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AMATEUR BREWER

FOR THE SERIOUS HOME BREWER

TABLE OF CONTENTS

TALK to Your Beer.....	Inside	C.
Barley and Malt, Part II.....		33
An American Jubilee Ale.....		36
ABC's of Brewing, Part III.....		41
Beer Club News.....		44
Other News of interest.....		45
Brewery News.....		45
Questions from our Readers.....		46
Publications available.....		48

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AMATEUR BREWER

Number Three, Summer 1977
July to September

Talk to Your BEER

PROFOUND APOLOGIES FOR BEING LATE. The press of my regular profession, plus the fact that I suddenly had to re-write my book (NEW FOURTH ED-- A Treatise on Lager Beer, available now for a time at the old price \$1.55 per copy, postpaid to my readers). This is really the first opportunity I've had to redo the thing after all these years. From the very first (1969) I realized that I had changed my ideas about some of the things I had written, and so the second printing, revised, allowed me to make a few changes, and again at various printings more changes, new ideas, and finally in 1975 a Third Edition with one of my color photos on the cover. Well by then, the changes were beginning to bulge like the circus fat man. Different type-styles, a nearly useless index, and a 1969 Table of contents! The information was still good and pertinent, but the order of the book was definitely in need of repair. I finally had my chance to change everything my little heart desired for an all new and much better FOURTH EDITION with new information and ideas.

I think this new edition of my book is very good, but I don't think YOU need it if you have the third edition already, because as a subscriber to the Amateur Brewer, much of the new information I added is from stuff already published in these pages, but organized a little better. So why don't you wait until it appears at your local supplier, and take a look to see if you really need the new edition. Of course if you can't wait....

Lee Coe, author of The Beginners Home Brew Book (available from your dealer or direct, POBox 2265, Station A, Berkely CA 94702) came by for a visit. We talked of many things and drank a beer or two. Lee is revising his book, too, and should have a new edition of it out in a few months. Lee and I share another interest besides that of home brewing: Haiku poetry!

We talked extensively about the legality of beermaking at home. Lee thinks that it is already legal, and I can't help agreeing with him, but the Alcohol, Tobacco and Firearms Bureau does not see it that way at all. They say (if you call them) that beermaking at home is illegal, period! Another case of lawmaking by bureaucrats. Just because a thing is not specifically made legal does not mean that is illegal, rather the opposite must be true: a thing is legal until and unless it is declared illegal by having a law against it passed in the lawmaking body of the land.

Howsoever & be that as it may, we are always going to have problems unless and until it becomes specifically legal to make beer at home. Then too, a goodly number of products are going to be second class until beermaking becomes legally legal: Bad American malts and yeasts will stay with us, and we'll never get a first class draft beer packaging device until beermaking becomes legal.

There is a bill in congress to do just that (see p45, H.R.2028), and to make a change in the bureaucrat's definition of who may make wine to include any adult. They even want to make it legal for women, fer gosh sakes! The bill, however, places a special limitation on home-brewers in that we cannot have on hand more than 30-gallons of the stuff, and we, (not the winemakers) must register with the ATFB. Now if you and your family drink a case (24x12-oz bottles--2½ gal) a week you will have to produce two 5-gallon batches a month. If you allow 10-weeks for fermentation and aging, including bottle aging (very short to my way of thinking, because even commonbeer needs 6-weeks to finish out), and up to two weeks more for consumption--THAT WOULD BE THIRTY GALLONS! This is very modest consumption for 2-adults, and is, I believe, an

--Continued inside back cover

Barley and malt--Part II

By FRED ECKHARDT

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As we discovered in Part I of this article: the malting process is the way in which the hard, tasteless barley is changed into the sweet-tasting and crispy malt with which we are so familiar. I refer here to the malted barley grain and not the product which you purchase in the supply store, properly called malt extract or sometimes malt syrup. That malt extract is made from malted barley grains that have been carried through the mashing process, which we will describe more fully in a future article.

The germination process activates the various enzymes which break down starch into fermentable sugars and degrade various proteins to make them soluble and usable in the beer.

As we have shown, there are two germinating systems which are part of the two malting systems. Those of the European style (including Canadian and U.S. malts) are often thought of as being *lager* malts, after the beer that is usually (but not always) made from them. These malts are not as complete—or as "fully modified," as the maltster terms it—as English malts. English malts are the result of a very long and complete malting system in which the finished product is quite different from the American and Continental malts. English malts have more active enzymes so that the mashing procedures used with them are much simpler.

The length of time and the temper-

ature at which the kilning of the malt is done provide for the differences in the types of malts produced. When finished, the desired color, aroma, mellowness and enzymatic power are obtained. These temperatures are very carefully controlled by the maltster.

The green malt is first withered with low heat to remove most of the moisture before being kilned. The more moisture that is removed before the temperature is raised, the greater will be the enzymatic (or converting) power of the malt. The temperature and degree of kilning heat have a great effect on the color and aroma of the finished malt, and hence on the beer as well. When high kilning temperatures are used, they will have the effect of creating different color, taste and aromas in the beer. If the kiln is kept at lower temperatures, the malt produced will be better, with more enzyme power which will store better.

In the U.S., Canada and Germany the kiln usually has two floors. The green malt goes to the upper floor, where it is withered or slow-dried at low temperatures to remove moisture. In Canada and the U.S. these temperatures are very carefully controlled, but in Germany or Continental Europe they are the result of the heat from the lower floors, where the final kilning is done. The English use one-floor kilns; the U.S. has some three-floor kilns. In Germany a new tower malting system is being tried.

