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# AMATEUR BREWER

FOR SERIOUS HOME BREWERS

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### AMATEUR BREWER

Number One, Winter 1977  
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## A PHILOSOPHY FOR THE AMATEUR BREWER

Our philosophy for the Amateur Brewer will be to revive interest in brewing high quality traditional beers at home. We believe in the Reinheitsgebot, that 1516 Bavarian law, which still holds sway in Germany and other countries. This says that beer may have only four ingredients: water, malted barley, hops, and yeast. Of course, we are pragmatic too, we know that malt extract, which is used in almost all amateur brews, is by definition an adjunct, and not one of the above four ingredients. There is still the need to use some dextrose and other sugars, water treatment salts (we can't all of us live in Burton-on-Trent, or Dortmund), fining agents, and occasionally, nutrients. And of course there are great beers which call for other ingredients, such as Berliner Weissbeer, and Guinness style stout for example.

What we are really saying, is that we want to keep our beers as traditional and authentic as possible, consistent with the availability of quality ingredients. That will give us a goal to strive for, while allowing for the realities of present day life. Most of the recipes, therefore, will be double, or even triple. One, a fairly simple recipe for those who really don't have the time for such philosophical nonsense, and a more complex recipe(s) for those who really want the authentic product if that is at all possible.

We hope to glean many of these formulas from several old sources including Tausing (1882), The Theory and Practice of the Preparation of Malt and the Fabrication of Beer; Wahl-Henius (1908), The American Handy Book of Brewing, Malting and Auxiliary Trades; Nugey (1948), The Brewer's Manual, Practically Considered. For the present at least, there will be no advertisements in Amateur Brewer.

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# The ABC's of beermaking

Part one of three

By FRED ECKHARDT

There are three aspects of home beermaking to be considered: equipment needed, brewing materials (or ingredients), and procedure.

A wide variety of home brewing equipment is available in most wine-making supply stores, but the home brewer can make good quality beer with a minimum of equipment, such as the following:

1. Cooking vessel of 3-5 gallon capacity, such as a fruit canner.
2. Open primary fermenting vessel of 7-10 gallon capacity, hard plastic preferred, and a sheet of plastic to cover the ferment.
3. Secondary fermentor, such as a 5-gallon carboy, hard plastic carboy, or one-gallon wine jugs.
4. Plastic siphon hose to rack (transfer by siphoning) from one vessel to another.
5. Fermentation locks for each secondary fermentor.
6. Winemakers hydrometer (not the traditional homebrewers Saccharometer with the "red-line").
7. Thermometer.
8. Bottle capper, caps, and bottles, such as returnable beer bottles, or cappable champagne bottles (better).
9. Other items you might want to own could be a wooden spoon, small postal-size scale, larger bread-type scale, refrigerator, pH test paper, dextrocheck test kit, measuring cup, spoons, etc.

Traditionally, beer has been made only from malted barley, hops, water

and yeast. The modern commercial breweries use a variety of grain adjuncts and additives, as does the modern home brewer.

In my opinion, the best beers will be those that adhere to the traditional methods and materials for their manufacture, and I believe this to be equally true of commercial and home brewing. The problem, however, is traditional methods require mashing malted barley, and this is a time consuming two to six-hour project before boiling the preparation. Most home brewers will have to satisfy themselves with a prepared product, such as malt extract syrup (or dried malt extract).

## THE BEERMAKING PROCESS

Beermaking (and winemaking) can be readily separated into three areas of procedure: Preparing the wort for ferment; fermenting and aging or storage; and finishing or bottling steps.

There are many variations possible for each of these three areas, and we will outline a few possibilities for each. The brewer can then choose just how he wishes to proceed to create his own high quality beer. Whatever recipe you are now using can be improved by the use of these methods. [United States residents should know that beermaking at home may be illegal, but such illegality has never been decided in the courts.] Canadian citizens can make very high quality beer by following these methods carefully.

## PREPARING THE WORT FOR FERMENT

There are four ways to prepare your beer for ferment. When the preparation is ready for the yeast culture to be added, the liquor is called wort (pronounced wert). These methods are as follows: full mashing procedure, modified mashing procedure, boiling the wort with hops, and a short procedure for those in a hurry. You may wish to skip part A and B below, if so turn to C.

**A. FULL MASHING PROCEDURE.** This is for beers using more than 2-lb. (1.9-kg.) of malt grains. We cannot describe this complex method in this short article. Briefly, however, there are 3 mashing methods used, and these depend on the type of malt grains available and the kind of beer being fermented.

