, like licking salt before drinking tequila.

I don't know if I shed any light on this question, but I'm sure this question will pique enough interest to resurrect a long-gone drink! ■

Mr. Wizard's Address

Do you have a question for Mr. Wizard? Write to him c/o Brew Your Own, 216 F St., #160, Davis, CA 95616. Or send e-mail to wiz@byo.com.

Craftier than Cupid, Mr. Wizard aims his arrows high. Each well-shot dart causes unsuspecting victims to fall in love with beer.

Add Character With Specialty Grains

Brewer: Tim Schwartz
Brewery: Bitter End Brewing, Austin, Texas
Years of Experience: Two
Education: Five years homebrewing
House Beers: EZ Wheat, Bitter End Bitter, Aberdeen Amber, Austin Pale Ale, Hammerhead Porter, and Sledgehammer Stout

The first consideration when using specialty grains is figuring out what type of beer you want. We know what our brewhouse efficiency is, so we can calculate how much grain we're going to need to hit a particular gravity. Then we determine what color we want. You also have to ask yourself if you want your beer on the malty side or the hoppy side.

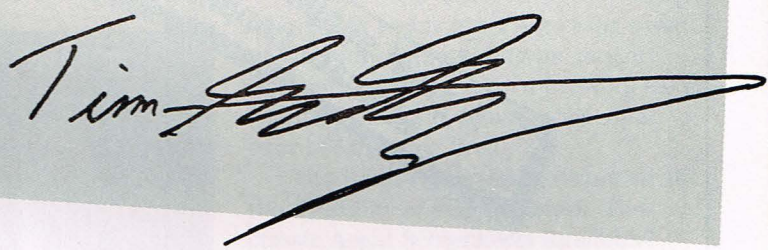
One of the best things homebrewers can do is look at books for different beer styles. Brewing handbooks can give you traditional percentages of specialty grains for certain styles. You might want to try the traditional recipe, then start experimenting to see what you like. That's one of the fun things about homebrewing, making something unique.

For example the percentage of crystal malt and specialty grains we use in our Bitter End Bitter is a lot higher than in a traditional English ESB. We use a blend of the five crystal malts, which is a little unusual. Quite often you're using one or two crystal malts. Using five gives it a little more depth and complexity, because different shades of the crystal malt contribute slightly different flavors, some sweeter, some nuttier. The really dark crystal adds a slight raisin flavor. We were going for a fairly big malt profile on this beer, even though we put a lot of English hops in it.

Bitter End Brewing

"It's better to start off with the lightest extract you can and build the recipe up using specialty grains. It gives you more control over the process, and it's more indivdualistic. You're beer won't taste like everyone else's."

Brewer: Tim Schwartz



It is dark copper. English bitters have a wide range of colors, from golden to very dark amber. So a variety of colors fall into the traditional category.

The crystal malts we use are 13° Lovibond carastan, 30° Lovibond cara, 55° Lovibond crystal, 75° Lovibond crystal, and 120° Lovibond crystal. The majority is 55° Lovibond crystal, about 6 percent of the grist. If you were homebrewing the Bitter End Bitter, you'd use 2 pounds of specialty grains: 10 or 11 ounces of 55° Lovibond crystal, 6 ounces each of 13° cara, 30° cara,

The Tips

Tim Schwartz

• Don't rigidly match your malt extract to the style you are attempting. It's better to start with the lightest extract and build up the recipe using specialty grains.

• Start with the amounts given in a recipe for a traditional style and then experiment until you find variations you like and can call your own.

• Never boil grains. Steep them as the water comes to a boil. When boiled, grains leach tannins and could ruin your beer.

• Crystal malts are already caramelized, so they respond well to steeping. Other grains, such as Munich and Vienna, must be mashed.

and 75° Lovibond crystal; and two to three ounces of the 120° Lovibond crystal. This is an all-grain recipe. But if you're a homebrewer making an amber beer, you don't necessarily need to brew with amber malt extract. It's better to start off with the lightest extract you can and build the recipe up using specialty grains. It gives you more control over the process, and it's more individualistic. Your beer won't taste like everyone else's, because you're picking out your own specialty grains for flavor and color.

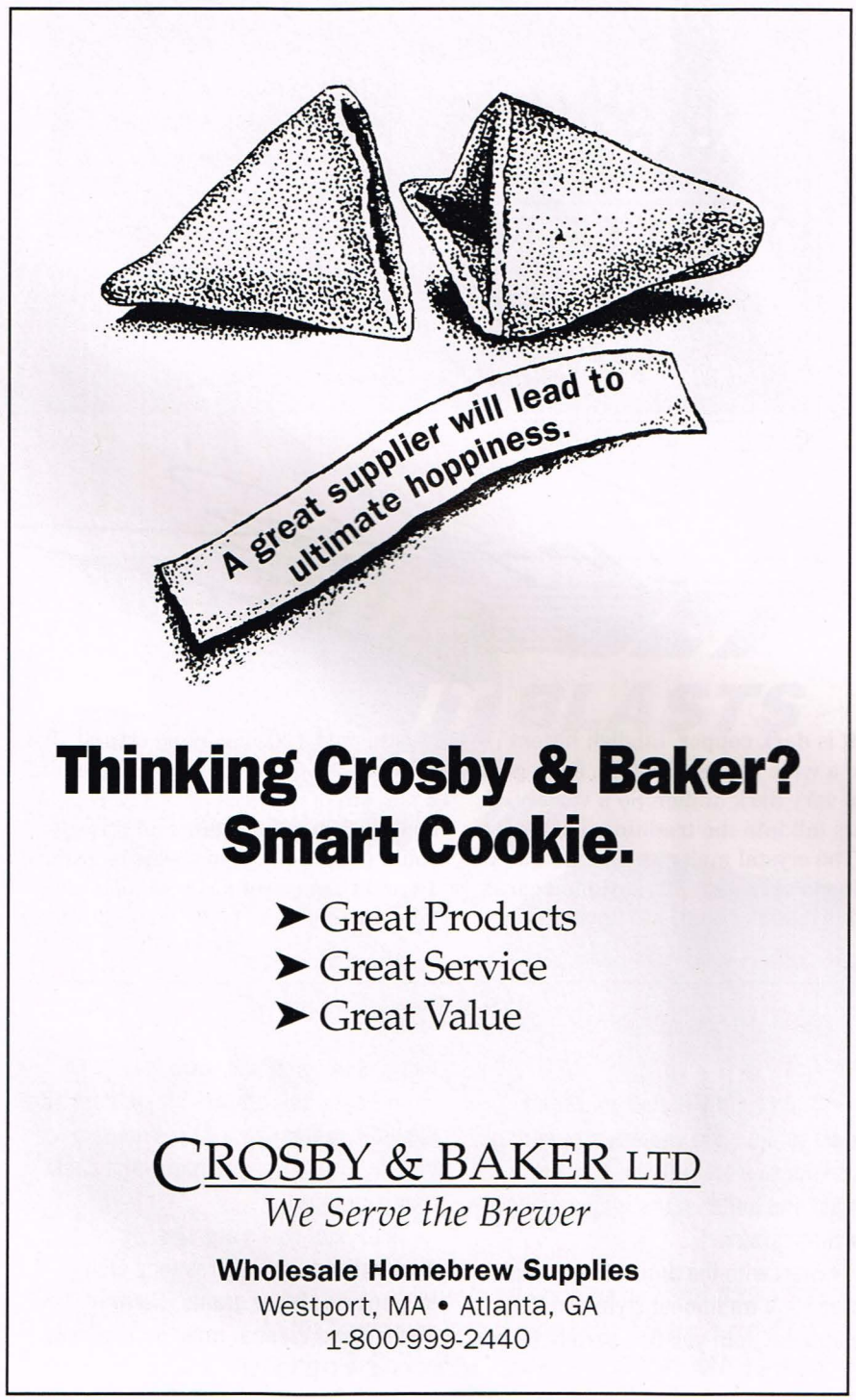
One of our most unique recipes is the Sledgehammer Express. It is an espresso version of our Sledgehammer Stout. It has eight pounds of espresso beans in a 200-gallon batch. We wanted some nice roasted notes, which are traditional in a stout, so we used chocolate malt, a pretty good amount of roasted barley, and a little black patent malt to get an opaque character and dry roastiness. We also put in a lot more crystal malt than we do in our stout because we needed to balance the roastiness and the dryness of the coffee flavor with a little sweetness and bring up the body. Whenever you increase the percent of crystal, you get more body and more unfermentable dextrins in beer. This adds to the mouthfeel.

That's another thing you need to think about when homebrewing. The more specialty grains that you're adding, the higher your finishing gravity is going to be, because specialty grains have sugars that aren't going to be fully converted.

When using specialty grains, steep them as the water comes to a boil; don't boil them. If you do, the grains will leach out tannins that will give harsh, astringent flavors to your beer. When you get into all-grain brewing, it's easy to make the mistake of mashing with too high a percent of specialty grains that don't have the kind of enzymatic content that you normally get from two-row or base malt. When mashing in all-grain recipes, you have enzymes converting carbohydrates into sugars. So if you do all-grain and use a very high percent of specialty grains that don't have requisite enzymes, you'll end up with a lot of starches or carbohydrates that weren't converted to sugars.

Brewers who partial mash should include some two-row so the enzymes are in there. If you use specialty grains such as Munich or Vienna malts, it's better to do a mashing process on them. The sugars in crystal malts are readily available to go into solution, because crystal malts have undergone a sort of mash in their production. Munich and Vienna malts, however, do much better with mashing even if it's short — 10- to 15-minute rests around 150° F or so — because they need to go through the conversion process more than crystal or roasted barley and black patent malt.

Another important tip is the more involved you are in the process — the more specialty grains you use — the more control you have over your outcome. ■



Brew a Smokin' Rauchbier

by Jeff Frane

I have had some memorable experiences with beer, and some of the best have been with my wife, Elizabeth: drinking bitter and playing gin rummy at Spinnaker's (she cheats!); smuggling bottles of Ballard Bitter onto the inter-island ferry in the San Juans; and simply watching her expression when she takes the first taste of my latest brewing experiment.

One of the most memorable moments was on a rare childless Easter weekend in a motel room in Astoria, Ore. Sitting by a window overlooking the Pacific Ocean and the mouth of the Columbia River, we ate dinner and shared a single bottle of Alaskan Smoked Porter given to us by beer writer Fred Eckhardt. I have never been able to find another bottle (at least one that wasn't empty), and even visitors to Alaska report that the beer is frustratingly rare.



One of the few commercial examples of rauchbier, Alaskan Smoked Porter is made from malt that has been smoked over alder fires at a neighborhood salmon processing plant.

At one time a lot of beers undoubtedly had a smoky tinge. There are only a few ways to dry barley after it has been malted. Any wood used to heat the malt would have imparted some smokiness to the grain, which in turn would have added some smoke flavor and aroma to the beer. Given the rough edges early beers undoubtedly had, the smokiness may not have been particularly noticeable, and it's unlikely that the smokiness was deliberate.

Few of these beers have survived changes in technology. But in the area of Germany surrounding the city of Bamberg, a few stubborn brewers have retained the style, kilning their malt over beech-wood fires.

The Bamberg brewers demonstrate the flexibility of smoked beers. The classic Aecht Schlenkerla Rauchbier (1.054 original gravity) is dark, rich, and smoky, brewed entirely from smoked malts. But paler versions are brewed with smaller portions of rauchmalz (smoked malt) included in a more "normal" grist. Years ago in Portland, Ore., Widmer Brewing Co., which shares a building with B Moloch restaurant, smoked a fraction of its malt in the restaurant's brick oven and produced some experimental batches of a wonderful Rauchbier. The smoked malt gave the beer an intriguing, almost citric quality — very refreshing.

The Alaska Brewing & Bottling Co. in Juneau, Alaska, smokes all the malt (including caramel and roasted) for its smoked porter over alder fires. They smoke it down the street in a salmon processing plant. The beer is rich and warm, the smoke adding just the right level of complexity and mystery.

Smoked beers cry out for food to

accompany them, especially foods that also have been smoked (salmon, cheese, meat). Perhaps cigar aficionados would find them a good match for their vile (oops, strike that), pernicious (better cut that, too), fragrant habit.

There are two distinct approaches that can be taken to produce a Rauchbier. The "purest" is to smoke the grain during the malting process, as the Bamberg approach demonstrates. The barley (or in the case of one unusual Polish beer, the wheat) is soaked thoroughly in cold water, then allowed to germinate. When this process is well along, the green malt is kilned, or gently and thoroughly dried. Rauchmalz are created by kilning with the heat of smoldering wood, usually beech.

The extremely ambitious homebrewer can, of course, malt and dry barley from scratch, but German maltsters provide delicious rauchmalz, available from well-stocked homebrew supply stores. Rauchmalz may be substituted for all the lager malt in a basic lager recipe; märzenbiers, with their slightly higher original gravity, seem particularly appropriate.

Beech, of course, isn't the only wood that can be used (hickory beer?), and smoke doesn't even need wood. Scotch whiskey begins as a sort of beer (before distillation), and malt, kilned over peat fires, is an essential ingredient. Peat-smoked malts are available to the homebrewer and have been used in some commercial beers. Samuel Adams Scotch Ale is widely available and contains peated malt. An unusual French lager, Adelscott Smoked Malt Liquor, has a delicate smokiness from peated malt, and beer critic Michael Jackson reports on a couple of Seattle brewers who have used peat to special effect in barley-wine and Scotch ale.

Peated malt, however, should be used with plenty of caution. More than one homebrewer has created undrinkable "Scotch" ales, and a brewpub produced a version (with a conservative addition of 5 percent peated malt) that it not only couldn't sell but couldn't give away. Much of the same effect could have been achieved by pouring kerosene into the serving tank.

The second approach, used by Alaska Brewing and Widmer Brewing among other craft breweries, is to smoke the finished malt, either all (pale, caramel, and roasted) or some portion of it. Anyone with a home smoker and some wood chips can run any number of experiments, varying the types of wood (ah, here's that hickory-smoked ale, just right with a pulled pork sandwich), and the proportions of malt. Or consider a Chinese tradition in which duck is smoked over coals covered with black tea. The possibilities are truly endless.

One other method of adding a smoky taste to beer is a radical departure, indeed. At one time kettles were made of wood rather than copper or steel and impossible to fire directly. Some breweries boiled the wort by heating stones in a separate fire and then tossing the rocks into the kettle, bringing the wort to a boil, and caramelizing wort sugars on the stone's surface. One German brewery reintroduced stone beer; makers of Rauchenfels Steinbier not only add hot rocks to the wort but later introduce them into the lagering tanks, where the caramelized sugars are slowly re-dissolved into the beer.

In the days when Chuck Skypeck, vice president and head brewer of Bosco's brewpubs in Tennessee, homebrewed, he and a friend duplicated the Rauchenfels method. They heated quartzite stones and added them to the kettle and later to the secondary fermenter. Skypeck eventually took the technique to another level, brewing his Flaming Stone beer at two Bosco's brewpubs. The stones are now heated in the brick pizza ovens, and Skypeck usually doesn't reintroduce the rocks to the fermenters but allows the caramelized sugar to build up over successive batches, eventually producing one intense Rauchbier.

Steinbier

(5 gallons, extract)

Ingredients:

- 6.6 lbs. German light malt extract
- 1 lb. extra light dry malt extract
- 1.5 oz. Mt. Hood hops (3.2% alpha acid), for 60 min.
- 3 lbs. metamorphic rock (such as quartzite), scrubbed, boiled, and thoroughly rinsed
- 1-qt. starter of Wyeast 1007

Step-By-Step:

You will need a kettle large enough to boil 6 gals. of wort, a very hot fire, and a stainless steel basket or colander for the stones (something that won't completely warp when heated). Best results are achieved by keeping the stones out of the firewood, on a grate over the heat. Some sort of bellows or fan should be used to get the flames as hot as possible.