In Canada and the U.S. the upper floor is kept at 75°F., increasing to 90°F. (24-33°C.) for the first 24 hours. This is called the withering phase, and the malt is turned at regular intervals. The temperature is kept low for the first 24 hours until most of the moisture is gone, and then the malt is moved to the lower floor for the final kilning, which lasts another 24 hours. On the lower floor the temperatures start at 120-130°F. (49-54°C.), held for 12 hours until dry, and raised within 1½-2 hours to the final temperature which is 145°F. (63°C.) for most pale malts, although high dried malt will be finished up to 220°F. (100°C.). The malt is then cooled slowly.

After kilning the malt is cleaned to remove rootlets (or sprouts) and dust. It is then stored in cool bins to preserve the enzymatic strength, where it is aged and blended before being shipped. Malt should be stored at temperatures below 80°F. (26°C.) and kept moisture free (very important). Briefly, the basic malts are as follows:

American:

Acrospire or shoot is only permitted to grow ¾ length of kernel.

Pale Malt, final temperatures 180°F. (82°C.) 48 hour total kiln.

Extra Pale Malt, final temperature 145°F. (63°C.) 48 hours total.

American Dark Malt, final 220°F. (104°C.) held 2-4 hours, 24 hours total kiln.

Dextrin Malt, a fairly recent innovation. Similar to caramel malt, but with no high final temperature. It has a mellow flavor, a deeper color than pale malts, and is used for better foam and more intense flavor.

English:

Germinated for 10-15 days at lower

temperatures (acrospire or shoot allowed to grow full length of kernel); total kilning time about four days, including withering. First day 95-100°F. (35-38°C.); second day up slowly to 120°F. (49°C.); third day up slowly to 140°F., and then to 150°F. (60-66°C.); fourth day 185 to 200°F. (85-94°C.) for pale malt, 220-225-230°F. (104-107-110°C.) for high dried malt; last temperature held for five-six hours. Malt is then trodden to remove rootlets.

Amber Malt, final temperature 220-230°F. to destroy diastase (amylase).

Brown Malt, also called chocolate malt; it is smoked or dried over beech or birch wood; has no diastase.

Black or Patent Malt, roasted like coffee.

Caramel or Crystal Malt, moistened during drying with a solution of sugar, and dried at 220-230°F.

The English malts are used as follows: *Pale Ale* has only pale malt; *Mild Ales* use pale malt with a little black malt. *Porter* and *Stout* use highly dried caramel and amber malts with black malt, *London Ales* need amber, brown, black and pale malts with a ratio black/pale of 1:7 to 1:12.

German:

There are four distinct types of continental malts: Bohemian (Czechoslovakian), Wiener (Vienna or Austrian), Dortmund and Bavarian (German). Each of these malts is produced by quite different methods. These continental malts are all from two-rowed European barley and their purity is similar to American types.

Bohemian Malt: Used in the famous Pilsner beer; very light color, steeped 57-72 hours, allowed to malt 9-10 days total at temperatures up to 68°F. (20°C.). Kilning time 24-30 hours in

two levels. Temperature raised from 110°F. (38°C.) gradually to 153°F. (68°C.), and finished by raising to—and holding at—178°F. (81°C.) for an hour.

Bavarian Malt: used in the famous dark Munich and bock beers; made from Bavarian two rowed barley, steeped 90-120 hours, and then allowed to germinate five-six days to allow the rootlets to mat. Kilning time is 48 hours. The temperature is increased slowly to 185°F. (85°C.) and then to the final temperature of 224°F. (105°C.).

Wiener (Vienna) Malt: Starts with barley of as light color as possible, steeped 57-84 hours up to 66°F. (19°C.), then germinated 9-10 days, and not allowed to mat. Total kiln time 48 hours. This malt has been characterized as being between Bohemian and Munich styles, similar to Munich, but with lower drying temperatures.

Dortmunder Malt: Germinated as Bavarian malt, kiln time 24 hours, ending at 195-205°F. (91-98°C.).

Chit Malt: Germinated only to the chitting point, to comply with German law requiring all-malt beers only. The Chit malt is treated as a cereal adjunct and is not mashed as is other malt; rather, it is added in the kettle after the fashion of American and British brewers using corn and rice to augment the brew kettle.

Reprinted from the Amateur Enologist Spring 1973

Wheat malt

There is another malt that deserves mention. Wheat malt, although used extensively by the baking industry, has a few brewing uses. The diastatic power of wheat malt is low, and it has a high percentage of deleterious proteins. Thus, a beer made with a high percentage of wheat malt would be subject to protein haze. Wheat malt has some limited use in making lager beer, but is most noted for its use in Weiss beer, a delightful, tart pale German top-fermented beer. Weiss beer is heavy in lactic acid and has high carbon dioxide pressure. German Weiss beer not only suffers from chill-protein-haze, but has some of the top fermenting lactic acid bacteria inoculated yeast culture in each bottle. There is also a Weiss beer made with smoke-cured wheat malt! Although Weiss beer sounds somewhat unpalatable, it is a delightful beer to drink—particularly during hot weather.

Other malts

Any grain can be malted, and most have been. We hear of strange malts being used in different country beers. Among such malts have been rice, corn, rye and oats to name a few.