1. The English Infusion system: The finely ground grains are mashed-in and retained at 150°-158°F. (65.5°-70°C.) and held at that temperature range until starch conversion is complete. The English use highly modified malts wherein the protein conversion has been completed. Such malts must be imported from England, and are not readily available on the North American continent.

2. The American Infusion system: The rough ground grains are mashed-in at 95°-106°F., or up to 118°F (35-41-48°C.), depending on the water hardness and pH, and raised to 126° (52°C.) for protein conversion, and then to 145-158°F. (63-70°C.) for starch conversion. This method, and the German system (No. 3) use a different conversion method than the above English system, because American, Canadian, and Continental European malts are incompletely modified due to a different malting system.

3. The German Decoction system. By this method a part of the mash (one-third) is boiled and returned to the main kettle to raise the temperature of the mash to accomplish the same temperature rests as described in the American Infusion method above (No. 2).

The completed mash is then sparged (rinsed to extract all of the sweet wort possible.) The brewer then follows the wort boiling procedure (part C, below), to complete the preparation for ferment.

**B. MODIFIED MASHING PROCEDURE.** This is for use with beers using only small amounts (less than 2-lb., 1.9-kgs.) of malt grains. Such small amounts of malt grains are often called for in recipes to add flavor to the beer, and hence it is not necessary to use a full mashing method, substituting instead a short steep in hot water as follows. Use this method with any recipe calling for small amounts of malt grains in addition to the usual malt extract. Add hot tap water (about a gallon, 4-liter) to your brew kettle, and then add the malt grains (ground) (grinding may be done in a blender a cupfull at a time) wrapped in a cheesecloth bag. Raise the temperature to 155-158°F. (68-70°C.) (accuracy not necessary), and hold for about an hour. Black patent malt or roasted barley should not be treated in this manner, but rather they should be added whole grain to the kettle during the last 30-minutes of boiling (part C below). When the steeping process is complete, strain and press the bag of grains, and rinse with hot tap water, and then proceed to boil the wort as described (part C) next.

## BOILING THE WORT

C. BOILING THE WORT WITH HOPS. The beer wort, prepared wholly or in part by methods A or B, is now ready to boil.

If you have not included any grain malts in your ingredient list this is where you start the whole process. This would be the case with most beers made from dry malt extract or malt extract syrup, sometimes called malt syrup.

1. Bring the liquor obtained by the mashing method of A or B (Above) to a boil, or just bring as much water as your kettle will safely handle to a boil, and as the water is coming to a boil, add the malt extract syrup, or dry malt extract to the kettle. The best procedure is to boil the full amount of water to be used in the beer. For myself this means two brew kettles, since my equipment is limited in size, and I can only boil a maximum of about 3½-U.S. gals. in each kettle. If you don't have the equipment to bring the full volume to a boil, then you must boil as much as you can with the full amount of malts, malt extracts dissolved therein. While the liquid is coming to a boil, add the water adjustment salts (plain salt, gypsum, epsom salts, citric acid, etc., as called for in the recipe). These should be added in proportion to the volume of the kettle, and that of the total beer.

2. Bring the wort to a full *rolling* boil, not a steep or a simmer, I repeat a **FULL ROLLING BOIL**.

3. For Ale or top-fermenting type beers, add all of the second quality or boiling hops immediately.

4. The boiling process must continue (at a full rolling boil) for at least an hour and a quarter. The length of time the wort is to be boiled will effect

the color and taste. For richer full tasting beers the boiling time will be 2 to 3 hours, for pale beers 1¼ to 2 hours, for dark beers, 2½ to 3½ hours. We will deal more fully with the whys and wherefores of the wort boil in a future article. Some writers on the subject of home beermaking have said do not boil the wort. They are absolutely wrong. The wort **must** be boiled, particularly if you use hops, and not hop flavored malt extract (see part D below).

5. For lager or bottom fermenting steam beers, the hops are added as follows: 60 minutes before the end of the boiling period, add half the boiling hops, cover the kettle, but leave space for steam to escape, or your kettle will boil over. 30 minutes before the end of the boiling period add the balance of boiling hops.

6. If you are using black patent malt, or roasted barley, add these, wholegrain, not ground, about 30 minutes before the end of the boil.