Dissolve the malt extract in hot water, then bring to a boil. Add the hot stones after 30 minutes, and leave them in the wort until the intense steaming has died down. Remove the stones from the wort, allow them to cool. Place them in sanitary containers and store in the freezer. Meanwhile, add the hops to the wort and continue boiling for a total of 90 minutes.

Cool the wort (place the kettle in a large sink and run cold water around it) to 70° to 80° F. Transfer to a fermenter, aerate thoroughly, and pitch yeast. Follow normal fermentation procedures, but rack into a wide-mouth fermenter (a soda-pop keg is ideal) for secondary fermentation. Add the rocks to the fermenter, and keep them there for several weeks. Follow normal kegging or bottling procedures. You can re-use the stones for your next steinbier.

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CIRCLE 47 ON READER SERVICE CARD

Just as there are a number of approaches to smoking beer, there are no hard rules about the brewing process. Schlenkerla, like other beers in the Bamberg region, is a lager. But steinbiers are top-fermented (appropriate to a style that pre-dates lager yeast). Skypeck's research into stone brewing produced a method that had survived into this century, in which the hot stones (and the hops, which acted as a filter bed) were added to the mash. The wort was never boiled separately.

American craft brewers generally follow their standard brewing practices for their rauchbiers, with single-step infusion mashes and top-fermentation.

Smoked beers can be golden or dark, dry or rich. Seemingly, any wort is a suitable base, and the brewer can adjust the level of smokiness according to taste. German rauchmalz has a distinct but not overpowering smoke flavor and can substitute for all of a beer's base malt. Brewers experimenting with home smokers might want to taste their malt side by side with some Rauchmalz before adding it to a brew. Some very intense smoked malts might best be used at levels of 15 to 20 percent initially or in particularly rich beers.

Hopping rates, too, depend on the brewer's discretion, but I would tend to start conservatively so the bitterness or hoppiness doesn't conflict with the smokiness. ■

Rauchbier

(5 gallons, all-grain)

This recipe is from Jim Busch, a fine amateur brewer with one foot well in the professional door. He suggests that if the lagering schedule is too difficult to achieve, a clean substitution can be made with Wyeast 1056 and a primary fermentation at 62° to 64° F.

Ingredients:

- 9.75 lbs. Weyermann rauchmalz
- 1/3 lb. Belgian cara-Vienne malt
- 1/3 lb. Belgian cara-Munich malt
- 1.25 oz. of German Northern Brewer hops (7.2% alpha acid), for 60 min.
- 1-gal. starter of lager yeast (Yeast Lab YCKC L31)

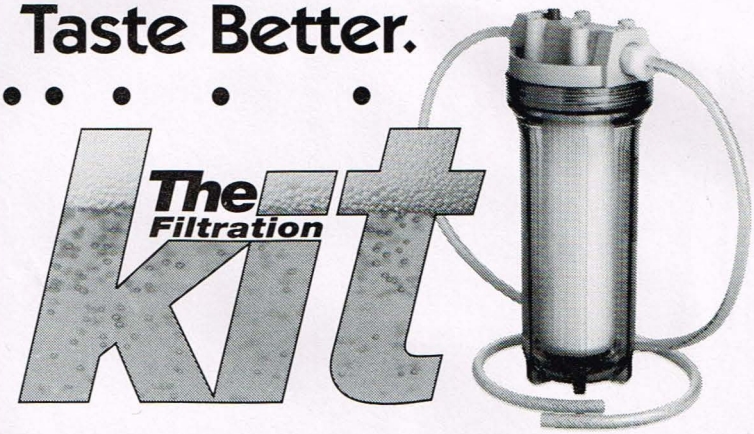
Step-By-Step:

Mash in at 131° F for 15 minutes. Pull decoction and rest decoction at 152° F for 20 minutes before boiling for 20 minutes. Combine mashes and hold at 152° F for 30 minutes. Raise to 158° F for 15 minutes. Raise to 170° F for mash-out, and lauter.

Add hops and boil for 30 minutes. Boil 60 minutes more. Cool to 48° F, aerate thoroughly, and add yeast. Ferment for seven to 10 days. Rack to secondary and lager at 31° F for five to six weeks. Follow normal kegging or bottling procedures.

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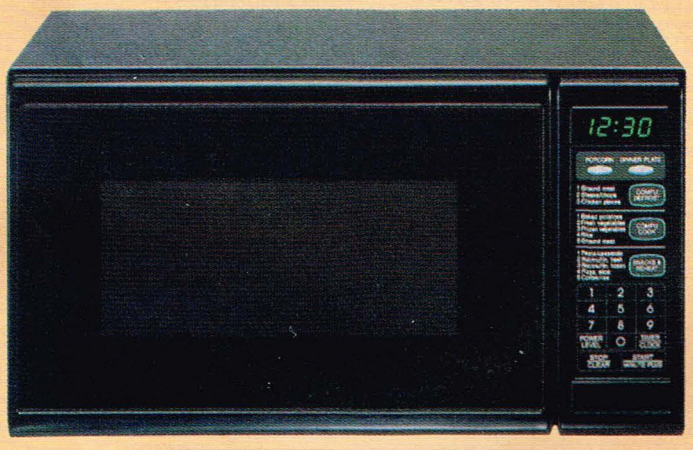
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CIRCLE 26 ON READER SERVICE CARD

RADAR RANGE BEER



by Sal Emma

Some guys will do anything on a dare. Clark Nelson, former head brewer at Coyote Springs brewpub in Phoenix, is reported to have made beer out of Cheerios while cruising aboard a Navy submarine.

I am ready to face my challenge. The staff at BYO let it slip that they doubted I could successfully complete a grain mash in a microwave oven.

Ye of little faith! Read on, brew trooper, and you will learn the secrets of radar range mashing!



The real origin of the story is a bit mundane. One morning, as I was zapping my daily bowl of oatmeal in the microwave, I was overcome by the hare-brained idea. Oatmeal lovers stopped cooking their porridge on the stove top years ago in favor of the convenience of the microwave. It is quicker and cleaner and requires no pot scrubbing.

I thought: "Why wouldn't those advantages apply to the brewer's mash?" Of course they would. And unbeknownst to the doubtful skeptics on the BYO staff, I had a secret weapon: the temperature probe!

I have an old Kenmore microwave. It was built about 10 years ago, during the brief period when microwave ovens came with strange — and largely ignored — accessories, such as temperature probes. The temperature probe looks like an ice pick wired to a quarter-inch headphone plug.

A mated quarter-inch jack is mounted inside the oven. The idea was a product of the days when microwave designers actually believed their consumers would cook in the microwave. You know, Sunday dinner roast beef with potatoes, carrots, all the trimmings, in half the time.

The ice pick was to be inserted into the meat, then plugged into the jack. The oven was programmed to zap the meat until it reached a predetermined internal temperature, according to the tastes of the user.

The thing really works. The problem, as we all know, is that cooking roast beef and Sunday ham in your microwave is not the best way to coax the flavor, color, and tenderness out of the meat. Meat cooked in the microwave comes out tough, gray, and rubbery. It's not exactly appetizing.

Legions of microwave owners filed the ice pick away with the microwave recipe book, never again to see the light of day as the oven was relegated to its truly useful purposes: heating cold coffee, popcorn, burritos, TV dinners, and leftovers.

I was one among legions. In fact long before my brewing days, I had thrown my probe away, knowing I would never use it.

My mother, on the other hand, saves everything. She still had hers. When the micro-mash idea hit me, I quickly appropriated mom's — with her permission, of course.

My microwave's temperature program range is 115° to 200° F. Is that perfect for mashing or what? Another reason I could pull this off is that my oven is one of the big ones. Tall and deep with a removable wire shelf. I knew I could fit a pretty big mash tun in there.

I decided on a recipe, Belgian Strong Ale. Not for any particular reason, except that I had never made one before. Plus, I found it humorously ironic to imagine a Trappist brewer toiling away in a Belgian Monastery tapping temperature commands on a Kenmore microwave. The recipe was based on Dave Miller's Trappist Ale from *Brewing the World's Great Beers*.

I planned to make this beer all-grain but when weighing out the malt at the homebrew store, it became evident that even my oversized microwave was not big enough to accommodate 10 pounds of malt and 10 quarts of water. I switched gears and pursued a mash/extract version instead.

To take full advantage of my techno-power, I chose a temperature-program mash. I would use a protein-developing step mash, bringing the mash to around 120° F and resting there for 30 minutes before proceeding to a 60-minute conversion, holding at 155° F.

According to author Charlie Papazian, the "protein-developing step mash" will improve head retention, reduce chill haze, and assure development of adequate yeast nutrients. Step mashing is also recommended when adjuncts (sources of starch other than malt) are present.

Since this was to be a strong ale, I planned to use the mash process to convert some extra starch to sugar. I knew the Belgian ale yeast would be able to handle high-gravity wort. Hence, the addition of corn starch to the grist.

I added the raw barley only because it was sitting in my brew closet collecting dust and I could not bear the thought of throwing it away.

The Microwave Method

My wife uses an enormous porcelain mixing bowl for chocolate chip cookies, big salads, and the like. It fit in my microwave just right and was spacious enough for the mash.

First I zapped five quarts of filtered water, setting the temperature program at 130° F. The oven ran for 25

Radar Range Belgian Ale

(5 gallons, partial mash)

Ingredients:

- 3.5 lbs. pale malt
- 0.5 lb. crystal malt, 40° Lovibond
- 1 lb. corn starch
- 0.5 lb. flaked barley
- 1 lb. dark brown sugar (substitute 1 lb. Belgian dark candi sugar, if you can get it)
- 6 lbs. light liquid extract, unhopped
- 10 alpha acid units of Hallertauer, Fuggle, and Saaz hop pellets, two-thirds the amount for 60 min., one-third for 15 min.
- 1 Tbsp. Irish moss
- Wyeast Belgian Strong Ale yeast
- 3/4 cup corn sugar for priming

Step by Step:

Prepare yeast starter the day before brewing. On brew day mash and lauter (see The Microwave Method in the main story).

Bring the resulting wort to the boil. Add water as needed. Add extract, sugar, and two-thirds of the hop blend at the beginning of the boil. Boil 45 minutes. Add the last third of the hops and the Irish moss. Continue boiling for 15 minutes more. Total boil is 60 minutes.

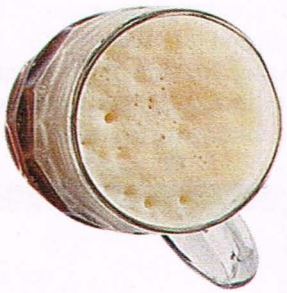
Chill, pitch, ferment, and bottle according to your usual plan.

OG = 1.070

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minutes before beeping to announce the temperature had been reached.

I sifted in the corn starch before mashing in the malt, adding about a pint of cold water until the temperature stabilized at 120° F. I reset the microwave program for 120° F and returned it to the oven for 30 minutes. During this time the oven activated very little. An unexpected benefit of the microwave method was that the thick porcelain bowl retained the heat of the mash. The oven had little work to do during the protein rest.

I stirred and checked the temperature once during the rest. My scheme was unfolding perfectly.

During the last minutes of the protein rest, I boiled a quart of water on the stove top. When the first rest was over, I added the quart of boiling water to the mash, stirred, and returned it to the oven, setting the temperature probe to 150° F. It ran at full power for 12 minutes to reach 150° F.

For the next 60 minutes I listened to the oven cycle on and off to gauge the power level it used to hold the temperature. It was actively nuking only around 10 percent of the time. Again, the heavy mixing bowl did a great job at holding temperature.

I stirred and checked the temperature three times during the conversion rest. The iodine test was just slightly stubborn after the first hour. I let it sit another 30 minutes and the iodine test was fine.

At the end of the conversion, I boiled two gallons of sparge water on the stove and increased the microwave setting to 170° F. It took the oven 15 minutes to reach the mash-out temperature, and I began the sparge/lauter.

It worked!

Brewing Notes

My oven is rated at 600 watts power. You can expect shorter heating times with a more powerful oven.

If you want to try this at home and your oven does not have a temperature probe, zap the water at full power until you reach your strike temperature. During rests you will not need more than 10 percent power to hold the temperature, especially if you use a porcelain or earthenware bowl.

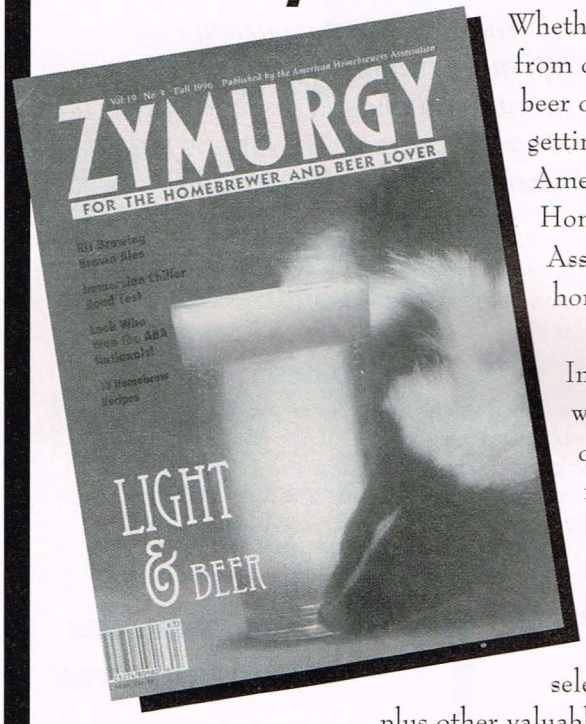
Stir occasionally during rests to distribute heat evenly.

Another potential use for the microwave in brewing is less messy, no-pot decoction.

And if you use a picnic cooler as a mash tun, you can remove and microwave a portion of the mash, returning it to the cooler to increase the overall mash temperature without thinning it by adding hot water. I did that once, after striking in a picnic cooler that I had neglected to pre-heat. The temperature dropped far below conversion range, and I used the microwave "decoction" method to increase the temperature.

Now, who said microwaves were just for frozen burritos?

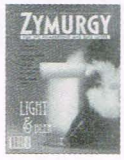
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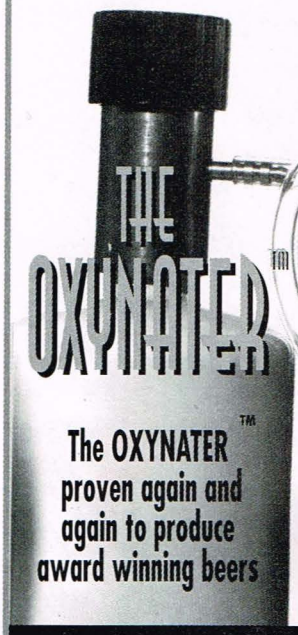
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LAGER

Pale pilsner to malty Munich, this beer is cool, clean, and smooth.