BEERTASTING

Amateur Brewer's new guide to the art of beer tasting and competitive judging of BEER. What to look for in beer evaluation. Complete with Judging Forms..... 70¢ see p 48 to order

AN AMERICAN 1977 QUEEN ELIZABETH II JUBILEE ALE

by Fred Eckhardt

The Celebration Ale, similar to Strong Ale or Barley Wine has been a European institution for some centuries now. These are a famous group of beers with very high Original Gravities and, although they are true beers, they are champagne bottled; aged and drunk in the style of very great wines. Celebration Ales are available only in the bottle, and small bottles at that. Most English breweris will produce a special ale to comemorate a very special occasion such as a coronation or a monarchical visit or in this case a silver jubilee (25-years reign). As an example, for this years Queen's Jubilee celebration, the Allied Breweries chain of London and elsewhere, (second largest of the English beer producers), allowed each of their three brewing companies the privilege of brewing special Jubilee Ales. The company owns 7600 pubs or drinking houses, and each of these pubs were allocated 96-10 oz (285-ml) bottles of this very special beer. Picture your favorite tavern with only four cases of beer to sell, and you can get some idea of the scarcity of such brews.

The company directive to its breweries was to produce "a truly superb ale brewed specifically to suit the (regional) consumers of each (brewery)", this was to be "a distinctive bottled beer worthy of carrying the Silver Jubilee symbol, and fulfilling the Lord Chamberlain's strict code of practice." They were to adhere to the tradition of high original gravity (1.100, 1.100, and 1.098), alcohol around 9-10% by volume (7-8% by weight). Each company used its own local distinctive special ingredients. For example the Ind Coop Jubilee Ale is brewed with the famous Burton Well water.

Recently an Edward VII King's Ale, from his 1902 coronation, was sold at an historical society auction in Burton, Ohio. The ale had been a gift from the mayor of Burton, England to the mayor of Burton, Ohio, when that functionary visited England in 1948. That old bottle of ale brought \$300, and may still be drinkable, even after 75 years. These ales have very long lives. Analysis of a bottle of similar ale produced in 1901 shows: OG 1.097(24.4°B); SG beer 1.015 (3.9°B); Alcohol 10.5% by volume (8.75% by wt); unfermented extract 7.6% including 1.6% sugars, & 0.9% protein; acid 0.07% as tartaric. The hop rate was about half oz/USgal(0.6-oz/UKgal, 3.9-gm/litre).

The really interesting thing about these strong ales is that in the old old days they were the regular beer! Queen Elizabeth I is said to have guzzled up to two gallons (English gallons let it be known) of such beer at breakfast! Her majesty's breakfast was little more than bread, wine and beer, (yes she drank wine with her beer.)

The process of brewing this type of beer starts in the mash tun, where the beer is ran-off until the gravity, which may be as high as 1.100 at first, is reduced to about 1.050. The balance of the run was used to make the weaker "small beer" of the time. That "small beer" is about what we get these days for regular beer! Those old brewers got two batches of beer from the one

from the one mash. The wort, at about a gravity of 1.075 was then boiled and boiled (4-5 hours) until it became concentrated enough, by evaporation, to reach the desired original gravity of 1.100 or whatever. These days sugar is often used to raise the wort gravity to the desired level. The beer is fermented and aged for about six to nine months in casks, and then bottled where it is held for another year or so before release.

The 1977 Jubilee Ales released this year were probably originally brewed in late 1975. Bottling is in small champagne bottles, with wired corks, or at least that's the way it used to be, I really don't know how the current Jubilee Ale is packaged, other than in the 10-oz bottles mentioned earlier. Many celebration ales are packaged in even smaller bottles called a nip, which is a little smaller than our champagne split (6.4-oz; 190-ml).

The English are not the only strong-ale drinkers. Other countries, Germany and Denmark for example, make strong celebration beers. I have in my refrigerator at this moment, (but not by the time you read this), a small bottle of Danish Ceres Jule Bryg, a Christmas Ale, which is brewed annually in limited quantities, and is very potent in alcohol. This beer even has a little sediment on the bottom--lucky me!!

In this country the strong ale spirit is almost dead, but there is a rumor that a small San Fransisco brewery is about to come forth with a Christmas ale of its own!

It is highly unlikely that you or I will get our filthy hands on such fine beer, but I have some information on the processes and we can brew one of our own. We are going to give two recipes for this beer, one using a mixture of grain malts and malt extracts, and the other a more simple, but still delicious, malt extract beer. These are two-gallon recipes, and you should bottle in champagne tenths or splits. If you wish to store the beer for over two years--prepare it as you would fine champagne. Use champagne corks wired in, this after disgorging the beer if it is not a still-beer. (see our new paper, p48: An Outline of Procedures for Making Champagne at Home.)

RECIPE No. 1 (2-gallon; 8-litre)

- 1-lb (500-gm) crystal or caramel malt, crushed.
- 1 tin, 2.2-lb (1.0-Kg) Edme SPX or John Bull plain malt extract, or other high quality malt extract such as Munton-Fison.
- 2-lb (1-kg) good quality dry malt extract (Canadians, English use 3-lb).
- 3½-oz (100-gm) best quality fresh hops you can find such as Northern Brewer, Fuggles, Cascade or Talisman). Set aside 2/3 oz (20-gm) for dry hopping.
- Water hardening to 1700 ppm or about 1-3/4 tspn our Burton formula in "soft" water (= 1-t gypsum, ½-t salt, ¼-t epsom salts).
- OG 1.090 RG (racking) 1.040 TG 1.016 or so
- yeast Red Star Dry Champagne Yeast
- est alcohol 7.8% by weight, 9.7% by volume.