## ABOUT HOPS

We have referred to two types of hops: boiling hops and finishing hops. This refers to their function, that is boiling hops are added during the boil, for bitterness, and to protect the wort from infection by wild yeasts and souring bacteria. The boiling hops must be boiled with the wort to release the resins which accomplish these purposes. Boiling hops do not need to be of the highest quality, but it is unwise to use old "cheesy-smelling" hops for this purpose, and it is better to use good quality hops. I use the oldest hops I have on hand, such as year-old hops, etc., but I do not use low quality hops for boiling hops. You can also use hop pellets,

and hop extract for boiling hops.

The second type of hop we call for, is finishing hops, and these should be the best you can obtain. They are added for flavor and aroma. You should try to acquire current, fresh, "name" hops such as *Cascade*, *North-ern Brewer*, *Talisman*, *Brewer's Gold*, *Pride of Ringwood*, *Fuggle*, or your own home grown varieties. Occasionally one encounters imported English or German hops. These should only be used if they look and smell good (look green or yellow green, not grey or yellow). The merchant should also have hard information on his imported hops (on all his hops) such as resin content, and definite information on the year of harvest. Many wine suppliers don't know that they can obtain this information from their supplier. Use only the best for finishing hops. Most of the better hops available are US grown and of the variety listed above. If you get your hops by mail from England, be sure you find a dealer who knows about hops. Some that I've tried have been terrible. It is better to buy your hops direct from your local merchant. Low quality hops are more likely the result of dealer ignorance than any attempt to defraud you. In this case you can be a big help to your dealer by informing him of some of these facts.

German and European hops are also becoming available, and again you must be careful, but I've found good *Hallertau*, *Saazer*, *Tettnag*, *Spalt*, *Hallertau-northern brewer*, *Kinder*, and *Styrian Goldings*. These make fine finishing hops for Continental style beers.

Finishing hops can be added at the end of the boil, and retained into the primary ferment, or discarded before then. They are also valuable for use in

secondary ferment or aging (dry-hop-ping), or they can be added at bottling time (sugar-hop-krausen), or in any combination to your desires. Hop oils can be used as a substitute for this aromatic purpose, as can iso-merized hop extracts, or again in a combination of the above methods.

## FINISHING THE BOIL

7. Near the end of the boiling period (5 minutes); add fine quality finishing hops. If you plan to retain them into primary ferment, wrap them in cheesecloth.

8. When the boiling has been completed, allow the hot wort to settle for 30 minutes. The sugar (no sugar is used at this point if you are making an all-malt beer) is dissolved into the wort at this point, or it may be placed in the bottom of the primary fermentor. After the wort has settled, pour into primary fermentor, by straining through the hops. If you do your own grain mashing as described in part A, you might use your lauter-tun as a hop strainer. If you strain the hot sweet wort through the hops, be sure to rinse them (sparge) with hot water to rinse the sugars from them. If you use a crock for a primary fermentor be very careful when you add the hot wort, so as not to crack the crock. Cover the primary fermentor with a sheet of plastic allow to cool.

## D. SIMPLE BEERMAKING

Skip the above procedures A, B and C. This method can only be made using hop flavored malt extracts, or concentrated beer worts. If you do not have a brew kettle, you can add

the malt syrup to the primary fermentor, rinse with hot water, add sugar, and form your beer wort in the primary fermentor by adding hot tap water to dissolve the syrup and sugar (dextrose preferred), and then allowing it to stand and cool before starting the ferment. You can do this, but I do not recommend it. I firmly believe that the beer wort should be brought to a boil even when using hop flavored malt extracts. Theoretically beer wort concentrate should have been boiled in the manner we described in part C., before being reduced to a syrup, and placed in a container, but I am not sure this is actually the practice. Boiling is necessary to separate the insoluble protein constituents, which may cause trouble when you are

trying to clear your beer (later). Be sure, and boil the wort. 'in the case of hop flavored malt extracts or syrups, there is almost certainly not been any boil before concentration. Be sure, by combining your malt syrup (hop flavored) with about 2 gallons (8 liter) in a large sauce-pot, and boiling about 15 minutes. There is no need for a long boil, however, and as I said you can skip the boil, but I don't think you should.

Whether or not you boil the simple wort, pour it into the primary fermentor, after placing any sugar (dextrose or corn sugar or glucose) your recipe may call for, in the bottom of the primary fermentor. Be sure to stir this to dissolve it thoroughly, and measure the volume accurately.

Cover the primary fermentor with a plastic sheet, and allow to cool, after which the wort will be ready for the ferment.