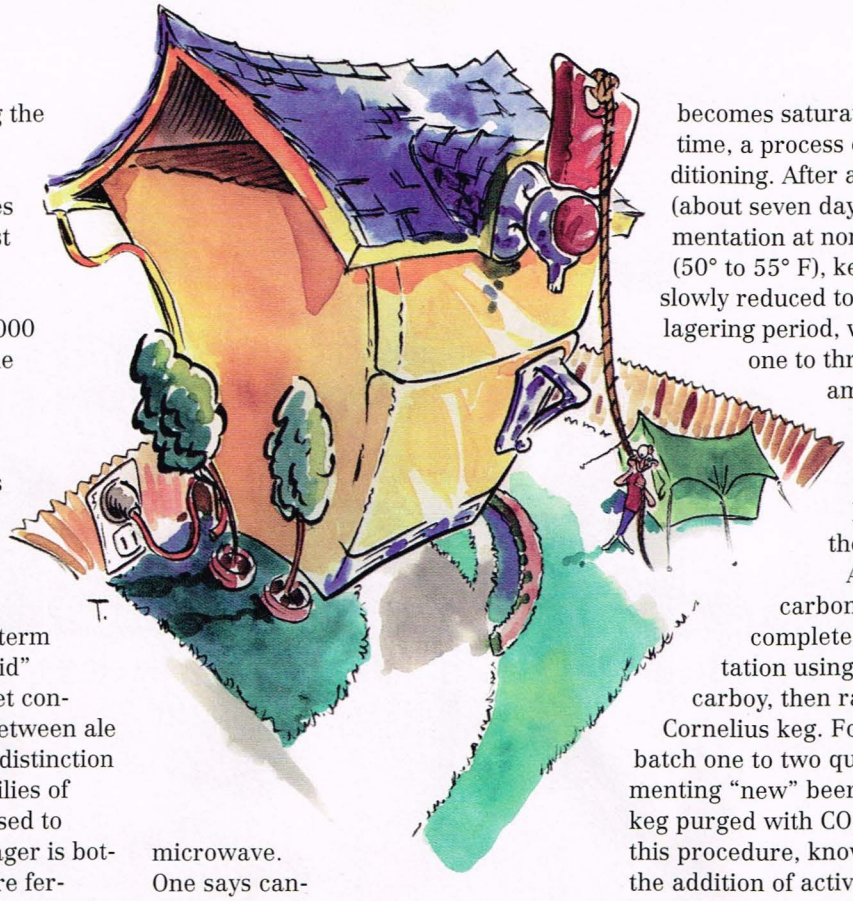
by Kirk Fleming

Most homebrewers begin by brewing ale, and their entire exposure to lager is limited mostly to American light lagers. Even many imports are often brewed to offend as few palates as possible. This sometimes leads people to think that by brewing a lager they're brewing a Budweiser.

The spectrum of delightful nectars belonging to the lager family is as varied and rich as that of the ale world, and the number of options for beermaking equally vast (and sometimes puzzling). If you prefer to stick to traditional lager styles, you're still free to brew beverages ranging from pale pilsners to malty Munichs and to choose from the complete range of hop bitterness and aroma. The small amount of fermentation by-products produced by lager yeast, combined with extended aging periods at very cold temperatures, make for a delightful beverage unprecedented in clarity and smooth, clean taste. These characteristics may account for the tremendous popularity of lager the world over.

In the 1800s lager brewing gained popularity in Europe when economical refrigeration made year-round production possible. Many emigrants to the United States brought their love for lager making

with them, thankfully. During the 1850s through the 1870s, lagers took off in the States. The growth of lager breweries for the next two decades must have resembled what we see today with the microbrewery explosion, with more than 4,000 facilities in place by 1870. The following decade saw the introduction of commercial refrigeration equipment that nearly eliminated restrictions on both brewing season and location.



What Makes a Lager?

With beer now a generic term for all ales, lagers, and "hybrid" malt beverages, it's easy to get confused about the differences between ale and lager. The single biggest distinction between these two great families of malt beverages is the yeast used to make them. The key to any lager is bottom-fermenting yeast. Ales are fermented with top-fermenting yeast. But if you've made beers with both lager and ale yeasts, then you've noticed something pretty puzzling: When either yeast is used and wort is fermenting, the bubbles of carbon dioxide come off the bottom of the carboy.

One reason for this is that there are many millions of yeast cells in a five-gallon fermenter, and the yeast is actually distributed throughout the fermenter — top, middle, and bottom. Many ale yeast cells rise close to the surface of the wort, but with lager yeast, a far greater percentage settle toward the bottom. During active, primary-stage brewing, these preferences in yeast migration can't really be seen.

Bottom-acting lager yeasts prefer much cooler working temperatures than ale yeasts. Because lager yeast works best in the 50° to 55° F range, the chemistry of fermentation is quite different than with ale yeasts, which work best at 60° to 70° F. The result: Beer that's lager, not ale.

There are many recipes and beermaking kits that specify lager yeast. Brewing these recipes by fermenting for three days at 70° F will not produce a lager. It's the difference between slipping quail in a stone oven to roast and popping chicken in the microwave. One says candlelit dinner for two, the other, hot wings. It isn't an issue of one being "better" than the other, but there's no question they are different.

The Lagering Process

For the homebrewer there are three goals of the lagering process:

1. To allow yeast, haze-forming proteins, and any other suspended materials to drop out of the beer.

2. To improve and mellow the flavor of the beer.

3. To carbonate the beer.

After primary fermentation passes through high krauesen (the period of peak activity) and begins to subside, some brewers carefully remove as much of the trub-laden surface foam as possible. This is a good time to rack the beer to Cornelius kegs for secondary fermentation. Cornelius kegs are especially handy because they can be easily sealed and set up with an adjustable pressure relief valve. The tank is purged with carbon dioxide, the fermenter racked in, and the keg lid sealed.

The adjustable relief valve is set to maintain the tank pressure at about 10 pounds per square inch and attached to the "in" fitting on the top of the keg. Because this fermentation cycle is conducted under pressure, the beer also becomes saturated with CO_2 at this time, a process called natural conditioning. After a reasonable period (about seven days) of secondary fermentation at normal temperatures (50° to 55° F), keg temperature is slowly reduced to 30° to 32° F. The lagering period, which can last from one to three weeks, provides ample opportunity for the yeast and haze particles to settle and for the beer flavor to further mellow.

An alternative carbonation method is to complete secondary fermentation using an airlock and carboy, then rack the beer to a Cornelius keg. For a five-gallon batch one to two quarts of actively fermenting "new" beer is then added, the keg purged with CO_2 and sealed. In this procedure, known as kraeusening, the addition of actively fermenting beer has two purposes. One is to provide a fresh source of fermentables. The other is to add very active yeast to the beer to reduce the diacetyl, a buttery flavor produced during primary fermentation.

During any normal fermentation yeast make both desired and unwanted by-products. Beer style largely determines whether the by-products are expected, desired, or considered faults in the beer. Because it has very little if any positive taste contribution to beer, diacetyl is a by-product that most brewing processes are designed to eliminate.

Luckily, the same yeast that produces diacetyl also has the ability to reduce it. During a typical ferment cycle diacetyl levels rise as the yeast become more active, then lower due to yeast enzyme action. Controlling fermentation temperature keeps initial diacetyl production low enough so that, during secondary fermentation, most of it can be eliminated. This is one of the attractions of lager brewing, although ale brewers have no problem with diacetyl they follow correct fermentation procedures.

There are about as many ways to help the yeast reduce diacetyl levels as there are brewers. All techniques have two main themes in common.

1. Ferment at low, lager temperatures to minimize diacetyl levels to begin with.

2. Ensure that after fermentation is complete there is enough active yeast in the beer to reduce most of the diacetyl initially produced.

Besides diacetyl, yeast naturally produce a number of sulphur compounds you've probably already noticed when fermenting very active ales in the house. Many a new lager brewer has experienced the foul aroma of a high sulphur producing yeast and worried about contaminated beer. During the lagering process, the cold temperature of the beer combined with increased acidity cause tannins, proteins, and sulphur compounds to come out of solution and drop out of the beer. This action is a big part of the mellowing that occurs during the cold storage process.

With 10 pounds per square inch of pressure maintained on your Cornelius keg lagering tank, you can use a standard picnic tap to sample your product about every two to three weeks. After four weeks at 31° F, the beer should be quite clear. A straw-colored pilsner won't be brilliantly clear, but certainly by six weeks there should be only very slight haziness.

Lagering Equipment

By ale standards lagering requires a lot of time. Unfortunately, most of that time has to be spent at 45° F or below and so requires some form of refrigeration. The fermentation process can last a few weeks and is best done near the optimum yeast temperature, usually 45° to 50° F. That means your fridge needs to be large enough to hold your fermenter, at least. If you want to have draft beer on hand continuously, your cooler will also have to hold one or two dispense kegs.

Lager yeast isn't as energetic as ale yeast. There just never seems to be the huge burst of action that marks onset of high kraeusen.

After secondary fermentation is complete and the beer is racked to your lagering vessel, you'll need to store the beer at 30° to 35° F for up to three months. For most amateur brewers this means buying a new or used freezer chest.

A nine- to 10-cubic-feet chest will hold four five-gallon Cornelius kegs. If you're shopping for a used unit, it's very helpful to take a few Corny kegs with you to make sure they'll fit into the fridge you buy. Two kegs, side by side, require a minimum clearance of 17 inches.

If you opt for a freezer chest, you'll

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1lb Light Crystal Malt (Caramel 20)
1 tsp Gypsum (omit if using hard water)
3/8 tsp Chalk
1/8 tsp Calcium Chloride
3/4 oz Northern Brewer Hop Pellets (60 min) 20.7 IBU
3/4 oz Northern Brewer Hop Pellets (30 min) 7.3 IBU
1/2 oz Northern Brewer Hop Pellets (5 min) 1.2 IBU
3/4 oz Northern Brewer Hops (in fermentor) 3.9 IBU
1 pint Wyeast #1968 Ale Yeast Starter
OG: 1051, IBU: 33.1

Recipes created by:
Byron Burch

Byron Burch is a respected authority on beer, wine & meadmaking & author of 'Brewing Quality Beers' avaliable from all good Homebrew retailers.

'ST. SERAPHIM'S' PORTER (5 GALLONS)
A rich, strong Porter with a complex flavor profile & satisfying mouth feel

Ingredients:
1 x 3.3lb can EDME Maris Otter Malt Extract
1 x 3.3lb can EDME Microbrewery Series DARK Malt Extract
1/2lb Medium Crystal Malt
3/4lb Dark Crystal Malt (Caramel 40)
3/4lb Black Roast Barley
4oz 100% Dextrin Powder
1/2 tsp Gypsum (omit if using hard water)
3/4 tsp Calcium Carbonate
1/4 tsp Calcium Chloride
1/2 oz Columbus Hop Pellets (60 min) 26 IBU
1/4 oz Northern Brewer Hop Pellets (60 min) 7.4 IBU
1/2 oz Williamette or Fuggles Hop Pellets (5 min) 0.7 IBU
1 pint Wyeast #1056 Ale Yeast Starter
OG: 1052, IBU: 34.1

Gravities are provided for guide only.



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also need to add a thermostat to the unit to keep the temperature high enough. Most freezers can't be set to temperatures much above 0° F, and you'll want both 45° to 50° F and 30° F as options. Many brewer's supply and mail-order shops carry easily installed thermostats for about $40 to $70. Look for one with a "deadband" of at least 3° to 4° F. That means the thermostat won't turn on the refrigerator until the temperature is about 2° F higher than the setpoint and won't shut it off until it's about 2° F lower. A narrower deadband means the thermostat cycles the fridge more often, trying to maintain a more precise temperature. This causes undue wear on the system. The temperature of four or five gallons of beer will stay very uniform even with a 6° F or more deadband.

Fermentation

Lager yeast isn't as energetic as ale yeast. There just never seems to be the huge burst of action that marks onset of high kraeusen, the large, foamy crest that marks a vigorous ale fermentation. Any distinction between the primary and secondary phases of fermentation is far more subtle for lagers. Note: Don't be tempted to get things going by warming up either your starter or your fermenter. The idea is to let the lager yeast do its work at cool temperatures, where yeast metabolism by-products are minimized.

After several days of steady fermentation, you will notice a reduction in kraeusen production, marking the end of the initial phase. The beer should be carefully racked into a secondary fermenter and the thermostat on the refrigerator clicked down about 1° to 2° F per day until stabilized at 30° to 35° F. Total time in the fermenter at this point will be between seven and 15 days. Now it's time to let the yeast do its work for about four to 12 weeks. Be patient!

Partial-Mash Brewing

If you're an extract brewer, then all you need is a recipe and the specified ingredients. Your usual process will work just fine, except after the boil you'll want to chill to as cool a temperature as possible. This recipe is for five gallons.

Kurzbrau Dunkles

Ingredients:

- 7 lbs. light malt extract
- 1 lb. Munich malt
- 4 oz. dark crystal malt
- 2 oz. chocolate malt
- 4 oz. Hallertauer hops, 2 oz. for 60 min., 1 oz. for 20 min., 1 oz. at end of boil
- Wyeast Bavarian Lager

Step by Step:

Add 3.5 gals. water to a 6-gal. pot (your brew kettle) and start the burner. Draw about 1.5 qts. of hottest possible tap water into a 2-qt. saucepan, and add the grains. Add just enough water to allow enough stirring to maintain temperature near 145° to 155° F.

As the water in the kettle begins to boil, slowly add malt extract, watching out for sticking and boilover. After all the malt is added, continue to stir for 10 to 15 minutes to ensure no extract gets burned at the bottom of the kettle. When the kettle seems to be under control, carefully strain the mini-mash into the kettle using a large (six-inch) kitchen strainer. Try not to get any grain in the kettle, but don't worry about a few grains that spill in. Discard the drained mash.

Add 2 oz. hops to the kettle in three or four additions, putting each additional amount in only after the kettle seems to be under control. Begin the kettle timer when a full rolling boil begins. Boil 40 minutes. Add 1 oz. hops and boil an additional 20 minutes, adding the last 1 oz. of hops just prior to the end of the boil, or even after the burner is shut off. Chill the wort as you normally do, and rack to the fermenter with chilled water to yield 5 gals. in the fermenter.

Cover the mouth of the glass carboy with a plastic sandwich bag and rubber band, or if you're using a plastic bucket as a fermenter, lightly place the cover on top (don't seal it!). Put the fermenter in your freezer chest or refrigerator and allow the temperature to stabilize to your starter temperature (which should be around 45° F). Pitch the starter.

Monitor fermentation activity, and notice when the kraeusen forms, how quickly it forms, and when it appears to reach peak activity. With daily checks you'll notice when there is a slight reduction in surface foam.

If you use a carboy, rack the beer to a clean Cornelius keg if you have one, taking care to leave all trub, both floating and settled, behind. Attach the pressure relief valve to the keg, set for 5 to 10 psi if it's adjustable. Rack to a clean fermenter and place an airlock if you don't have a Cornelius keg. Avoid aerating the beer, which can lead to diacetyl production and staling.

Maintain the secondary at the same temperature used for the primary ferment for about two weeks. You may want to pull occassional samples for gravity readings if you ferment in a keg, or just CO_2 production if you ferment in a carboy. In one to three weeks there should be virtually no airlock activity at all. To remove diacetyl raise the fermenter temperature to about 55° F over a 24-hour period, and maintain at that temperature for 24 hours. Then lower the temperature two to five degrees per day to 30° to 32° F. Maintain at this temperature undisturbed for four to eight weeks for "normal" gravity beers or up to 12 weeks for bigger beers such as dopplebocks.

All-Grain Brewing

Decoction is the traditional German mash style for lagers, but temperature program (sometimes called upward step) mashing is probably most common among American microbrewers.

This recipe calls for a double decoction, but it can also be used with a temperature program or single infusion mash. It makes eight gallons.

Pt. Fermin Pils

Ingredients:

- 5 lbs. German pils malt
- 8 lbs. Belgian pils malt
- 1.5 oz. Northern Brewer hops (7.3% alpha acid), for 90 min.
- 2 oz. Saaz (3.5% alpha acid), 1 oz. for 60 min., 0.5 oz. for 30 min., 0.5 oz. at end of boil
- yeast

Step by Step:

Add about 6 qts. of 145° F water to

the grain, thoroughly wetting the mash. After mixing well, add another 3 or more quarts of 140° to 160° F water as needed to obtain a 95° to 105° F mash. Rest for 20 minutes, during which bring about 2 gals. of water to 150° to 155° F. Add half the 150° F water while gently stirring the mash. Measure the temperature while adding the remainder of the water to reach 122° F. Rest for 20 to 30 minutes.