1. Place the crushed crystal malt (in a cheesecloth bag), in about a gallon of hot tap water in a kettle that can safely boil 2-gallons of water. Add water hardening salts (dissolved in a cup of hot water). Raise the temperature to 255-158F(68-70C), and hold there for about an hour. Remove the bag, and rinse with water to remove any fermentables remaining. Add the malt extract syrup, rinsing the tin, stir, and then add the dry malt extract.

2. Add water to about the 2-gallon level, bring to a boil, and continue boiling for about two hours. After half an hour, add about $\frac{1}{4}$ of the kettle hops (remember to save $\frac{2}{3}$ -oz (20-gm) for dry hopping later. Keep these dry and in your refrigerator until needed.) Add $\frac{1}{4}$ of the kettle hops every half hour, with the last being added at the last 5-minutes of boil. Allow this hot wort to settle for about 30-minutes, and pour into your primary fermentor, straining the kettle hops out. Rinse these hops with water to bring the volume in your fermentor to about 2.2-gallons. Follow the fermenting procedures outlined below.

RECIPE No. 2 (Grain malt-malt extract)

1-lb (500-gm) crystal malt or caramel malt, crushed.
4-lb (2-Kg) pale malt grains, crushed.
1-lb, 10-oz (approx) dry malt extract (Canadians and English use about 2-lb, 10-oz, Metric 780-gm)
The amount may vary according to your grain yield.

balance ingredients as in recipe #1 (hops, water treatment, yeast, etc).

OG 1.100 RG 1.043 TG 1.018 or so
Alcohol 8.6% by wt, 10.7% by volume

Note--this recipe uses grain malts augmented by dry malt extract, because an all grain recipe would involve about 9-lbs of grains, mashed, (sequence below), and drawn off until the gravity reaches about 1.040, and the remainder used to make a "small" beer about 1.028 OG. The first half of the wort would then be boiled down to an OG of 1.100. This is a rather expensive, time consuming and complicated procedure. The following recipe represents a compromise, for which I must apologize, but it is easier to produce.

Grain malts vary greatly in their yield, and your yield may be quite different from my own, so you must be sure to adjust the end product with dry malt extract, dextrose, or water to get the desired O.G. called for.

Full details on mashing your own grains are presented in our pamphlet Mashing for the North American Home Brewer available from us or your local supplier.

MASHING PROCEDURE

1. Dissolve (or try to) the water hardening salts in 1-cup hot water.
2. In your mashing kettle place 6-USqts water (5-UKqts; 6-litre), along with half the hardening salt mixture (above).

3. Mash-in at 122F(50C), by adding the crushed grains of pale and caramel or crystal malt. Stir, with a wooden spoon, and keep stirring regularly and frequently. Temperature will fall to about 116F(47C), raise the temperature slowly over a 30-min period until it reaches 122F again, and hold at that for 45-minutes. During this time the pH should fall to 5.3 or lower. Keep stirring regularly all the while. (With water at 1700 ppm there should be no problem with pH).

4. Raise the mash to a temperature of 126F(52C) in 10-minutes, and hold that for 20-minutes, stirring regularly.

5. Raise the mash to 158F(70C) and hold at that temperature for 5-minutes and then check for starch conversion with iodine. Hold this temperature until 45-minutes PAST the conversion point as shown by the iodine test. Keep stirring.

6. Raise the mash to 167F(75C), and transfer to your Lauter Tub (straining vessel). Allow the mash to rest there for 30-minutes, and sparge with about another 6-USqts water at 170F(78C).

7. The above procedure will yeild around $2\frac{1}{2}$ gallons wort for boiling in your brew kettle. Add the balance of water adjustment to your brew kettle.

BOILING THE WORT

1. Bring the sweet wort obtained (above) to a boil, and boil for about two or three hours until the volume is reduce to under 2-gallons. After about half an hour add about $\frac{1}{4}$ of the kettle hops (remember to save $\frac{2}{3}$ -oz (20-gm) for dry hopping later. Add $\frac{1}{4}$ of the kettle hops every half hour, with the last of them being added in the last 5-minutes of boil. During the last 30-minutes of boil, add the dry malt extract.

2. Pour into your lauter tub strainer, stand for 30-minutes, and then draw off into your primary fermentor. Sparge with about a quart of hot water to rinse the hops. This should result in about 2.2-gallons of wort. Follow the fermenting procedure outlined below.

THE PRIMARY FERMENT

1. Allow the wort from either recipe to cool to around 75F(24C). Adjust the gravity in the usual manner (add dry malt or dextrose as necessary).

2. Prepare the champagne yeast. In a glass of warm wort 105-110F(40-43C) sprinkle the packet of Red Star Champagne yeast (UCD Bayanus yeast) on the surface, stand 10-minutes, stir, and add to the wort, rousing that thoroughly to aerate it. (You could also use a strong strain of Ale yeast (English only, not American), we think the champagne yeast will serve better, and may save you a lot of trouble since it has a temperature tolerance down to 42F(5.5C), which means that you can cold ferment this beer if you wish. I do not advise using lager yeast for a strong beer such as this.)

3. After about a day of ferment, or when the beer reaches lower krausen, transfer it to a cooler place 60-65F(15-18C),

or even lower. Ferment until the beer reaches racking gravity (1.040 or so), and rack to one or two appropriate secondary fermentors, such as 1-gallon bottles. Add a supernutrient such as yeast energizer, and place under a fermentation lock with water in it. Do not top-up the fermentor(s).