NEXT ISSUE: The Ferment.

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#### ABOUT THE EDITOR

Fred Eckhardt is the author of A Treatise on Lager Beers; in its third edition, having sold over 55,000 copies. He is also the author of many other articles on beer and winemaking.

Fred teaches evening classes in winemaking for Portland Community College and is a free-lance photographer, writer, and lecturer. He is also a consultant to the winemaking supply trades, and is working on a second book: The Compleat Home Brewer: More than you ever wanted to know about the subject.

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## QUARTERLY RECIPE--THE ALL-MALT BEER

Somewhere in each issue of the Amateur Brewer we will have at least one recipe for a distinctive beer. The recipe may be separate as it is in this issue, or it may be a part of one of the main articles. The recipe will consist of either two or three formulations; a simple procedure, plus one or two more complex methods, which will require some or all of the malt extract to be produced by you the brewer, using a mashing process similar to that used by most commercial breweries. This method is fully detailed in our publication Washing for the North American Home Brewer, (to order, see p16). The procedure for making and setting beers in this style will usually take the better part of a day, as it does in good breweries, and will probably cost more. The quality will be far superior in every way, I can assure you. The method may be time consuming, but it is not really difficult, and you may make numerous mistakes before the quality can be seriously effected.

There is one style of traditional beer-making which we will not encourage: the old open-crock prohibition method. We think the modern home brewer would do well to add secondary ferment in a closed carboy.

All of our recipes will include U.S., metric, and Imperial measurements. All terminal gravities are necessarily estimates, since these vary with different malts used.

The recipe on the next page is from the Editor's book A Treatise on Lager Beers, and page references are for that book. In future issues of the Amateur Brewer, as we develop parts two and three of "The ABC's of beer-making", (starting in this issue) we will refer to those more detailed procedures. The Treatise can be found in most winemaking supply stores, or can be ordered from us (p16).



## GERMAN STYLE PILSEN BEER

A traditional all-malt beer

5-US Gallons (4 Imp Gls, 19-20 Ltr)

### Ingredients:

(for other all-malt beer recipes refer to center page chart.)

Water to volume for 5-gallons of finished beer. 4-Imp; 19-20 Ltr  
6-lb. dry malt extract (or malt extract syrup, or any 6-lb. combo) (2.7-3 Kg)

HOPS: 2-oz. boiling hops — good quality such as *Cascades* (60-gm)  
1-oz. finishing hops — highest quality fresh hops such (30-gm)  
as imported *Hallertau*, *Saazer*, or domestic *Cascades*

WATER TREATMENT: 1½-tsp. salt, 1½-tsp. gypsum, ¼-tsp. epsom salts  
(optional) (650 ppm; 12.25 gm; 3½-tspn Burton formula

NUTRIENTS AND ACID ADJUSTMENT: not necessary with all malt  
lager beers

CORN SUGAR (DEXTROSE): 8-oz. ONLY added at bottling time for  
carbonation. 240-gm.

ORIGINAL GRAVITY: 1.044 to 1.048 (depending on malt extract quality)

RACKING GRAVITY: about 1.026

TERMINAL GRAVITY: 1.007 to 1.0014 (depending on malt quality)

ESTIMATED ALCOHOL CONTENT: 4% by weight, 5% by volume,  
8.75% imperial proof spirits.

### PROCEDURE OUTLINE

(be sure to read details on pages listed for each procedure)

1. Prepare a good lager yeast starter, (p. 20).
2. Boil the wort with as much water volume as your kettle will boil safely, for a total time of about 2 hours. This is a *full rolling boil* — you are not steeping tea. After 1 hour add half of the boiling hops, 30-minutes later add the balance of boiling hops. At the end of 2 hours stand 30 minutes to settle (p. 18-19)
3. Place finishing hops in cheesecloth bag in primary fermentor and *strain* the hot wort (to remove boiling hops) over them. Add water to 5-gallon volume.
4. When the wort has cooled to around 70°F add the yeast or yeast culture (p. 19-21).
5. Follow procedures on p. 21-23 for lager style ferment, or if you wish, the beer can be made as a steam beer (p. 12-13).
6. Bottle the beer, don't forget to add the 8-oz. corn sugar for carbonation (p. 24-25). Heading Liquid and Ascorbic Acid added here.
7. For 6-gallon batch of this beer use 7-lb. malt extract, and 10-oz. corn sugar for bottling. 23-24 Liter; 5-Imp gal; 3.2kg
8. German beer is often consumed a little warmer than US palates call for, that is about 50-55°F. Cheer up — the English drink their ales at a very warm 60-65°F (or even warmer). Like all homemade beer, this beer must be decanted, or it will cloud. The carbonation is a little lower than US taste usually calls for.
9. This beer should only be made after you have tried the simpler recipe on p. 12-13.