After this protein rest is complete, use a large (six-inch) kitchen strainer to remove about one-third of the thick mash to a separate pot. Raise the temperature of this decoction over 15 minutes to 148° to 155° F and rest for 20 minutes.

Raise the decoction to boiling while stirring. Maintain a gentle boil for about 20 minutes, stirring to prevent scorching.

After the decoction boil is complete, return the decoction to the main mash in two or three steps, stirring gently and measuring mash temperature. Total mash temperature should be maintained near 150° F. This can be adjusted with a boiling water infusion, another small decoction, or external heat. Rest for 20 minutes.

Pull about one-half of the thin mash and raise it to boiling over 20 minutes. Boil for 5 minutes and return the decoction to the main mash. Stir the main mash gently and maintain at 160° to 168° F for about 15 minutes, then begin to sparge.

Bring the wort to a boil and add Northern Brewer hops. Boil for 30 minutes. Add 1 oz. Saaz hops and boil an additional 30 minutes. Add 0.5 oz. Saaz hops and boil 30 more minutes. Add last 0.5 oz. hops at end of boil.

Cool and pitch as in the Kurzbrau recipe.

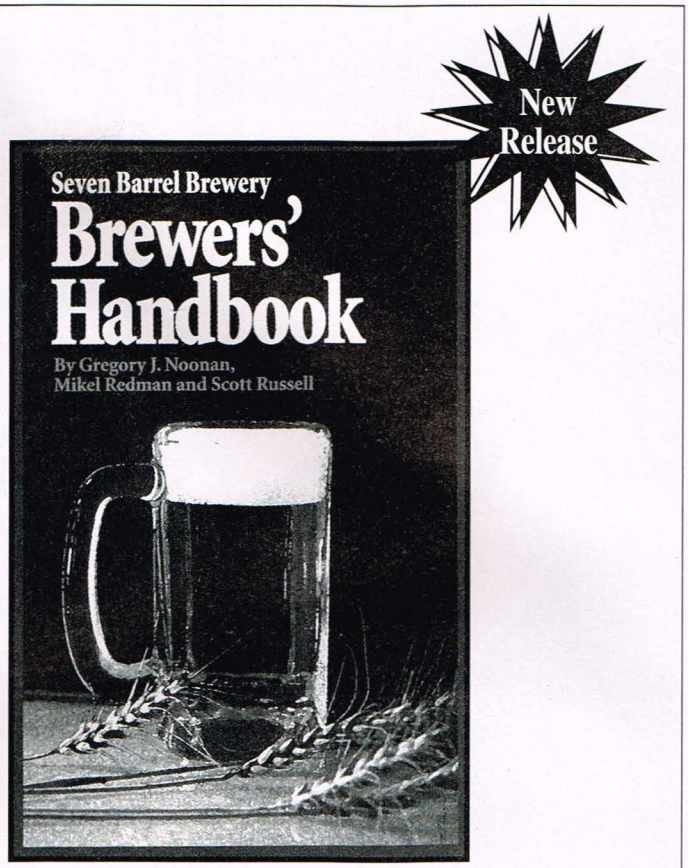
Tips and Alternatives

Some brewers may not have access to a freezer chest that can be devoted to the most noble of duties, and regular refrigerators are very difficult to adapt to fermenting, lagering, and dispensing. There are several alternatives that might work for you.

If you live in cold-weather country, your basement may stay cool year-round. If fermentation can be kept in the low 50s, then lagering can be done in Cornelius kegs, which are more easily cooled than fermenters. This would provide a compromise that could produce good beer.

Another alternative is to simply scale down for lager brewing. A number of two- to three-gallon food containers are available that would more easily fit into a standard refrigerator.

At one time you may not have believed good beer could be brewed at home. Now that you know better, you should be ready to accept the challenge of making your own cool, satisfying lager. If you can manage the equipment needed for proper fermentation and cold conditioning, then you're ready. Just apply what you've already learned about brewing, and take the time to let the beer lager. Then sit back and enjoy the reward you deserve.



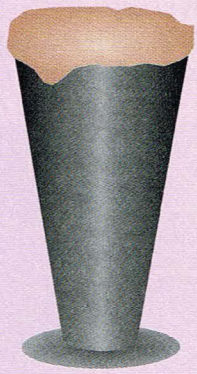
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M. GRHANEY

PERCOLATOR DOPPELBOCK



by Scott R. Russell

and other eye-opening recipes that pair your favorite brews

It's just one of those things, I suppose, but the combination of beer and coffee, for me, is among the most intriguing possibilities in the world. Ideally my day is divided into two sections: the coffee section (weekdays from awakening until about 4 p.m., weekends until about 2 p.m.) and the beer section (I never start before lunch!). When I have a coffee brew in the house, the two tend to overlap. And contrary to popular belief, coffee (beer) makes a great nightcap.

Selecting Your Coffee

Use fresh whole beans and crack them, like you would a specialty adjunct grain, as close to brewing as possible. Try experimental batches with different grades, varieties, colors, even flavored coffees to see what works best for you.

If the thought of mixing caffeine (a stimulant) and alcohol (a depressant) bothers you, there are many Swiss-process decaffeinated coffees you can use with flavors that are every bit as good as the caffeinated varieties.

Brewing With Coffee

There are basically two points in brewing when coffee can be added. The easiest and most efficient is to steep the coffee in the cooling wort. I use this technique in most of my recipes. This is the method most likely to add some dark color to the beer. Lighter beers may require the use of the second technique, which is to soak the beans in a cold liquid and add it at bottling. Brewpub owner Greg Noonan, author of *The New Brewing Lager Beer* (Brewers Publications), suggests that "cold-brewing" coffee will even give a less coarse, smoother flavor, as well as making the beer lighter in color.

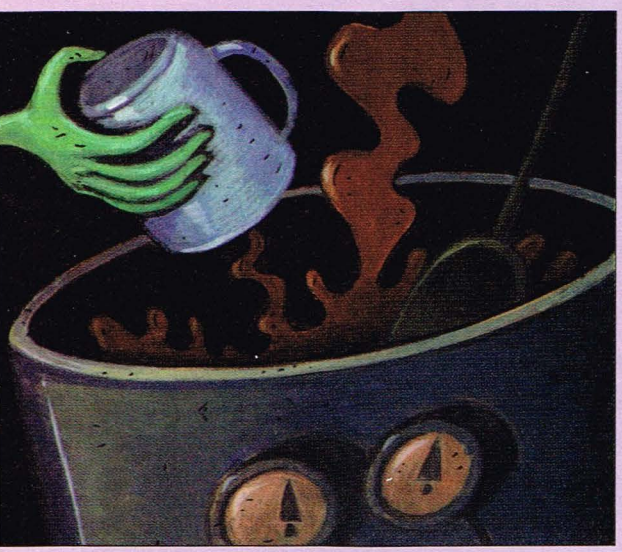
It should be noted that there are also coffee syrups, extracts, tinctures, and so on that may or may not be of use in brewing. If you think it might work, try it.

Selecting Your Beer

Almost any style of beer can be "caffeinated" in some way. One rule, though: Coffee will inevitably darken any beer, so



some beers are better suited than others. What follows are recipes I have developed and used over the last five years or so. Each is based on a "standard" or "classic" style, so they do technically fit competition guidelines for the American Homebrewers



Association and Beer Judge Certification Program. Coffee as an ingredient would be classified as a spice or herb. The best way to get a preview of these beers (although the brewing and fermentation process will change when coffee becomes an ingredient) is to take the classic style and add a slug of joe to it.

Recipes

All of the following recipes are extract with grain and make five gallons of beer.

Percolator Doppelbock

Ingredients:

- 0.5 lb. dark crystal malt, 90° Lovibond
- 0.25 lb. chocolate malt
- 0.25 lb. Munich malt
- 9 lbs. unhopped amber dry malt extract
- 1 oz. Tettnanger hops (4% to 5% alpha acid), for 60 min.
- 1 oz. Perle hops (4% alpha acid), 0.5 oz. for 60 min., 0.5 oz. for 15 min.
- 0.5 lb. cracked (not ground) medium roast Colombian coffee beans
- 10 to 14 g. dry lager yeast or a liquid lager yeast slurry (1 pint at least), such as Wyeast 2308
- 2/3 cup corn sugar for priming

Step by Step:

In 2.5 gals. cold water steep crystal, chocolate, and Munich malts. Heat gradually to 170° F and remove grains. Add extract to kettle. Bring to a boil. Add Tettnanger hops and 0.5 oz. Perle hops. Boil 45 minutes and add 0.5 oz. Perle hops. Boil 15 more minutes. Total boil is 60 minutes. Remove from heat. Steep the coffee in the cooling wort. Remove coffee after 20 minutes, chill wort, and top off to 5.25 gals. with pre-boiled and chilled water. At 70° F pitch yeast.

After fermentation has begun (24 hours or so) move to cooler place (no warmer than 55° F) and ferment 10 to 14 days. Rack to secondary and age cold (38° to 40° F) for six weeks. Prime with corn sugar and bottle. Bottle condition six weeks.

Approximate OG = 1.080.

Café-Framboise Pseudo-Lambic

Ingredients:

- 0.5 lb. cara-pils malt
- 0.5 lb. flaked wheat
- 6 lbs. unhopped weizen (40% to 50% wheat; 50% to 60% barley) dry malt extract
- 1 oz. mild flavoring hops (3% to 4% alpha acid) — older, even stale hops are acceptable — for 45 min.
- 0.25 lb. cracked (not ground) French roast coffee beans
- 3 lbs. fresh (or thawed frozen) raspberries
- Belgian ale yeast culture
- Lambic culture (either collected from a bottle or use Wyeast 3278)
- 3/4 cup corn sugar for priming

Step by Step:

In 2.5 gals. cold water, steep cara-pils malt and flaked wheat. Heat gradually to 170° F and remove grains. Add extract to kettle. Bring to boil and add hops. Boil 45 minutes. Let wort stand for 15 minutes in an ice-water bath, then rack from kettle into fermenter onto coffee beans and raspberries. Top off to 5.25 gals. with pre-boiled chilled water. At 70° F pitch the Belgian and lambic cultures.

Ferment relatively warm (70° to 75° F) for a week, then rack off fruit/coffee to a secondary. Age in secondary for three weeks. Prime with corn sugar, bottle, and condition cool (50° F or below) for six weeks.

Approximate OG = 1.052.

Hazelnut Coffee Brown Ale

Ingredients:

- 0.375 lb. brown malt (or Belgian amber, if brown is unavailable)
- 0.25 lb. Belgian Special B malt
- 0.25 lb. chocolate malt
- 0.125 lb. black patent malt
- 5 lbs. unhopped amber dry malt extract
- 1 oz. Styrian Goldings hops (5% alpha acid), for 60 min.
- 0.5 lb. cracked (not ground) hazelnut-flavored coffee beans
- 0.5 oz. Styrian Goldings hops, preferably whole flower, (2% to 3% alpha acid), for post-boil steeping
- 10 to 14 g. of a dry ale yeast or a British liquid culture (Wyeast 1098 or 1028, for example)
- 1/2 cup corn sugar for priming

Step by Step:

In 2.5 gals. of cold water, steep brown, Belgian Special B, chocolate, and black patent malts. Heat gradually to 170° F and remove grains. Sparge back into kettle with about 1 qt. hot water. Add extract and 1 oz. hops to kettle. Boil 60 minutes. Remove from heat to an ice-water bath. In cooling wort steep (all together in a bag) coffee beans and 0.5 oz. hops (preferably whole flower). Steep at least 20 minutes. Add to fermenter and top off to 5.25 gals. with pre-boiled chilled water. At 75° F pitch yeast.

Ferment warmish (70° F or so) for 10 days, rack to secondary (remove coffee and hops at this point) and condition two weeks. Prime with corn sugar and bottle. Bottle condition two weeks, serve at "cellar" temperature (50° to 55° F).

Approximate OG = 1.045.

Kaffee-Vanille Weissbier

Ingredients:

- 0.5 lb. cracked wheat malt
- 0.5 lb. cracked unmalted wheat

- 0.5 lb. Belgian cara-Vienne
- 2 lbs. extra-light dry malt extract
- 3 lbs. unhopped weizen dry malt extract
- 1 oz. Hallertauer hops (4% alpha acid), for 45 min.
- 0.5 oz. Saaz hops (2% alpha acid), for 45 min.
- Liquid wheat beer yeast culture (for a Berlin-style sourness try Wyeast 3333; the Bavarian strains 3056 and 3068 give too many esters and other confusing flavors)
- 2 to 3 drops of a dilute (9 parts water to 1 part acid) lactic acid solution
- 4 oz. vanilla coffee tincture (steep 0.125 lb. light roast coffee and 1 chopped vanilla bean in 4 oz. vodka during fermentation time) for priming
- 7/8 cup corn sugar for priming

Step by Step:

In 2.5 gals. cold water, steep wheat malt, Belgian cara-Vienne malt, and unmalted wheat. Heat gradually to 170° F. Remove grains. Add extracts to the kettle. Bring to a boil and add hops. Boil 45 minutes. Cool wort, top off to 5.25 gals. with pre-boiled chilled water. At 70° F, pitch yeast.

Ferment at 65° F for 10 days. Rack to secondary and add lactic acid solution. Condition in secondary two weeks. At bottling, add vanilla coffee tincture along with corn sugar to prime. Bottle condition three weeks in a dark, cool (45° to 50° F) place.

Approximate OG = 1.050.

Italian Coffee Porter

Ingredients:

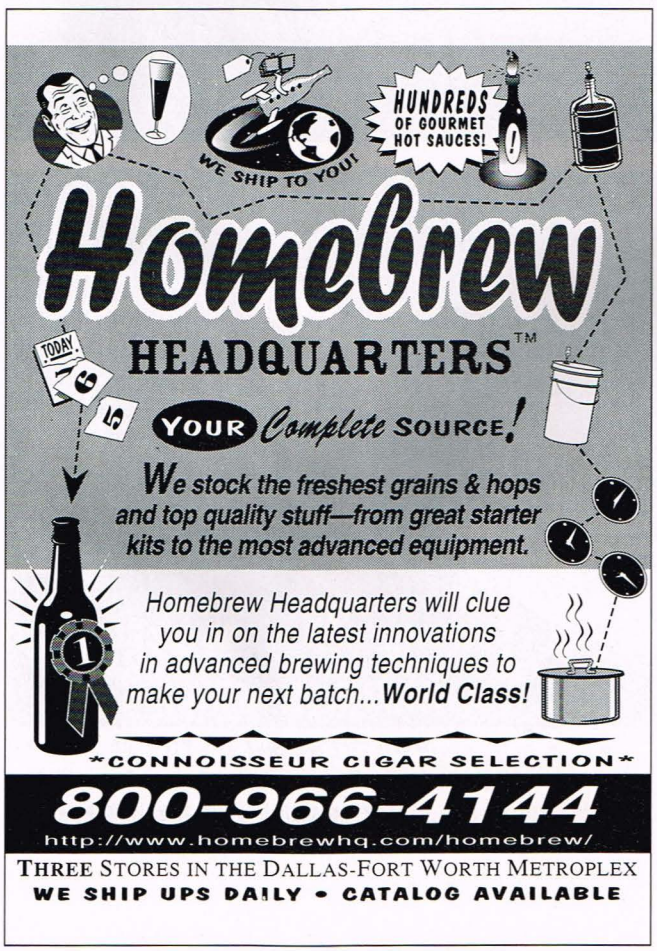
- 0.25 lb. chocolate malt
- 0.25 lb. black patent malt
- 0.5 lb. dark crystal malt, 120° Lovibond
- 7 lbs. dark malt extract syrup
- 1 oz. Fuggles hops (4% alpha acid), for 50 min.
- 1 oz. Galena hops (10% to 12% alpha acid), for 50 min.
- 1 oz. shaved or crushed licorice root
- 0.5 lb. espresso coffee beans (cracked, not ground)
- 10 to 14 g. dry ale yeast or a British liquid culture (Wyeast 1028 or 1968, for example)
- 2/3 cup corn sugar for priming
- 2 oz. sambuca or Galliano liqueur for priming

Step by Step:

In 2.5 gals. cold water, steep chocolate, black patent, and crystal malts. Heat gradually to 170° F, turn off heat, and hold warm for 30 minutes. Remove grains and bring to boil. Add extract to the kettle. Boil 10 minutes and add hops. Boil 50 minutes. Remove from heat and place in ice-water bath. Steep licorice root and coffee beans in wort. Steep at least 20 minutes. Pour into fermenter, top off to 5.25 gals. with pre-boiled chilled water. At 75° F pitch yeast.