SECONDARY FERMENT

1. Two days later, add loose hops you saved (2/3-oz (20-gm) of the best, such as Fuggles, Bullioun, Talisman, etc). Move to a cool dark place 50-55F(10-13C).
2. Rotate the container(s) daily. Tilt and turn half a turn left, and half a turn right each day for 6-months (3-months at 68F--20C).
3. Add gelatin finings, top-up, and stand for 10 days as cold as you can, down to 32F(0C).
4. Bottle in champagne bottles using a yeasted method with champagne yeast, and dextrose to produce about 1 to 1½-atmosphere bottle pressure (0.6 -0.9 oz/USgal; 1.09-1.44 oz/UKgal; 6.75-9 gm/litre). Alternately you may bottle this as still barley wine with no carbonation, or you can carbonate to your usual desire. Still another possibility is to bottle as champagne for disgorgement, etc., and here you need an extra atmosphere pressure over that desired in the end product. See ABC's of Brewing Table One for sugar requirements in bottling.
5. This beer should be bottle aged for another six months to a year, and may be aged for 3 to 6 years under champagne finish.

DID YOU KNOW?

All of our recipes are for three quantities: USgallons, UK(United Kingdom & Canada or Imperial)gallons and Metric units based on 4-liter quantities or "metric gallon". When a recipe says Canadians, English use... we mean that quantity is necessary to produce a similar beverage in UKgallonage. The metric units are to produce a similar result in metric units of 4-litre "metric gallons". This in place of 454 gm per pound straight translation. This means that people using metric equipment will be able to brew direct in that language. For example our 2-gallon recipe will make 2-USgals; 2-UKgals or 8-litres; depending on which units you follow. This is really necessary because in Canada and England the gallons are beginning to appear as 4-liter units, and in the US (wine for example) they are 3-liter units. I am hoping that if we must go metric the gallon will be 4-litre rather than 3-litre.

CHAMPAGNE OUTLINE

Companion to our Outline of Winemaking used by Portland Community College classes see p48 to order 55¢

the ABC's of BEERMAKING part III finishing and packaging

by Fred Eckhardt

This is the third article on the beermaking process: the first dealt with preparing the wort for ferment. The second concerned itself with fermenting and aging. This, the third part, is about finishing and packaging the beer for your consumption. The material I had originally planned to use here turned out a little more extensive than I had anticipated, hence we will finish part three in AB#5, since AB#4 will be devoted entirely to hops and their use. We have made no attempt to discuss most of the ingredients, and have touched only lightly the subject of equipment. We are concerned now mainly with procedures. Their use with any recipe you have should improve that beer.

BOTTLE PRESSURES

It is prudent to discuss the bottle pressures that may be generated by various additions of sugar to be added for the re-ferment in the bottle to carbonate the beer. The bottle ferment is one of the least understood aspects of the production of home made beer.

According to various sources, we find that 4-gm/litre of sucrose (cane or beet sugar), or 4.5-gm/litre dextrose (corn sugar or glucose) or fructose will, when fermented, generate one atmosphere (14.7-lb/in²--1.03-kg/cm²) CO₂ pressure in a closed container, such as a beer bottle. The sugar we recommend will be dextrose. These calculations assume a temperature of 50F(10C): as will be seen higher or lower temperatures will result in higher or lower pressures in the bottle.

US and Canadian brewer's use bottle pressures of 2 to 3 atmospheres (30-45 lb/in²--2 -3 kg/cm²). German and English beers exported to the US are similar in pressure, while Continental and English beers in their own country are lower in such bottle pressure.

The unavoidable presence of air in home made beer adds to the ebullience of that product, and there are bacteria which increase this effect, so that a typical homebrew may appear to be much more highly carbonated than commercial beer, when in reality that may not be true. Lower temperature ferments will aid greatly in controlling these effects.

Table ONE shows the amounts of dextrose or corn sugar needed to achieve various pressures in the bottle and Table TWO gives information concerning the effects of various temperatures on these bottle pressures. Together they show that even a small variation in specific gravity at bottling can result in potentially dangerous bottle pressures. The addition of sugar by the teaspoon or half teaspoonful per bottle, as recommended by some authors, is almost impossible to measure accurately, errors are inevitable. I do not recommend that method. Also an error of even one millimeter, in reading your hydrometer, can result in nearly double bottle pressures under some temperature variations. If you must use the common beer method to

TABLE ONE

— Sugar Required for Various Bottle Pressures (c) 1977 Fred Eckhart

Atmosph.	lb/in ²	Kg/cm ²	dextrose oz/US gal.	dextrose oz/UK gal.	dextrose gm/Liter	Sp. Gr.
0.61	9	0.63	0.37	0.44	2.77	1.001
0.68	10	0.7	0.41	0.49	3.1	1.0011
1.0	14.7	1.03	0.61	0.73	4.5	1.0016
2.0	29.4	2.07	1.2	1.44	9.0	1.0032
2.5	36.8	2.6	1.5	1.8	11.2	1.004
3.0	44.1	3.1	1.8	2.2	13.5	1.0048
4.0	58.8	4.1	2.4	2.9	18	1.0064
6.0	88.2	6.2	3.65	4.4	27	1.0096

TABLE TWO

— Pressure— Temperature variances. All values approximate (c) 1977

Pressure lbs/in ² @ 50° F (10° C)	59° F (15° C)	68° F (20° C)	77° F (25° C)
10	14	16	18
20	23	26	28
30	35	41	44
40	47	54	58
50	60	70	75
60	70	80	90
75	90	100	110
90	103	120	135

bottle your beer, I strongly urge you to use a hydrometer jar to take the reading rather than simply placing the hydrometer in the fermenting vessel. I do not recommend the commonbeer or red-line method of bottling beer.