From A Treatise on Lager Beer, 3d Ed © 1975

# Brewing Material Water

By Fred Eckhardt

WATER, last of the basic three ingredients in beer, plays a very important—almost critical—role in beermaking. If, as we stated earlier, mashing is the central process of brewing; then water is the critical element of that process, without a doubt.

The mashing process is virtually impossible without proper water characteristics. Fortunately water control is not nearly as important in the later beermaking phases as it is to the mashing process; but it is true nevertheless that the chemistry of water affects all aspects of the beer-making process. You will use more water than any other ingredient (commercial breweries use about nine gallons of water for every gallon of beer produced).<sup>4,5</sup>

## Water hardness

The most important characteristic of water, as far as brewing is concerned, is the hardness of the water supply. Water hardness fluctuates, even in the same area, and different sources often quote different levels of hardness. Water hardness is caused by non-alkali, metallic cations in solution—mostly calcium and magnesium.<sup>1</sup> Hardness is usually stated in parts per million and sometimes in grains per gallon. Calcium carbonate ( $\text{CaCO}_3$ ) is the measure in the United States, Canada, England (including Commonwealth)

and France, while the Germans use lime (Calcium oxide,  $\text{CaO}$ ). 1-grain per U.S. gallon = 17.1 ppm, (1-Clark degree = 1-grain/Imp. gal. = 14.25 ppm) ( $\text{mg/l} = 1 \text{ ppm}$ ).<sup>4</sup>

The hardness of water supplies is measured in terms of "ppm as Calcium carbonate ( $\text{CaCO}_3$ )."

The more ppm "as  $\text{CaCO}_3$ ," the harder the water. Generally, water with less than 50 ppm is considered "very soft," 50-150 ppm as "soft," and 150-350 ppm is usually thought of as "medium." Water with more than 350 ppm is considered "hard" or "very hard" (over 500 ppm).

There are two kinds of hardness: temporary and permanent. When water is boiled, many carbonates (lime and magnesia) become insoluble on boiling, and are thus separated from the water. These are referred to as temporary hardness, while those chemicals that are not removed by boiling are termed permanent hardness.

The presence of calcium in water causes certain reactions with the constituents of the ingredients of beer wort, initiating an increase in acidity and a corresponding decrease in pH. This has a beneficial effect. The presence of bicarbonates has an opposite effect in this regard. Normally water has a pH of slightly over 7 (7.1 or so); a higher pH (over 7.5) would indicate the presence of carbonates and bicarbonates. It can

be seen then that calcium is the most important chemical and sodium carbonate undesirable.

Good brewing water should be a little hard with a good calcium supply, but low in magnesium (and calcium) carbonates. These chemicals are objectionable because they reduce acidity and affect flocculation. Carbonates can usually be reduced by boiling (maximum desirable: under 20 ppm). You can find out about your water supply as I did by calling your local water department. Ask for: 1. total hardness ppm as calcium carbonate, 2. ppm calcium and magnesium carbonate (Ca, MgO<sub>3</sub>, and 3.) pH. For example, here in Portland, Oregon, we have soft water with 59 ppm hardness (as CaCO<sub>3</sub>), 13.3 ppm CaCO<sub>3</sub>, pH 7.1. Portland water makes good beer since it is relatively soft. By the use of hardening salts, I can change its character as necessary to brew whatever beer I desire.

### The character of water needed for beer

Generally speaking, pale lagers can be made with a variety of waters from medium to fairly hard. Dark lagers and ales also require medium water, while strong pale beers such as London Ale or Dortmund Lager need hard to very hard water. The most famous water we hear about is "Burton-on-Trent" in England, used in the manufacture of Burton Ale. Burton water is about 1790 ppm hardness as Calcium Carbonate. It is so famous in this regard that the brewing industry refers to water treatment formulas as "Burton Salts," and the act of adding hardening salts is termed "Burtonizing"!

As you can see, water is a very

important ingredient; and the slogan "it's the water" has a certain validity. If your water supply is really bad, I suggest that you might purchase distilled water and add hardening salts to suit your own desires. You might also use rain water, after first purifying it.