Ferment moderately cool (55° to 60° F) for two weeks, rack to secondary, and condition for three weeks. Prime with corn sugar and liqueur. Bottle and condition four to six weeks.

Approximate OG = 1.048.



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CIRCLE 42 ON READER SERVICE CARD

What does it take to open your own brewery? Plenty of capital, for starters. When John Bloostein opened Heartland Brewery (above), he relied on his financial background a lot more than his homebrewing experience.



When starting your own brewpub, technical expertise is important, too. Bruce Winner (above at right) offers advice to a student at the American Brewers Guild.

Start Your Own Brewery

WHAT IT REALLY TAKES TO GO PRO

by Sal Emma

Three industry insiders offer advice on opening and running a successful microbrewery or brewpub.

You have said it to yourself. Maybe your friends have said it to you, too. "Your beer is excellent. You should open your own brewery."

Many have considered it. A few have even made it happen. But as the pros will tell you, there's more to running a brewery than making good beer. Following is a glimpse of what it takes.

Bill Moore is founder, brewmaster, and a member of the board of directors of Independence Brewing in northeast Philadelphia. Moore was an avid homebrewer for 12 years before brewing professionally. He spent five years brewing at Stoudt Brewery in Adamstown, Pa., before opening his own place.

Moore understands the most important aspect of running a microbrewery: selling beer.

To Market, To Market

"Market pressure is what is driving the micro industry. The consumers, at least here on the East Coast, are getting more and more sophisticated and willing to try new things," says Moore. "Our task is a balance of making products that are interesting enough to get attention but traditional enough to sell.

"That's the key difference between homebrewing and doing it professionally. It's one thing to make a couple of cases in your basement and really like it. Some of your buddies might like it, too, so you are tempted to believe that the beer would sell in the open marketplace. In reality it might sell or it might not, depending on a million other factors."

When choosing the beer to brew, Moore quickly learned that success in the beer business means giving the customer what he wants, not want you think he wants. "We made our debut in the Philly market with our Independence Ale, which was stronger, maltier, and hoppier than anything the beer-drinking public was used to. It was well balanced but very big. In fact, too big. We quickly learned that Philadelphia was one of the nation's biggest Coors Lite markets. It did not take a lot of inspiration to realize that we overestimated the tastes of our customers and we had to tone it down a notch or two.

You have to weigh isolated requests from a few people with the kind of large-scale demand that ultimately affects your bottom line, Moore says.

One of the microbrewer's weekly challenges is sorting out the difference between real consumer demand and fads. "Sometimes it's not so easy," says Moore. "For example berry beers and fruit ales are popular now, as are honey beers. But if I am going to put a berry weizen on the market, I had better be pretty sure that it is going to sell before I start making it 40 barrels at a time.

"We have five beers on the street right now: our pale ale, a lager, our Gold, a porter, and the Franklinfest, which is an Oktoberfest style. Even with that much variety, the sales guys keep coming back, reporting that the distributors want something different. We are jumping through hoops just to keep our regular stuff going, and we really can't afford to climb on every fad that comes down the pike."

But then again, when you think you have tapped into real demand, you have to be flexible enough in your plant to be able to get the new style out there. Constant demand has caused Moore to make porter year-round instead of seasonally.

For this reason, you need a professional brewery, run by professionals, according to Moore.

Once you get the beer itself in good shape, you still have far to go. You will have your distribution market to deal with. That's another reason you need people in the organization who not only know the business but know the business in your market. "For example the Pennsylvania market is drastically different than the market in, say, Maryland or Jersey. In Pennsylvania beer is sold by the case, through distributors. It takes a big commitment to buy beer here. The customer wants some beer, so he walks into a distributor and has to be willing to take a chance on 24 bottles of beer. He or she is unlikely to make that commitment for an unknown or unfamiliar beer," says Moore.

"In Jersey or Maryland you can walk into a big liquor store and buy a six-pack. In many stores you can even buy a single bottle. It's much easier to get someone to try your beer if it only involves a few dollars and a few bottles. We don't have that luxury in Pennsylvania."

Finding distributors who know your area is important, he adds.

The distributors, too, can make life challenging for the brewer. They have a lot of control over the small brewery's success. They want a good price, and some will do anything to save 50 cents on a case. And they may not accommodate your every need.

Moore wanted to produce unpasteurized beer. When he realized that distributors were not going to refrigerate it, he changed his brewing procedure to increase the beer's shelf life.



Independence Brewing was capitalized at $1.5 million, an amount that turned out to be far too low. Owner Bill Moore now estimates the cost of building a 30- to 40-barrel brewery at $2.5 million or more.

"It's a very competitive market and it is getting more so. The micro pioneers had only the big boys to compete with. We still have them, but we are also competing with ourselves and with big brewers masquerading as craft brewers.

"Besides that, the big micros from out West are expanding their markets into the East. You have got to be the best you can be and flexible enough to respond to a rapidly changing marketplace. You won't have what it takes if you try to do it on the cheap or build a brewery on a shoestring," he says.

Moore puts a $2.5 million lowball price tag on building a 30- or 40-barrel brewery. That includes production, packaging, marketing, and transportation. Moore says the $1.5 million he started with was not enough, and he has been raising capital ever since by selling private shares. To stay financially healthy, Independence plans a public offering in the near future.

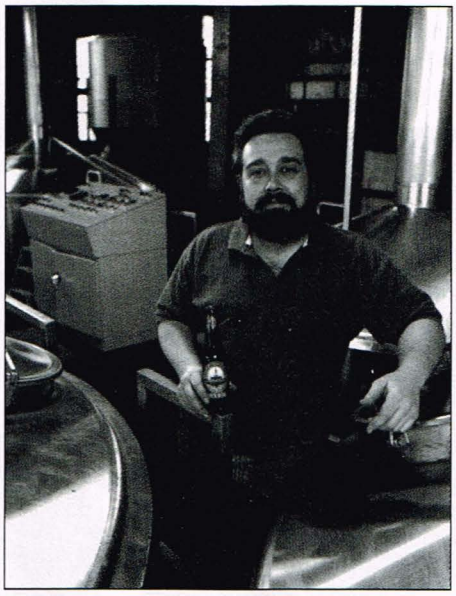
Moore's firm learned the hard way that saving money up front often costs you much more later. The lesson came in the form of his bottling line. "The bottling line is a very important and, unfortunately, a very expensive part of the micro's equipment list," says Moore. "We made the mistake, like other micros, of buying a used line that did not live up to our expectations. We bought it through the back pages of one of the trade journals, and it did not come with any support or expertise. We got what we paid for — a bottling line, nothing more."

Buying the bottling line was a bad move because the employees at Independence lack knowledge, and the dealer does not provide enough support, Moore says.

Independence is tearing out the used line and replacing it with new equipment that comes with customer service support. "I would advise anyone who is serious about this business to choose equipment and suppliers very carefully. You want some accountability to go with the equipment," he says.

Also keep in mind the size and layout of your building. Independence served as a warehouse and steel fabrication plant before the brewers moved in. They have high ceilings and 35,000 square feet to grow into. "If you are successful, you are going to grow and you need to have space. If your building is just right or if it feels too small when you open, you are probably heading for trouble," Moore says.

Moore's approach is to build



Bill Moore was an avid homebrewer for 12 years before opening his own brewery. At a commercial brewery, he says, "You have got to be willing to do whatever it takes to keep the beer selling."

breweries bigger. "It's not going to be worth it to you to build anything under a 10-barrel capacity, even in a brewpub. You won't save much by building smaller, and the cost of production is significantly higher when you build small. Making 10 barrels instead of four or five will cost you literally pennies more. It always costs more to expand, rather than starting off with the capacity you need to go the distance."

The bottom line is that if you are seriously considering the option, you have to be willing to admit that operating a brewery is a business. To keep a business successful, you have to be willing to raise enough money, buy the right gear, get the right building, hire the right people, and sell the right beer. "If you have unlimited cash on hand and you do not have to work for a living, make anything you want, any way you want. But if you want to make money at it, you have got to be willing to do whatever it takes to keep the beer selling," Moore says.

Before You Invest

Jon Bloostein's advice for homebrewers with aspirations to build breweries:

1. Work in a good brewery or get really friendly with someone who knows how to run one.

2. Understand business and money. If you do not, the only way you will succeed is through pure luck.

3. Hire the best. Be realistic about how many employees you will need to cover all shifts and provide the best service.

4. Understand the restaurant business.

5. Know your costs — all of them.

A Model Brewpub

If you have never visited the Heartland Brewery on Union Square in New York City's Flatiron district, put it on your schedule. It is one of New York's friendliest and most comfortable places to eat, drink, have a cigar, or just hang out.

And that's no accident. Jon Bloostein has gone to great lengths to make his place as comfortable as it can be. He is detail oriented, and it shows.

Heartland is decorated with handsome murals depicting scenes of agricultural tranquillity on America's plains. It's heavy in brick, dark wood, and comfortable lighting.

Bloostein is proud of his creation and feels he has successfully created the space he intended when construction began in late 1994.

"I was in the acquisitions and mergers business, a career that promises years of white-collar frustration for those unlucky enough to pursue it. I spent a lot of time on the West Coast and seemed to always end up hanging out in a brewpub, no matter what town I was visiting," says Bloostein.

"I realized that New York City did not have anything quite like the West Coast brewpub, and I decided to build one. We had a few brewpubs, but they were going belly up as rent escalated. I had some experience in retail and was dumb enough to think that selling beer would be no different from selling anything else."

As it turned out, it was his financial expertise and his investigative ability that he relied on more than his retail experience when starting the project. "I know how to find out about businesses," he says. "So I knew which vendors and suppliers to encourage and which to avoid. My biggest challenge was in construction details. I do not know anything about construction, so I could never be sure if I was getting what I needed or if I was being taken for a ride."

Bloostein's instincts and a little luck got him through the details of construction and his vision kept the crews focused on the task at hand.

"I think a lot of people think a brewpub is a brewery with a restaurant. Some see it as a restaurant with a brewery. In fact it is neither. A true brewpub is a hybrid, a unique place with a unique feel.

"You have to be different, unique. Especially in a competitive market like New York, where the consumer has hundreds — if not thousands — of choices," he says.

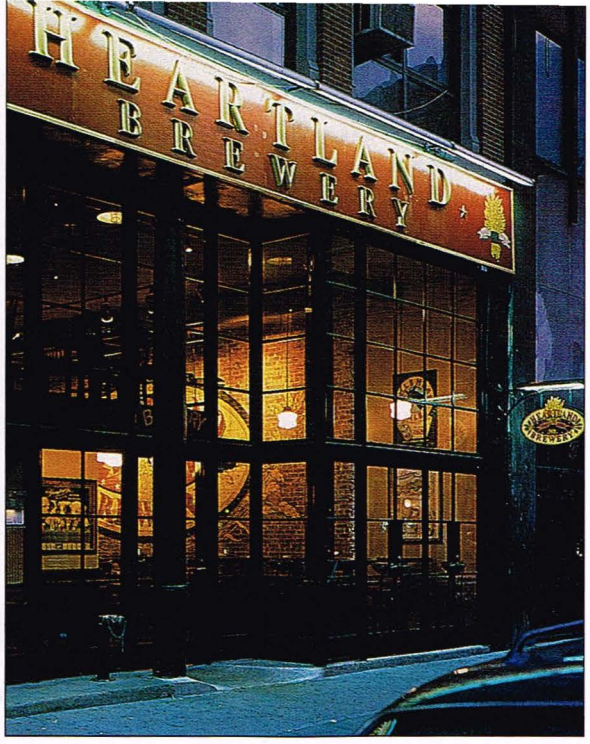
Bloostein is quick to point out that good beer in a brewpub goes without saying. But you have to be as dedicated to quality in the kitchen, if not more so, according to Bloostein. "The nice thing about beer is that the first glass out of the serving tank, under normal circumstances, will taste pretty much like the last glass, no matter how many were drawn in between. The kitchen runs under a different set of rules. If you make 1,000 hamburgers, they represent 1,000 opportunities to screw up. If you overcook it or undercook it or put bad lettuce on it, the customer will be unhappy. That's why you have to be really careful about who you put in the kitchen. The lion's share of your payroll costs will be in the kitchen, anyway. So be sure to spend that money wisely," he says.

Bloostein admits there is no way to know if the person you hire is right until you have worked with him or her for some time. "I thought I opened

While microbreweries can locate in industrial spaces, brewpubs must invest in a retail location. Atmosphere is important, which means hiring architects, designers, and other specialists.



MATTHEW LAWN



with a terrific staff. Of 85 employees, only five have been here since we opened. The brewer is one of them — I was very fortunate there. Plus you have to make sure you have enough of the right people, too. I never dreamt it would take 85 people to staff this place," he says.

Bloostein says opening a brewpub is like every other business in one important way: You can't do it without enough capital. "It's hard to say what a brewpub will cost without looking at the individual situation. Every town and location will be different. The important thing to realize is that it will cost significantly more than just the price of the brewhouse. I mean, some folks think that because you can buy a brewhouse for $200,000 you should budget for $300,000 and be covered. It doesn't work like that. Not if you are going to do it right. We spent $25,000 on our sound system alone. Our computer system cost thousands. This business is replete with hidden and soft costs that will haunt you if you don't plan to deal with them up front.

"Probably the biggest surprise I've had to deal with and continue to deal with is spending an incredible amount of time on non-business activities: dealing with lawyers, architects, designers, trademarking, advertising, repairmen. The list goes on. But they don't bother you at night, when you will have plenty of time to drink," Bloostein says with a laugh.

Teaching Brewing Enterprise

As president of the American Brewers Guild, Bruce Winner has regular opportunities to commune with professional brewers who serve the guild as regular and guest instructors at craft-brewing industry seminars and courses. Winner, too, does his share of instructing would-be brewery operators.

"I think the first piece of advice I give everyone is to either hire experts in the field or become an expert yourself. Everyone has his or her own special skills, but not everyone can run a brewery. And there are many fine homebrewers who have what it takes to become professionals, but most will need training and professional assistance to go pro," Winner says.

Winner says everyone brings a unique set of skills and experience to the brewery operation, but they may not be the skills needed to ensure success. "The micro is a combination of two basic operations: making good beer and selling it. If you do not understand sales and marketing in today's intensely competitive beer market, the best-made beer in the world will not move. Conversely, if you know how to market beer but the beer's no good, you will also find success elusive."

As you might expect, Winner is a big advocate of education as a means of preparation. "Education means more than just attending seminars. Read as much as you can on the subject, and interview operators of successful breweries to find out what makes their operations profitable," he says.

And echoing the words of Moore and Bloostein, he warns against going in with insufficient capital. "Always get more money than you think you need. It's a tough situation, because sometimes it's hard to estimate how much you will need. But if you do enough homework and write a good business plan, you will be able to come close," he says.