ADDING CARBONATION SUGAR

The best way to prepare sugar for addition to your beer is to make a syrup with it. Use some of the beer instead of water, unless you want to dilute your beer.

Make a syrup by boiling about two cups of beer with the amount of sugar calculated (Table ONE) to achieve the pressure desired in the volume of beer at hand. I recommend about 2.5-atmosphere pressure for American style beers. Table ONE shows that 1.5-oz dextrose (i.e. glucose or corn sugar) per US gallon (1.3-oz/UKgal--11.2-gm/litre) will accomplish this. A US cup holds about 6-oz dextrose, so for a typical 5-gallon batch this would be 7½-oz corn sugar, or 1-1/2 cup. The beer to be bottled should be completely fermented out, and settled.

When you are ready to bottle the beer, rack it from the carboy

to an open vessel such as your cleaned and sterilized primary fermentor; add the syrup, and stir carefully to distribute the syrup throughout the brew. Stir gently to minimize aeration. Failure to mix the syrup completely into the beer can result in variations in bottle pressure with exploding bottles a possibility.

OXIDATION

The effects of aeration (oxidation) will be minimized if you use ascorbic (vitamin C) acid as an anti-oxidant. Add 50 - 100-mg/gallon (15-25 mg/litre). NOTE: one US teaspoon weight ascorbic acid is about 1.5-gm--1500-mg, (UK tspn = 1.8-gm). As you can see you need about half to a full tspn per 4-6 gallons (20-24 litre)--too much is better than too little. The granular ascorbic acid or tablets should be dissolved in a little beer before adding. Some people fine their beer at this time, and others use heading preparations, which may be added at this stage. I question the necessity to use either, especially when brewing an all-malt beer. It is better to fine the beer when racking to secondary, or at the end of the lagering phase. Fining is fully detailed in part two of this series (AB#2).

BOTTLING YOUR BEER

Generally speaking there are two ways to finish out your beer. You may package it in a bulk container for draft beer, or you may bottle the beer. There are many ways to go about bottling your beer, but three are generally preferred, these are: Commonbeer method, Priming method, and Krausening or yeasted method.

Traditionally, when the homebrew had almost finished its ferment, the brewer would bottle the beer while there was still some unfermented sugar remaining. This was indicated by the presence of a "ring-of-bubbles", or when the beer reached the "red-line" on his "beer-tester" (saccharometer or balling scale hydrometer). As we have seen, this can be very dangerous. There are many homebrewers who, through skill and experience, have been very successful using this COMMONBEER method, but I do NOT recommend using it.

When the beer has been in storage for relatively short periods, the yeast, although settled, will still be active, and we can use the PRIMING method, which is simply adding a dextrose syrup to the beer and then bottling it.

When you have held your beer in lager or storage for over a month, or when the beer has been racked to a storage container, after finishing its ferment, then it is wise to add a yeast culture along with the sugar syrup to insure a good re-ferment in the bottle. We call this the KRAUSEN method, although strictly speaking true krausening is the result of adding newly fermenting beer at bottling time. That can be done,* but requires very careful measurements, and I'm not sure that the amateur brewer is wise to use it. The KRAUSEN method we describe here is actually a variation of the PRIMING METHOD.

* see letters to the editor (Reader Questions)

You may wish to add hop flavor to the beer at bottling time, and so there is a fourth bottling system called the SUGAR-HOP method, which may be either yeasted (krausened) or non-yeasted depending on your beer or choice.

Finally, after you have bottled your beer, you may use the DISGORGEMENT procedure to rid your bottles of sediment.

BOTTLES

The beer that you have gone to such trouble to produce must be placed in good strong bottles--and there are only two kinds that are really usable here in the US--these are returnable beer (or soda pop) bottles and champagne or sparkling wine bottles. If your state does not have a bottle law (yet), you might lobby for one, because it will solve a lot of your bottle problems no matter what you might think about the effects on the economy. Even where returnable bottles are hard to find, you may be able to find them used in your local tavern or bar; if so, buy them from the barkeep. Your local beermaking supplier may have them, too.

I like sparkling wine bottles. You must use US bottles, because they may be crown capped, whereas European bottles often do not have this feature. Sparkling wine or champagne bottles may be acquired from your local tavern, bar or restaurant, and sometimes they are available from your local winemaking supplier. The sizes are right: the 750-ml (fifth) for two people, the half-bottle (tenth) for one person. The split (6.4-oz) is the perfect gift size for your drunken friends. This latter size is considered by some to be the best size for drinking.

With some diligence you can get together a good supply of bottles and you will be all set. Make sure you have enough clean, sterile bottles on hand before you start bottling. You will need the services of a good bottle capper, unless you plan to wire corks into your bottles, and you shouldn't skimp on a capper, because cheap cappers are really quite unsatisfactory.

The final installment in this series will outline the bottling methods, disgorgement procedures, and putting beer into kegs.

BEER CLUB NEWS

AMATEUR BREWER VISITS THE MALTOSE FALCONS. The only beer club we ever hear from is the Maltose Falcons. They make up for this by being very active. With more than 65 members, they are probably the largest beer club in the US, if not the only one. There seem to be two big reasons for this. One is John Daume's Home Winemaking Shop of Woodland Hills CA (LA county). John has a large, well stocked shop, cares about his customers and has ample room in and behind his shop to host various meetings and gatherings. Then there's Merlin Elhardt, the driving honcho behind the club--their president.