Like his colleagues inside the brewery, Winner agrees that successful brewery entrepreneurs understand and admit that selling beer — in a micro or in a brewpub — is a business and should be viewed as such.

Most agree the salad days of the craft-brewing business are over. Still, Winner firmly believes the industry is growing with new opportunity. "I think the brewpub industry has a good five or 10 years of strong growth left. Demand is increasing as people all over America are being exposed to a huge variety of unique and full-flavored beers. And some of America's largest cities have no brewpubs, or only one or two.

"If I had to choose one (venue — microbrewery or brewpub) over the other, in today's market I would look more closely at the brewpub option. It's less risky, in general, because your

Equipment Manufacturers

Thinking of opening a brewery? Here's a list of brewing equipment vendors to get you started.

The Brew Store
Oakville, Ont., (905) 845-2120
3 to 20 barrels

Brewers Warehouse
Seattle, Wash., (206) 527-5047
0.5 barrels

BrewPro
Boise, Idaho, (208) 853-4677
0.5 to 10 barrels

DME Brewing Services
Charlottetown, P.E.I, (902) 628-6900
3 to 200 barrels

Elliott Bay Metal Fabrication, Inc.
Monroe, Wash., (206) 788-5297
2 to 14 barrels

Falco
Lachine, Que., 1-800-268-3541
8.5 plus barrels

HDP Brewing Systems
Cambridge, Ont., 1-800-563-8247
5 to 50 barrels

Kramer Stainless Systems
Quakertown, Pa., (610) 346-8919
2 to 30 barrels

Liquid Assets Brewing Systems
Santa Rosa, Calif., 1-800-730-1030
10 to 50 barrels

McCann Fabrication
New Gloucester, Maine, (207) 926-4118
2 to 300 barrels

New World Brewing Systems Inc.
Largo, Fla., 1-800-520-5777
3 to 15 barrels

Newlands Services Inc.
Abbotsford, B.C., (604) 855-4890
8.5 to 50 barrels

Pugsley's Brewing Projects
Portland, Maine, (207) 761-0807
5 to 300 barrels

S. Briggs and Co. Inc.
Rochester, N.Y., (716) 426-2460
15 to 2,000 barrels

Specific Mechanical Systems
Saanichton, B.C., (250) 652-2111
7 to 85 barrels

Vafac Int'l Brewing Systems
Fredericksburg, Va., (540) 898-5425
1 to 25 barrels

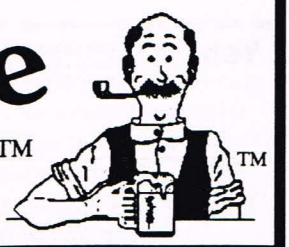
W.M. Sprinkman Corp.
Franksville, Wis., 1-800-816-1610
10 to 100 barrels

initial outlay is less. Plus it's a cash business. You serve the beer and the customer pays for it, unlike the micro end where you have to bill for product and wait 60 or 90 days for payment," he says.

Of course, the brewpub is a restaurant and the restaurant business is notoriously risky. "If you do not know anything about the restaurant business, either don't build a brewpub or get a partner who knows the restaurant business very well," Winner says.

No one can guarantee success. But if you are realistic about the project, find enough capital, understand your market, educate yourself, and surround yourself with experts, you will give yourself the best chance of success in a relatively hostile business environment.

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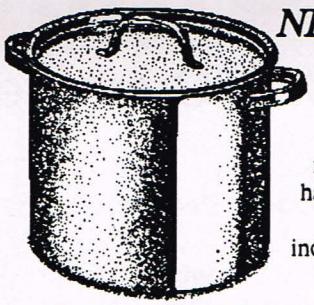
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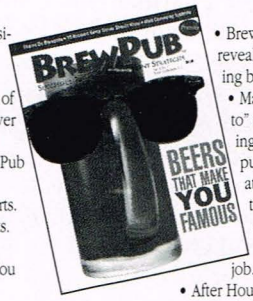


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L.D. Carlson COMPANY

Brew Beer That Matches Your Water

by Ashton Lewis

Using your neighborhood's unaltered water as a base, you can build a beer that is the perfect "home" brew.

Once upon a time, brewers created beer styles by matching local ingredients. Hops were scarce in rocky Scotland, so Scottish ales are malty and lightly hopped. Local microflora in certain valleys in Belgium gave unique and interesting flavors to beer and became incorporated as the most important contributor to the lambic beer styles.

Today, malted barley, hops, and yeast are all traded on the global market. In any region of the United States, it's easy to find malts from Canada, England, Belgium, Germany, and even Australia. Hops from North America, the United Kingdom, Europe, and even parts of New Zealand and Australia are also readily available.

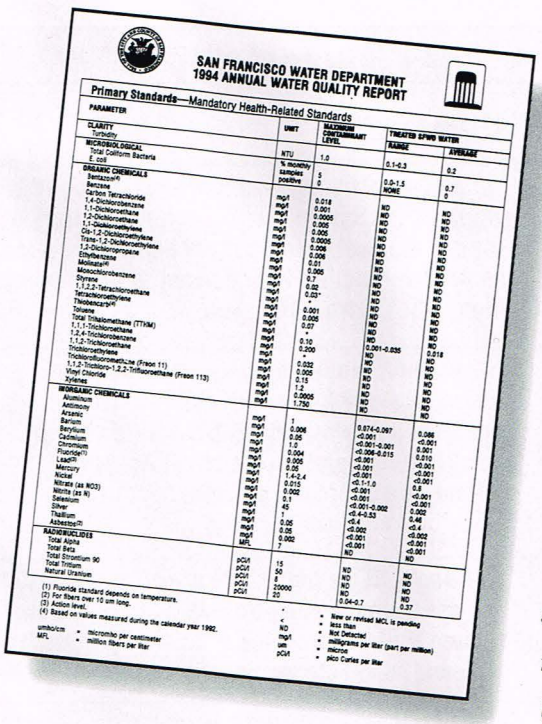
These raw materials are used in breweries brewing an incredible selection of ales and lagers. Some lager breweries proudly use new equipment made in the United States for microbrewers, who for the most part brew ales. Some ale brewers use beautiful copper brewhouses that were plucked out of traditional German lager breweries.

The notion that lagers are made using undermodified German malts, German hops, and decoction mashing is true in very few new breweries. Likewise, the traditional ale brewed from overmodified, floor-malted (steeped barley spread on a flat surface to germinate) British malt and hops from the county of Kent is not the easiest beer to find.

The fact is that the global economy we live in today has permanently changed the concept of "brewed locally." In truth the only local ingredient in beer is our water. This premise is even tested in some areas of the country that import water from distant areas or modify local water to be something it is not. For example Los Angeles water is piped hundreds of miles from the Sierra Nevada mountains in Northern California. At the Anheuser-Busch brewery in Northern California, water is modified to be more akin to St. Louis water.

Since water is the only ingredient that can truly be called local in most beers, it makes sense to match all of these wonderful raw materials from around the world to the water in your town. This philosophy is the exact opposite of adding some "Burton salts" to water in order to brew a Burton-style India pale ale.

Instead, don't tamper with your local water, except to remove chlorine,



SAN FRANCISCO WATER DEPARTMENT
1994 ANNUAL WATER QUALITY REPORT

Primary Standards—Mandatory Health-Related Standards

PARAMETER	UNIT	MAXIMUM CONTAMINANT LEVEL	TREATED SF/HH WATER	
			RANGE	AVERAGE
CLARITY				
Turbidity	NTU	1.0	0.1-0.3	0.2
MICROBIOLOGICAL				
Total Coliform Bacteria	% monthly samples positive	5	0.0-1.5	0.7
E. coli		0	NONE	0
ORGANIC CHEMICALS				
Benzene[4]	mg/l	0.018	ND	ND
Carbon Tetrachloride	mg/l	0.001	ND	ND
1,4-Dichlorobenzene	mg/l	0.0005	ND	ND
1,1-Dichloroethane	mg/l	0.005	ND	ND
1,2-Dichloroethane	mg/l	0.0005	ND	ND
1,1-Dichloroethylene	mg/l	0.006	ND	ND
Cis-1,2-Dichloroethylene	mg/l	0.006	ND	ND
Trans-1,2-Dichloroethylene	mg/l	0.01	ND	ND
1,2-Dichloropropane	mg/l	0.005	ND	ND
Ethylbenzene	mg/l	0.7	ND	ND
Molinate[4]	mg/l	0.02	ND	ND
Monochlorobenzene	mg/l	0.03	ND	ND
Styrene	mg/l	*	ND	ND
1,1,2,2-Tetrachloroethane	mg/l	0.001	ND	ND
Tetrachloroethylene	mg/l	0.005	ND	ND
Thiobencarb[4]	mg/l	*	ND	ND
Toluene	mg/l	0.10	ND	ND
Total Trihalomethane (TTHM)	mg/l	0.200	0.001-0.035	0.018
1,1,1-Trichloroethane	mg/l	*	ND	ND
1,2,4-Trichlorobenzene	mg/l	0.032	ND	ND
1,1,2-Trichloroethane	mg/l	0.005	ND	ND
Trichloroethylene	mg/l	0.15	ND	ND
Trichlorofluoromethane (Freon 11)	mg/l	1.2	ND	ND
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	mg/l	0.0005	ND	ND
Vinyl Chloride	mg/l	1.750	ND	ND
Xylenes	mg/l		ND	ND
INORGANIC CHEMICALS				
Aluminum	mg/l	1	0.074-0.097	0.086
Antimony	mg/l	0.006	<0.001	<0.001
Arsenic	mg/l	0.05	<0.001-0.001	0.001
Barium	mg/l	1.0	<0.006-0.015	0.010
Beryllium	mg/l	0.004	<0.001	<0.001
Cadmium	mg/l	0.005	<0.001	<0.001
Chromium	mg/l	0.05	<0.001	<0.001
Fluoride[1]	mg/l	1.4-2.4	<0.1-1.0	<0.001
Lead[2]	mg/l	0.015	<0.001	0.5
Mercury	mg/l	0.002	<0.001	<0.001
Nickel	mg/l	0.1	<0.001	<0.001
Nitrate (as NO3)	mg/l	45	<0.001-0.002	<0.001
Nitrite (as N)	mg/l	1	<0.4-0.53	0.002
Selenium	mg/l	0.05	<0.4	0.46
Silver	mg/l	0.05	<0.005	<0.4
Thallium	mg/l	0.002	<0.001	<0.002
Asbestos[3]	MFL	7	<0.001	<0.001
			ND	<0.001
RADIONUCLIDES				
Total Alpha	pCi/l	15	ND	ND
Total Beta	pCi/l	50	ND	ND
Total Strontium 90	pCi/l	8	ND	ND
Total Tritium	pCi/l	20000	ND	ND
Natural Uranium	pCi/l	20	0.04-0.7	0.37

(1) Fluoride standard depends on temperature.
(2) For fibers over 10 um long.
(3) Action level.
(4) Based on values measured during the calendar year 1992.

umho/cm = micromho per centimeter
MFL = million fibers per liter

* = New or revised MCL is pending
< = less than
ND = Not Detected
mg/l = milligrams per liter (part per million)
um = micron
pCi/l = pico Curies per liter

Your city's water report will give you the facts you need to pick the beer style for which your neighborhood could become famous.

once you determine the style of beer for which your local water is best suited. This doesn't mean that you can't adjust the water for the occasional stout if you live in Pilsner County USA. But it does mean that when you brew a Pilsner, you have brewed something truly representative of the locale in which you live.

Water Basics

Water is important to the brewer for two key reasons:

1. It affects mash and wort pH.
2. It can add ions to beer that affect flavor.

The fact that water affects mash pH is extremely important because the enzymes in malt responsible for the conversion of starch to fermentable sugars function best over a relatively narrow pH range, about 5.2 to 5.6 (for more on pH, see pH Basics, page 55). Mash pH is also important during sparging, because the extraction of astringent husk constituents (tannins or polyphenols) increases the higher the pH.

Wort pH increases as the specific gravity decreases over the course of wort collection. Once the wort has all been collected and the boil commences, the impact of pH is again evident because color and flavor development and hop utilization all depend upon pH level. In general these reactions in the kettle increase with higher pH.

Although pH influences all of the key reactions that occur in wort production, the practical brewer does not attempt to change pH to optimize each pH-dependent reaction. Rather, he is mainly concerned about the mash pH and the pH of the last runnings. He is also typically interested in the pH of wort in the kettle, because it can be measured. As long as the mash pH is somewhere between 5.2 and 5.6 and the last runnings pH does not exceed 6, there should be no major problems associated with pH.

◆

Although pH influences all of the key reactions that occur in wort production, the practical brewer does not attempt to change pH to optimize each pH-dependent reaction.

◆

Brewers are also very concerned about ions in water — including sulfate, sodium, chloride, and magnesium — that can affect flavor. These ions are associated with flavors ranging from sweet to bitter and palate-drying to body-building. For a complete description of these flavors at various concentrations, see the table below.

Ions and Their Effects on Beer Flavor

Ion	Flavor Characteristics
Sulfate	Sulfate is typically associated with palate drying and astringency. Sulfate also accentuates bitterness, reduces the perception of body in beer, and is associated with metallic flavors. These flavor attributes become apparent when the sulfate concentration exceeds about 100 mg/liter. Burton-on-Trent, England's pale ale capital, has very high sulfate concentrations, and the sulfate ion is important to the flavor profiles of beers from the area.
Chloride	Chloride is credited with contributing body, palate fullness, and sweetness to beer. Also, chloride leaves a clean, non-astringent finish. These properties make chloride the alter ego of sulfate. These attributes become apparent when the chloride concentration exceeds about 100 mg/liter. Note that water in Dortmund, Germany, a city known for malty, full-flavored lagers, has a relatively high chloride content. Many brewers prefer calcium chloride to calcium sulfate as a source of calcium because of these flavor characteristics.
Sodium	Sodium gives beer a sweet flavor at levels less than 100 mg/liter. As the sodium concentration is increased beyond this level, beers begin to taste salty. Some traditional brewers add sodium chloride (table salt) to the mash; this practice adds palate fullness from the chloride and sweetness from the sodium. Full-flavored beers, such as porters, Scotch ales, and sweet stouts, benefit from some sodium.
Magnesium	Magnesium adds a distinct metallic flavor to beer, increases beer bitterness, and affects mash and wort pH. Levels as low as 25 mg/liter in water have been associated with these flavor attributes. Note that Burton-on-Trent water has a magnesium concentration of 62 mg/liter; this amount gives the ales of the area a distinctive metallic edge and a perceived bitterness far greater than the level expected from International Bitterness Unit data. Most brewers find high levels of magnesium undesirable in almost all beer styles except Burton-style IPAs.

Classic Brewing Water						
Ion	Burton-on-Trent (pale ales)	Dortmund (pale lagers)	Dublin (stout, porter & mild ales)	London (stout, porter & mild ales)	Munich (dark lagers)	Pilsen (pilsner)
Calcium	268	260	80	90	80	7
Magnesium	62	23	19	4	19	1
Bicarbonate	282	540	328	246	328	18
Sodium	30	69	1	24	1	3
Chloride	36	106	1	18	1	5
Sulfate	638	283	5	58	5	6
Residual Alkalinity	0.1	4.9	4.0	2.7	4.0	0.2

pH Reactions

Most waters have two conflicting constituents that affect pH in opposite directions. The calcium and magnesium ions react with phosphate ions in malt to decrease mash and wort pH. The carbonate and bicarbonate ions, on the other hand, act to increase pH, mainly through their ability to "mop up" pH-suppressing hydrogen ions. For the scientifically inclined, Equations 1 through 4 ("A Little Chemistry," page 52) describe in chemical terms how these reactions work.

The key point to note is that water pH is a very poor indicator of mash pH. Calcium and magnesium do not affect pH until mixed with malt, and even though carbonates and bicarbonates do affect water pH, it is impossible to use their effect on water pH to predict their effect on mash pH.

The most important indicator of how these various ions affect mash pH comes from comparing their concentrations. To make this comparison, you

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A Little Chemistry
How ions affect mash pH

Calcium and magnesium have similar effects on mash pH in that they both react with phosphate from malt to form an insoluble precipitant (solid). These reactions cause a release of hydrogen ions. This causes pH to decrease, because pH is a function of the hydrogen ion concentration. As the hydrogen ion concentration increases, pH decreases (acidity increases).

In reality calcium is a more powerful acidifying ion than magnesium, because its phosphate salt ($Ca_3(PO_4)_2$) is less soluble than the phosphate salt of magnesium ($Mg_3(PO_4)_2$). It is the precipitation of the phosphate salt that drives the liberation of hydrogen ions from malt phosphates.

Reaction 1:

$$3\ Ca^{+2} + 2HPO_4^{-2} \rightarrow 2H^+ + Ca_3(PO_4)_2 \text{ (precipitant)}$$

Reaction 2:

$$3\ Mg^{+2} + 2HPO_4^{-2} \rightarrow 2H^+ + Mg_3(PO_4)_2 \text{ (precipitant)}$$

The discussion of water chemistry must include mention of both carbonate and bicarbonate ions. Both of the ions affect water pH. However, the carbonate ion is never present in a brewery mash, because the mash pH is too low to permit its existence. Instead, all carbonates are present as bicarbonate.

The bicarbonate ion is able to react with hydrogen to form carbonic acid (H_2CO_3), which then decomposes to carbon dioxide and water. This causes an increase in pH, because hydrogen ions are removed from water (see Reaction 3).

When mash water is boiled prior to mashing, a common method of removing carbonates, the carbonate ion is present and can react with calcium to form an insoluble salt (see Reaction 4). These are the key reactions that govern mash and wort pH.

Reaction 3:

$$HCO_3^- + H^+ \rightarrow H_2CO_3 + \text{Heat} \rightarrow H_2O + CO_2$$

Reaction 4:

$$Ca^{+2} + CO_3^{-2} \rightarrow CaCO_3 \text{ (precipitant)}$$

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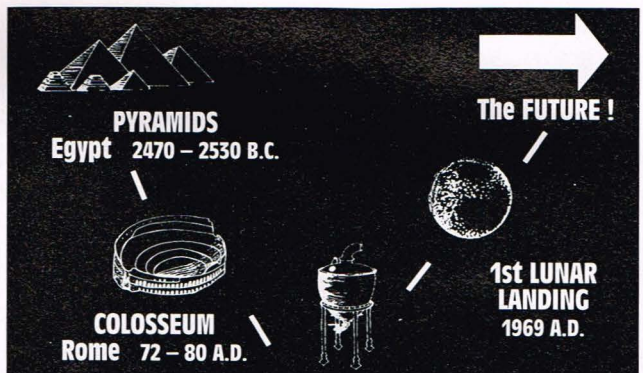
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need an analysis of your local water. This information is available to the public and can be obtained by calling or visiting your local water company.

Once you obtain a water analysis, it's time to begin determining what type of water you have. The following example has been taken from a much longer list of numbers, but the concentrations listed are the most important to brewers.

Ion	Concentration (ppm or mg/l)
Sodium	20
Sulfate	60
Chloride	58
Calcium	40
Magnesium	10
Bicarbonate	50

The first factors to examine are the levels of sodium, sulfate, and chloride. In this sample water, they are all relatively low (in fact the concentrations are similar to those found in London water). The second and most important step is to evaluate the three ions that affect pH: calcium, magnesium, and bicarbonate.

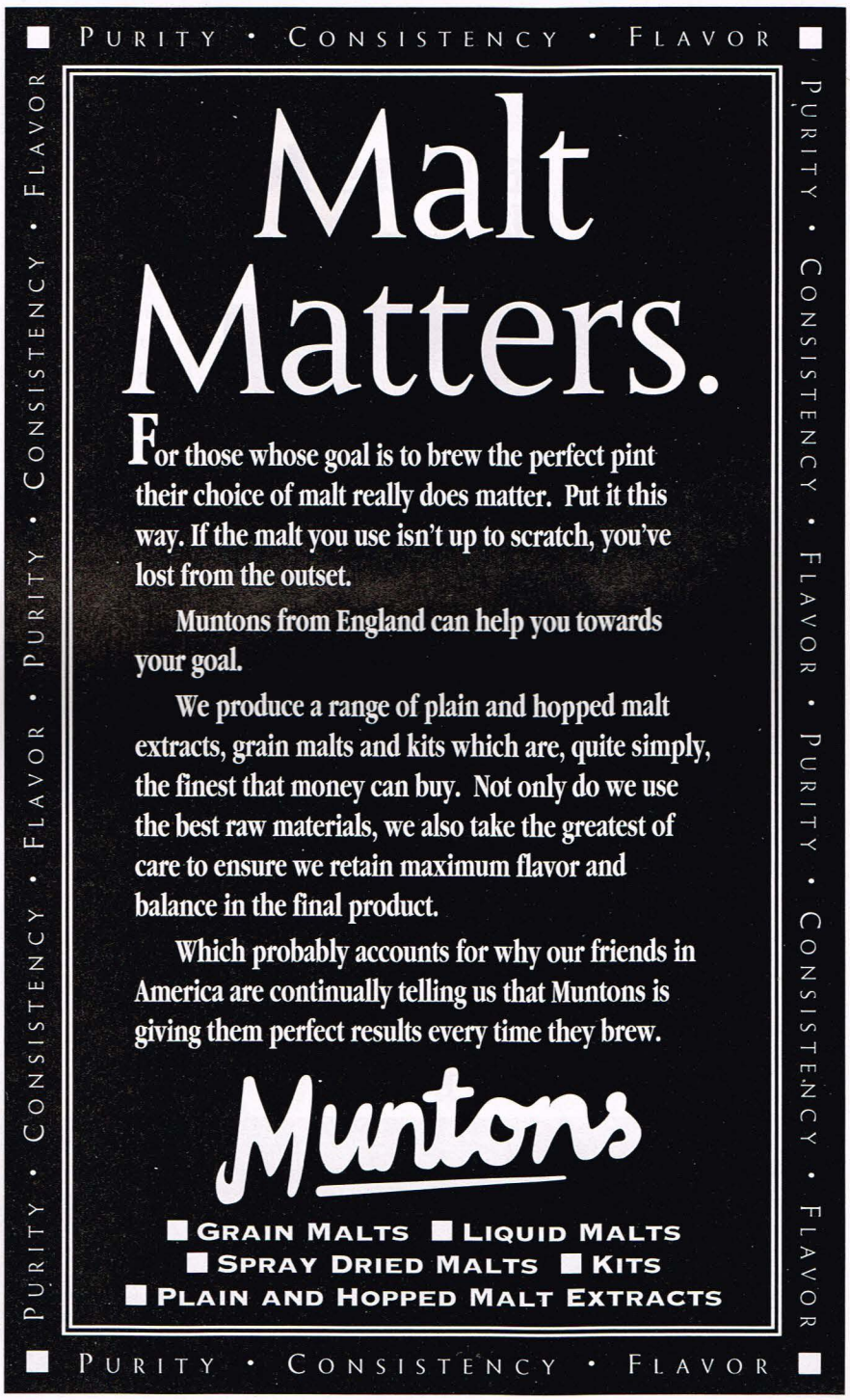
Unfortunately, this requires a couple of calculations. On its own, the concentration information provided by the water company is not very useful because concentration is expressed in milligrams per liter, which is the weight of the ion per volume of water. But the ability of calcium, for example, to lower pH depends on how many calcium charges are in solution, not on the weight of calcium in solution. Fortunately, these factors are related by a term called "equivalent weight," which accounts for the ion's charge and its molecular weight.

Step 1: Convert concentration (parts per million or milligrams per liter) to millivals.

A millival, or mval, is an expression of charge concentration and is simply the concentration of a given ion in milligrams per liter divided by the ion's equivalent weight (which is constant). The Conversion to Millivals table at right lists the concentration of calcium, magnesium, and bicarbonate, their equivalent weights, and the mval of these three ions.

Conversion to Millivals

Ion	Concentration in water (mg/l)	Equivalent Weight	mval
Calcium (Ca)	40	20	2
Magnesium (Mg)	10	12	0.83
Biocarbonate	50	61	0.82



Remember, these are the only three ions found in water that affect mash and wort pH. The mval concentration of these three ions is important in determining how the pH will be affected by the water. To evaluate your local water simply replace the "concentration in water" values in the table with your water values and divide by the respective equivalent weight to determine mval.

Step 2: Calculate the residual alkalinity of the water.

Bicarbonates increase pH and are said to be alkaline in nature. When the effects of bicarbonate ions at increasing pH outweigh the effects of calcium and magnesium ions at decreasing pH, water is said to have a positive residual alkalinity. Bicarbonate ions are about 3.5 times more effective at increasing mash pH than calcium ions are at lowering it, and seven times more effective than magnesium at lowering pH. Thus, the mval concentrations must be equilibrated. This allows the brewer to truly determine which system is the most dominant. The following equation can be used to calculate residual alkalinity:

Residual alkalinity =
mval bicarbonate -
(mval Ca/3.5 + mval Mg/7).

For the example water this equation becomes:

Residual alkalinity =
0.82 - (2/3.5 + 0.83/7)
= 0.13

This means the sample brewing water has a slightly positive residual alkalinity (RA). Compared with the RA of brewing cities around the world, this water is definitely suited for pale beers rather than dark beers. Although the water does have some chloride, sulfate, and sodium, the levels in the water are far lower than in most famous brewing waters. This water could probably be used for almost any pale beer, ale, or lager, and for amber and light brown beers with low levels of roasted malts.

If too much dark malt is used in mashing and the water has a low RA like the sample water, then the mash pH can be too low. This can interfere with the enzymes in the mash, lend acidic grain flavors to the beer, and decrease hop utilization in the kettle. This is why pale beers flourished in cities with this particular type of water.

Note that few cities around the world, and not just the selection in Classic Brewing Water (page 51), have low RA waters. This fact partially explains why pale beers were uncommon until methods of brewery water treatment became popular during the latter part of the 19th century. Also, very pale malts, like those routinely used today, did not exist until the early 1800s. For these reasons most cities could make good dark beers, which worked out great because pale malts were uncommon until recent times.

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When waters have a high RA, as do Munich and Dublin municipal waters, the mash pH tends to be increased. However, the malts used in these towns were historically very acidic and balanced out the alkalizing effects of the water. Thus stout, which contains high proportions of roasted barley, is best brewed with alkaline waters.

Dortmund, on the other hand, has a high RA but is famous for pale lagers. Traditionally, Dortmund brewed dark wheat ales but switched to bottom-fermented lagers in the mid-1800s. These pale beers required water treatment because of the high water alkalinity. Boiling prior to use was most likely the water-treatment method of choice.

Matching Water to Beer

The next step is to apply the methods discussed above to matching beer style to water chemistry. The best way to see how this works is to determine the RA of your local brewing water and compare it to that of the famous brewing waters in the table on page 51.

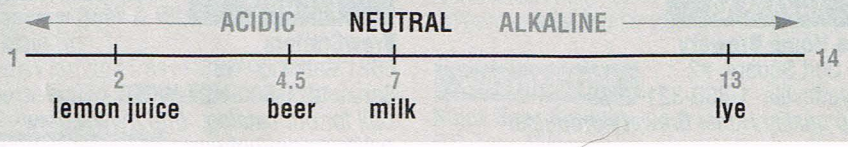
Take note of the other ions in your water, such as sodium, chloride, and sulfate, too, because they affect flavor. One point to remember when doing this is that there are essentially three types of brewing water: dark beer water, pale beer water, and very pale beer water. Once the water is loosely pigeon-holed, it is then up to you, the brewer, to empirically determine the best use for the water within these broad categories.

The best result of such experimental homebrewing is making your local brewing water an essential ingredient for your homebrew. Who knows, maybe a new and exciting beer style can come from your town! ■

pH Basics

pH is an indicator of the acidity or alkalinity of liquids. It is directly related to the hydrogen ion concentration. Solutions that have a pH less than seven are acidic. Solutions that have a pH greater than seven are alkaline and are referred to as bases.

Mathematically pH is: -log[H+], or the negative logarithm of the molar hydrogen concentration. This means as the concentration of the hydrogen ion increases, the pH decreases; this is why an increase in acidity (hydrogen ion concentration) causes pH to drop.



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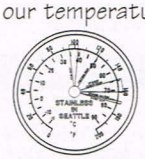
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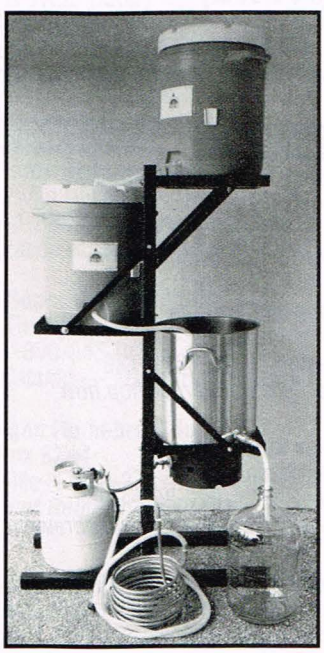
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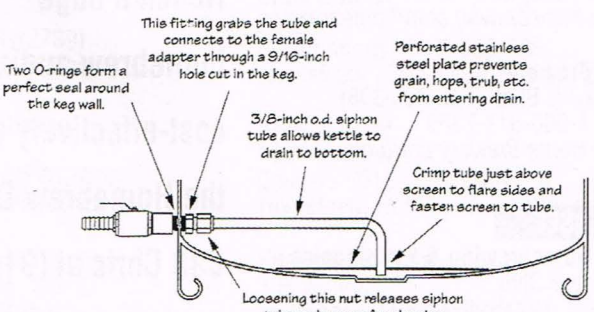
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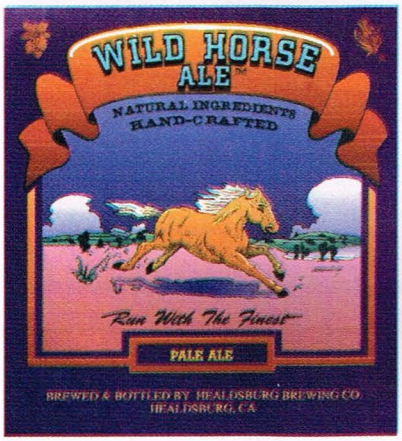
The Weld-Free Mash Kit



CIRCLE 50 ON READER SERVICE CARD

Harken Back to Hops in Healdsburg

by Steve Johnson



Aside from producing good beer, Healdsburg Brewing Co. is one of the first new breweries in California to grow its own hops.

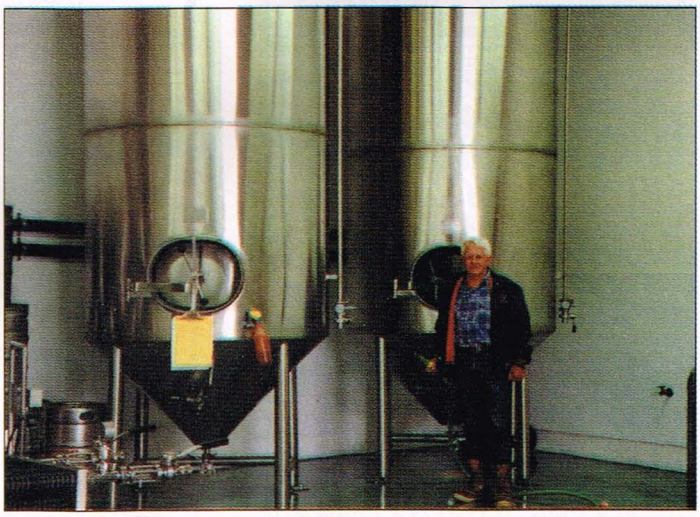
The brewery is nestled in a residential neighborhood on the outskirts of Healdsburg, in the heart of the Sonoma County wine country. The brewhouse is visible from the doorway of the industrial-looking building.