We recently had an opportunity to meet with some of these people, and taste their beer. There was enough of that--they had iced an entire tub of it, and I was handed mug after mug of it to sample, while they plied me with questions. They have had some trouble with US lager yeast. The stuff had been found contaminated, and the resulting beer very poor. While the nature of dried yeast makes it very difficult to keep culture pure,

I have never been satisfied with this particular yeast. I might say the company's other yeasts have been great. Their wine, champagne and top fermenting beer yeast have all done well by me. Only their lager yeast has never been satisfactory. In fact I have only found one really satisfactory lager yeast: Vierka, and I always culture before adding to my beer.

We are planning an extensive yeast issue in the future, and we we'll have more information on the yeast problem at that time.

The Maltose Falcons are planning their own book on brewing, and we are waiting breathlessly to review it, particularly if it is as good as their beer!

OTHER NEWS OF INTEREST

WASHINGTON DC--HOMEBREW BILL MAY PASS H.R. There's a good chance that H.R. 2028, sponsored by Rep. Conable, R-NY, will pass the house this fall. The bill would ammend the statutes to make beermaking "legal", and change the definition of who may make beer and wine and how much. Any adult (18-up) may make up to 100-gals beer and wine annually, or up to 200 gals per household of each. Winemakers will no longer have to register with the ATPB, but beermakers WILL. Meermakers may have only 30-gallons of beer (including that brewing) on hand at any one time. At present there is no bill before the Senate. (see EDITORIAL, Talk to your beer inside front cover).

BREWERY NEWS

NEW SMALLEST US BREWERY, Sonoma CA. The new smallest brewery in the US started its first batch of beer recently. The NEW ALBION BREWERY will produce about 4650-gallons of British style Porter, Stout and Ale this year. New Albion's brewmaster and president is 32-year old Jack McAuliff. He and his partner will concentrate on producing quality beer in rather primitive circumstances if one is to judge by the usual brewery standards. The truth is that this brewery is more like a winery in both size and operation. New Albion beer is to be made with Reinheitsgebot materials only: malted barley, hops, water, and good English Ale yeast. The beer is being produced with very modest equipment, and will undergo secondary ferment in 5-gal carboys for three weeks, and then primed! Bottling and capping by hand. Ale will be aged in the bottle for 6-weeks, the Porter and Stout for 6-month. The first beer is ready now. The brewery is located at Eighth and Denmark streets, two miles south east of Sonoma Plaza, in a tin warehouse. Visitors are welcome, but you must call them first: (707) 938-4263. We will try to get a little more information about this fascinating brewery for you in a future issue of AB.

DALLAS TX--MILLERS SUED. The Millers Brewing co is being sued here and in Chicago IL for deceptive marketing of its US made Lowenbrau beer. The US product looks exactly the same as the imported German product, except for small print on the label.

For a time here in Oregon imported Lowenbrau was sold, but in neighboring Washington Azusa Lowenbrau was sold, so we did a

comparison taste: despite his heavy prejudice for the German-made beer, he still found the Azuza product tasted better. Nevertheless one would think that Millers could at least change the label of its US product, if not the price.

AMSTERDAM, NETHERLANDS--Heineken profits rose almost 31% in 1976. Net profit and equity has more than tripled in 10-years. Heinekens is the largest selling imported beer in the US, with more than 40% of the imported beer market in US & Canada. Coincidentally their share of the Dutch market is also 40%!

MILWAUKEE WI--Pabst Blue Ribbon really is the favorite beer in Milwaukee. The 1977 Milwaukee Journal Consumer Analysis Survey shows a 5 to one preference during 1976. The "Blue Ribbon" came in 1893 at the Columbian Exposition in Chicago when it won honors as the best American beer. Most commercial beer in those days was hopped at a rate of about 2-oz per US gallon. These days many breweries use only 2/10 oz.

FRANKFURT, W.GERMANY--German beer sales are down. Germany's largest brewery chain is complaining that growth of soft drinks has hurt larger brewers. Most German breweris are small, however, and some are aggressively marketing their products in firm competition with their larger brothers. The large breweris, like their US counterparts are producing inferior beer to appeal to a more common palate, but the average German isn't buying it like we do, and the smaller breweris seem to be doing fairly well in that country.

*** READER QUESTIONS:

(Please enclose a stamped self-addressed envelope if you wish a direct answer to your question. Please ask only ONE question, and allow plenty of time. Sometimes I am quite overwhelmed with the questions people ask me.)

Mr. E.P., Jacksonville FL asks: I wish to bottle my beer by the authentic krausen method, how can I tell how much new beer wort to add at bottling time, and if I brew this much extra how can I tell how much total beer wort to make.

This is a rather complex matter, which is why I left it out of the Finishing part of the ABC's of Brewing (this issue). I recommend instead a variation of the priming method, that is simply adding yeast and starter to the priming syrup. I have worked up a formula to use, but it is rather complicated:

$$Kv = Kf + \left(\frac{Kf \times G}{Ke - G} \right)$$
 where Kv = volume of krausen beer needed to achieve a desired bottle pressure. Kf = a factor which is found by the formula
$$Kf = \frac{Bv \times B}{Ke}$$

CAVEAT EMPTOR

The Bureau of Alcohol, Tobacco and Firearms has issued an advisory to consumers that Lowenbrau beer, traditionally imported from Germany, is now being produced by the Miller Brewing Co. in the United States.

Officials said Miller is in a period of transition. Some marketing areas still receive imported beer, while others get the domestically brewed product. The transition will end in October 1978, after which all Lowenbrau beer in U.S. markets will be produced domestically.