The family-run business consists of co-owners Ed Bischofberger and his brother-in-law Bob Tingey, their wives and children, and even Bischofberger's parents.

Behind a duck pond is the hop field, only about one-eighth of an acre with 16-foot-high redwood trellises.

Bischofberger and Tingey bought their setup from Pub Brewing Systems. It consists of a 14-barrel brewhouse, two 28-barrel fermenters, and one 14-barrel fermenter. They don't have a bottler yet and are distributing in kegs only.

One of the most interesting aspects of the operation is the hop plants.



On bottling days, co-owners Ed Bischofberger and Bob Tingey get their entire families involved, including Bischofberger's father, pictured here with the fermenters.

While it's common for wineries to grow their own grapes, it's extremely rare for a brewery to grow its own hops.

At one time hops were an important crop in Sonoma County, but the local industry died out in the 1950s. During the first half of the 20th century, the American hop belt ran from California to Washington. Within California, Sonoma County was the hop basket.

In 1950, when hop growing was at its peak in the state, the California crop made up 28 percent of national production. That same year a hop blight developed and gradually cut production. Washington and Oregon, which have colder winters, were affected only slightly. But the blight proliferated in California's milder winters. Production dwindled. By 1960 hop growing in Sonoma County ceased altogether. Five years later the hop harvest in other areas of California accounted for only 10 percent of national production.

By 1980 California's share of the hop harvest had shrunk to 2 percent, and within a few years California hop farms were as rare as the California condor. These days only one small farm near Sacramento grows hops commercially.

Healdsburg Brewing has brought back commercial hop growing to Sonoma County, albeit on an almost microscopic scale. Whether it will be viable remains to be seen, but there has been one good sign that it isn't just a flash in the pan. About a month after Tingey and Bischofberger planted their hops, the owners of Benziger Family Winery in Glen Ellen, Calif., tore up some of their prized merlot rootstock, replacing it with hop rhizomes to prepare to open their own brewery.

Healdsburg and Benziger are planting hops because they must

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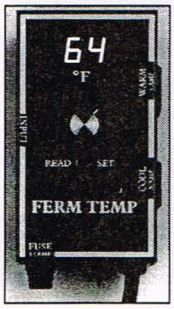
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comply with local agriculture zoning requirements. These laws require that anything manufactured on the properties must contain ingredients that were grown on the properties. Tingey and Bischofberger argued that by using their own well water for beer, which is 90 percent water, they would meet the requirements. However, the local planning commission insisted that they grow at least some of the ingredients and suggested that barley would be appropriate. Because growing barley would require too much space, the two groups agreed on hops.

Another noteworthy aspect of Healdsburg Brewing is that it has been able to survive and even prosper in a super-saturated market. Entrepreneurs inquiring about starting breweries in California find that conventional wisdom says the area is too competitive with more than 140 breweries. But, of course, if those starry-eyed homebrewers back in the 1970s and '80s had listened to conventional wisdom, the microbrewery revolution would never have started in the first place.

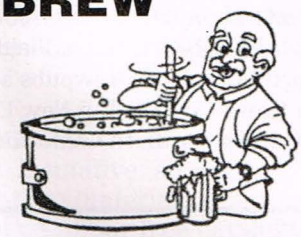
There are several secrets to Healdsburg's success. First, producing a high-quality product is important; wimpy beer just isn't going to catch consumers' attention. Also, rather than assume a loan, the owners were fortunate enough to be able to finance the brewery themselves. They already owned the property on which they built the brewery. Bischofberger, a building contractor, constructed the building.

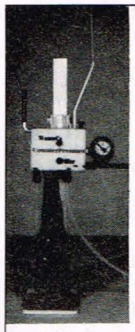
They also cut labor costs by getting both of their families involved in the beer production. "On bottling days," says Bischofberger, "wives, kids, and my father go to work, and we even have some good friends who pitch in." They avoided the expense of a bottling line by beginning production in kegs only (they have since installed an inexpensive bottler and labeler). Finally, they have both kept their day jobs up to this point. Tingey is an airline pilot, and Bischofberger is a building contractor.

The biggest challenge, however, was distribution. In the early days of microbrewing, every new beer was a novelty and attracted instant attention. But those days are long gone.

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"Marketing was the hardest nut to crack," says Bischofberger, who is in charge of marketing and distribution. He credits their success to local identity and doing their own distribution. "Initially," he says, "distributors didn't want to take us on, so I had to go door to door and gradually build up a clientele of local restaurants and bars. We had to prove ourselves before the distributors became interested. It was very rewarding when one day I received a phone call from a distributor offering to carry our beer. It was the same distributor who had initially turned us down."

Now all distribution has been turned over to five beer distributors, and Healdsburg's beer is available along the Northern California coast from Marin County (north of San Francisco) to the Oregon border.

Bischofberger feels choosing the right name for his beers is important to market identity. The Wild Horse theme arose during a brainstorming session in his home. He and Tingey were considering animal themes, since such names have enjoyed wide popularity in the microbrewery trade. A variety of dogs, cats, birds, and even elephants and rhinoceroses had already been picked. As they were racking their brains, Bischofberger says, "my eyes wandered to a lithograph on my living room wall of a herd of wild horses. Horses are popular in Healdsburg, so a horse theme seemed appropriate."

Freedom from distribution responsibilities has allowed Tingey and Bischofberger to concentrate on making beer. They expected to reach 600 to 700 barrels at the end of their first year of production, which was December 1996. In addition to the Wild Horse Pale Ale, they have added a wheat beer, an India pale ale, and an oatmeal stout.

Next time you are on the Northern California coast, look for Wild Horse brands. The owners would be happy to arrange a brewery tour, but call in advance. Healdsburg Brewing Co. is located at 673 Limerick Lane, Healdsburg, CA 95448, (707) 433-1248. ■



Healdsburg Brewing Co. houses this grain mill and its other brewing equipment in a building built by co-owner Ed Bischofberger.

Steve Johnson lives in Clemson, S.C., and is the author of three brewery guidebooks: On Tap: a Field Guide to North American Brewpubs and Craft Breweries, On Tap New England, *and* On Tap Northern California.

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Advertiser Index

	Page No.	Circle No.
Above the Rest Homebrewing Supplies	62	1
American Brewer's Guild	60	2
American Homebrewers Association	30	3
Austin Homebrew Supply	14	4
Beer and Wine Hobby	58	5
Beer Gear	60	6
Beer, Beer & More Beer	10	7
Brew King	1	8
Brew King	Cov. III	9
BrewCrafters	48	-
Brewer's Garden	51	10
Brewer's Resource	15	11
Brewer's Resource	60	12
Brewer's Warehouse	16	-
BrewPro	58	13
Brew-It-Yourself	55	14
Briess Malt	52	15
C & C Distributing	60	16
California Concentrate Co.	20	17
Canada Homebrew Supply	60	18
Cellar, The	60	19
Consolidated Beverages/Coopers	Cov. IV	20
Crosby & Baker Ltd.	22	-
Cross Distributing	12	21
Den, The	60	22
Edme Limited	5	23
Edme Limited	35	24
Fermentap	16	25
Filter Store Plus	26	26
Foxx Equipment Company	12	27
Frothy Shoppe	60	28
F.H. Steinbart	52	29
Grape and Granary	60	30
G.W. Kent, Inc.	37	31
Home Brewery, The	47	-
Home Brewer's Software	9	32
Homebrew Adventures	55	33
Homebrew Headquarters	41	34
HopTech	62	-
Jet Carboy and Bottle Washer Co.	20	35
LD Carlson Company	48	-
Leitrum Homebrew	61	-
Liberty Malt	31	37
Liquid Bread, Inc.	31	38
Maltexo Ltd.	2	39
Maryland Homebrew	61	40
MediaRight Technology, Inc.	14	41
Medicine Rock Division--Dakota Supply	41	42
Merchant du Vin	8	43
Muntons p.l.c.	53	-
Northern Brewer, Ltd.	10	48
Northwestern Extract Co.	9	-
Pennsylvania Homebrew Market	61	45
Pete's Brewing Company	Cov. II	46
Premier Malt Products	25	47
SABCO Industries	31	44
Siebel Institute of Technology	54	49
Stainless in Seattle	58	50
Stainless Service Corporation	7	51
TKO Software	10	52
U-Brew	61	53
Vinotheque	19	54
Wensel's Counter Pressure Filler	61	55
William's Brewing	16	56
Wind River Brewing Co., Inc.	12	57
Worm's Way	18	58
Zymurtek	51	59

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A Messy Beginner's Tale

by John Zeman

Since I can remember, I've liked good beer. Early on in life I couldn't afford it but still sampled "the good stuff" when I could scrape together extra change. As early as high school I was determined to make beer cheaply. Armed with a can of grocery-store extract, a five-pound bag of cane sugar, a package of baker's dry yeast, and a "recipe" from a monthly life insurance magazine, I made my first homebrew. Our cat fell into the open crock, and three-fourths of the bottles exploded (to this day there is still glass imbedded in the cellar walls at my parents' house). I had made truly bad beer. After another try with similar results (minus the cat and the fireworks) I decided that the $1.25-a-six-pack stuff was better than homebrew.

Some 20 years later, with a much refined palate, I had the opportunity to travel to Germany on business. The experience ruined me for life. The beer was superior to just about everywhere. When I returned home after a mere 2 1/2 weeks, the mass-produced stuff in my refrigerator just didn't cut it. I bought equipment and Dave Miller's books on homebrewing and even decided to jump right into grain mashing.

With the book as my only coach, I brewed my first batch. I found out you never really know what tools you need or how to use them until you've brewed (nothing against Mr. Miller). I got through the mash pretty well and even passed the iodine test.

The sparge was another thing. I found out how critical air space under the grain is. So after about two hours the sparge was complete. I had used five pounds of two-row malt, two pounds of crystal 60° Lovibond malt, and one pound of chocolate malt, all of which I crushed with a rolling pin to the tune of almost an hour a pound.

I found that there was too much wort for one kettle, so I divided it into two. The boil began. I found out how well dark beer shows up on kitchen surfaces, not to mention how hot burners smell when soaked in wort.

I had a bag of hops without a label indicating how much was in it. Lacking a scale, I decided that I probably did not order more than one batch worth, so in went the whole thing. The smell of hopped malt permeated the house, not necessarily to the enjoyment of all present.

Now for cooling. The book told me how important quick cooling is. But I hadn't made a cooling apparatus, so I put the kettles in each side of the kitchen sink and cooled them with running water. In the old house the drain was not as quick to empty as the faucet was to fill.

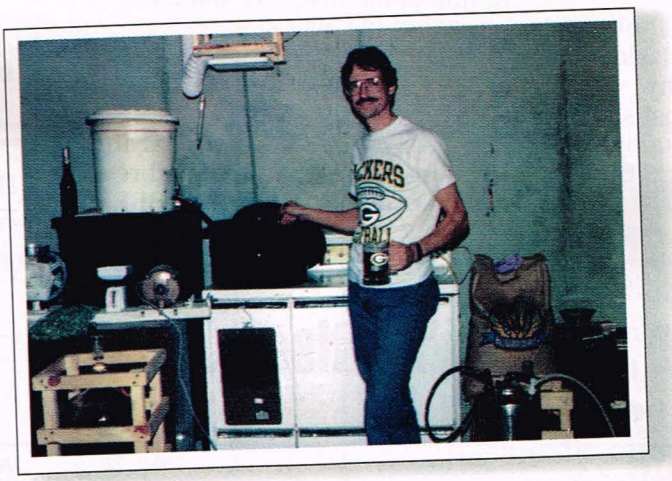
When the wort cooled I put it in the carboy and cleaned up. No small feat. The bottoms of both kettles had a fair amount of trub in them. I learned later I had ordered eight ounces of hops.

The drain seemed to be a good place for the trub, so down it went. Well not really. The drain was now stopped. The various tools I had could not fix this one. But now it was practically midnight, and I'd done all the damage I could for one day.

The next day I pitched yeast into the wort and started plumbing. When I pulled on the wrench to open the universal joint in the basement to clear the pipes, the entire horizontal pipe structure hit the floor. But that's another story.

A few weeks later I pulled the cap and tasted a quite bitter beer, but it wasn't terrible, and it was mine. I was hooked on brewing. I was banished to the basement and had to buy a used stove to continue my new hobby.

During one of my following brews I brought my clipboard to the basement to keep notes. I had forgotten to shut off the circuit breaker for the stove. I shut it off and went upstairs to get a pen. When I returned, the basement was filled with smoke. I got my family out of the house and called the fire department. A firefighter found I had left a burner on low to keep my sparge water at the right temperature. I set my clipboard on the still hot burner when I went looking for a pen. No beer was damaged in the crisis, so it just goes to show that even if you ignore signs to the contrary, you may still end up knowing what you're doing. Well, I'd better go; I think I hear a boilover in progress. ■



Banishment to the basement won't stop this accident-prone brewer from mashing again.

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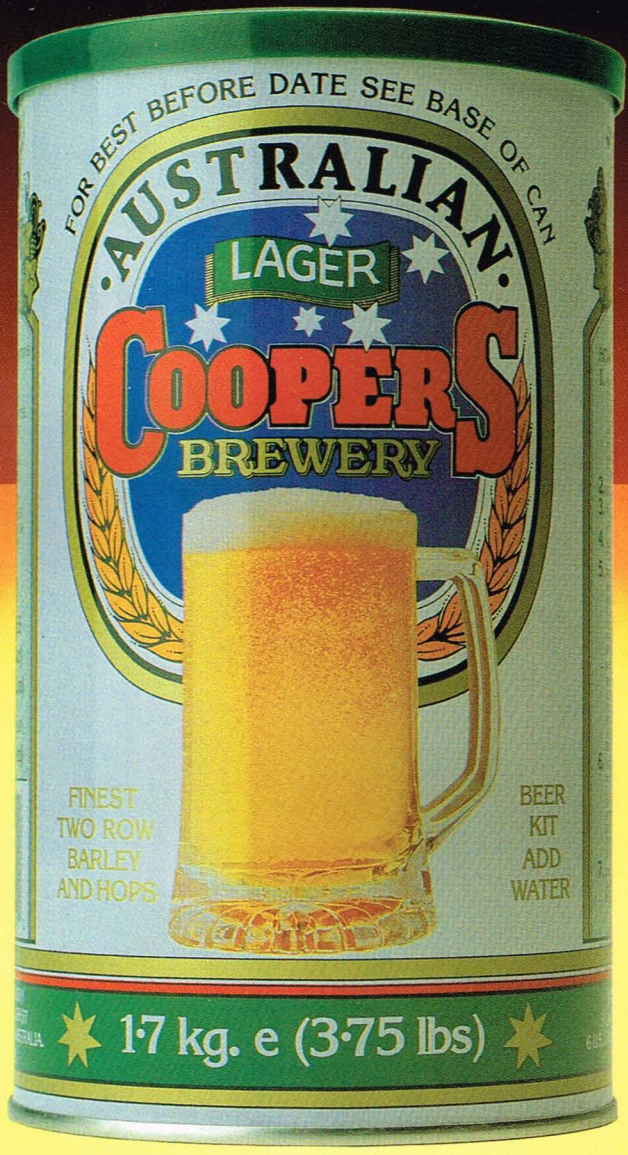
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