Because labels are similar on the domestic and imported products, ATF officials urged consumers to check the label carefully.

where Bv = volume of your beer to be krausened. G = Gravity increase desired, (see Table ONE, p42). For example if you bottled your beer at our recommended 2.5-atmosphere you would need an increase in bottling gravity of 1.004, (or 4-gravity points). If that were so, then G = 4.

Ke = the gravity drop of the krausen wort. This would be its OG less its TG (Original Gravity less Terminal Gravity). If you brew extra beer wort to use at bottling time, then these figures would be the same as those of the beer you are bottling. If you use a different brew for your krausen, then the figures would be different.

Now we can apply the above formula to a hypothetical beer. Assume an all-malt beer OG 1.051, TG 1.012. How much beer must you make up for a 5-gallon batch using wort saved from the same brew for krausening.

We have the following values: Bv= 5 gallons, G= 4, Ke= 1.051 -1.012 =.39. We can compute Kf

$$Kf = \frac{Bv \times G}{Ke} = \frac{5 \times 4}{.39} = 0.513$$
 Using the rest of the

formula to find Kv=
$$Kf + \left(\frac{Kf \times G}{Ke - G} \right) = 0.513 + \left(\frac{0.513 \times 4}{.39 - 4} \right)$$

$$= 0.513 + \left(\frac{2.052}{35} \right) = 0.513 + 0.059 = 0.57 \text{ gals} = 73+ \text{ oz}$$
 of Krausen beer.

The computations may be done in UKgallons or litres. In the above instance you need to bottle 5.57 gallons, which means that you must brew that plus an extra half gallon (for loss at racking, ferment, etc.) to have the required volumes, and that comes to just a little over 6-gallons total. This assuming you have read your hydrometer correctly.

Mr. Kwash, Manchester CT tells me that he made two batches of beer last fall. They were brewed two weeks apart from the same materials and in the same style, except temperature. The first primary ferment at 71F, the second at 64F, both aged at 55F. Both batches identical in sparkle, color and clarity, but the second batch was "far superior in flavor, aroma, after-taste and especially in the lingering hop aroma after the glass was drained." He has been unable to repeat his success and wonders why.

The answer sticks out like a sore thumb: COOLER IS BETTER. We try to impress on people that the ferment must be at the lowest constant temperature consistant with your capabilities (and that of the yeast). Thus your batch No. 2, which was fermented at 64F was, had to be, better than the first batch at 71F. The lower temperature ferment is better for a number of reasons, the most important of which is the higher the temperature, the more likelihood that your ferment will get contaminated with outside bacteria such as lactobacillus. Try making that beer in a refrigerator, with lager yeast. start at 55F, and lower the temperature to 40F for the secondary ferment, and then 32F for aging. Age 4-6 months and see how them cookies crumbles!

James Pollock Amherst MA asks about skimming the beer: Is it always necessary to skim? He quotes Leigh Beadle (Brew it yourself, available at your dealer, or from Specialty Prod. Int'l, Box 784, Chapel Hill NC 27514) as recommending the head be allowed to remain since it adds to the flavor of the beer.

I've never left the head on beer, so I really can't say if it adds to the flavor or not. Most of the English professional brewing texts call for skimming ale or top ferments at least once, and usually several times. It is standard procedure in lager brewer's to rack the beer out from under its head at krausen-fall. The brewer's I have visited have all followed this process, in ale by skimming, and in lager by racking. My guess is that the head, if allowed to remain on the beer, would deteriorate and various insoluble hop resins and tannins would then fall into the beer, remaining there until racking. The presence of these elements would probably add flavor, but I question the qualities of such flavor addition. I think they would be harsh, but I don't know from my own experience. Mr Beadle may be right for all I know.

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BOOKS

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(Continued from inside front cover)

unfair restriction for beermakers. It severely restricts us from producing quality beer. Just the same I would support this bill if only to legalize the thing in name, and for the boost that it would give to the homebrew supply business, and to ourselves in the way of new goods and services it would promote.

The bill, HR-2028, sponsored by Rep Barber B. Conable, Jr., R-NY, should be changed. I suggest you write your SENATOR, since there is apparently no Senate bill as yet. You might suggest he submit a simpler bill amending existing legislature to include beer. There need be no registration for anyone, and any adult should be allowed to make the stuff up to 100 gals/adult & 200 gals/household. This would simplify the whole thing for congress, us, and the AFB as well! Why must government always complicate itself--registration creates bureaucrats. We don't have to register guns, why beer?? The Conable bill protects only bureaucrats and the big breweries. Take your time and compose a nice (not too long) letter, in your own style. You might also write your representative, with a copy to Rep. Conable. I can't urge this too strongly, and now is the time to act. I know you can all write, because I get a lot of letters. Send one to your Senator And representative--DO IT TODAY! DO IT NOW!! Write:

Sen. John Doe
U.S.Senate
Washington DC

Rep. John Schmo,
House of Representatives
Washington DC

One of the nicest things that has happened to me lately was the gift of a bottle of American Stout from the newest and smallest US brewery the New Albion Brewery of Sonoma CA (story p45). FANTASTIC--what a surprise: it had yeast on the bottom, and an indentation in the plain metal cap, just like our beer, friend--but what taste! If you like stout you'd love this stuff. Our tasting results using our new beer tasting procedure (New pamphlet Beer Tasting and Evaluation for the Amateur, AB pubs 1977, p48 for your copy). We rated the beer 18.5 (20-point scale) against Guinness 17.2 (3 tasters). This brewery delights us--we think that any small brewery rates our blessing.

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