TABLE I  
(ppm total solids (Mg/1) as CaCO<sub>3</sub>)  
3,4,5,10,13.

Water hardness for certain world and U.S. cities. Compiled from various sources; accuracy cannot be guaranteed.	
1. Baltimore, Md.	54
2. Boston, Mass.	15
3. Buffalo, N.Y.	117
4. Burton-on-Trent, Eng.	1790
5. Chicago, Ill.	124
6. Cincinnati, O.	110
7. Cleveland, O.	120
8. Columbus, O.	84
9. Detroit, Mich.	96
10. Dortmund, W. Ger.	1110
11. Dublin, Ire.	543
12. Edinburgh, Scot.	800
13. Lake Michigan	188
14. Lake Superior	130
15. London, Eng.	1855
16. Los Angeles, Cal.	116
17. Milwaukee, Wis.	125
18. Munich, W. Ger.	284
19. Munich-Spatenbrau	556
20. Munich-Lowenbrau	547
21. Newark, N.J.	29
22. New Orleans, La.	71
23. New York, N.Y.	20
24. Philadelphia, Pa.	68-128
25. Pilsen, Czeck.	51
26. Pittsburgh, Pa.	90
27. Portland, Oregon	59
28. St. Louis, Mo.	80
29. St. Paul, Minn.	158
30. San Francisco, Ca.	155
31. Seattle, Wash.	19
32. Vancouver, Can.	10
33. Vienna, Austria	525
34. Washington, D.C.	93

## Water treatment chemicals or hardening salts

We have seen that all water may not be proper and satisfactory for beermaking, and if good for one type of beer it might not be satisfactory for another. If your water is medium hard (150-300 ppm) and low in Carbonates, you can brew most beers—providing you are using malt extracts and are not mashing your own grain malts. If you are mashing your own grain malts, then you must either add lactic or citric acid to adjust the pH; or better still, you can add hardening salts to about 500 ppm.

The world-famous Czechoslovakian Pilsen Lager beer is brewed with soft water of 51 ppm, BUT the mashing process begins with a very long (2-6 hours) acid rest.<sup>2,4</sup> During this time lactic acid bacteria generate the necessary pH increase to allow the mashing cycle to proceed at its most efficient levels. This is because German and Czeck law (the Reinheitsgebot mentioned previously) allows the brewer to use only Malted Barley, hops, water, and yeast in his beer. The exceptionally soft (for brewing) Pilsen water is the exception rather than the rule because most pale lagers—like pale ales—are brewed with much harder water at around 300-650 ppm or even harder. The soft Pilsen water has led many amateur brewers to believe that lager beer is normally made from soft water; this is simply not so, except under the circumstances I have outlined above.

If you are producing your beer from malt extracts and syrups only and you do not mash the grains, you need not be overly concerned with

the water hardness. A reasonable level of hardness is beneficial, if not critical, and one would be advised to act accordingly. If your water is hard and you wish to make it softer, you can add distilled water or sterilized rain water in proportion to reduce the hardness accordingly.

Water treatment is not a cure-all; it must be used to correct your water supply. I repeat: TO CORRECT YOUR WATER SUPPLY. The water treatment adjustments of our recipes are based on relatively soft water with less than 100 ppm (100 mg/1) hardness as  $\text{CaCO}_3$ . If your city water supply is not listed in Table I, call your water department. If you have no trouble getting soap to lather, it is probably fairly "soft." There are basically three water treatment chemicals: salt, gypsum and Epsom salts.

**Salt** (Sodium Chloride, NaCl): We are speaking here of plain salt. Do NOT use iodized salt, or salt treated with magnesium. A little salt has a beneficial effect on the fermentation process and it also affects our taste mechanism. Even if you use no other water treatment, a little salt (about 1/4-1/2 teaspoon per gallon) (300-700 mg/1) will help in any case. One teaspoon of plain salt (U.S. tsp., 5-gm; 80 gr.) (Imp. tsp. 6-gm; 90 gr.) will increase the hardness of one gallon by 1300 ppm.

**Kosher Salt:** A light, pure, flake salt, available in health food stores and Jewish delicatessens. This is the salt I prefer, probably because I like the flaky texture of it and because it dissolves almost instantly on contact with water. The teaspoon weight is just half the weight of plain salt, so you need twice as much of it.

**Unbleached Organic Salt:** This is a

salt you may wish to use. It is found in health food stores, and contains the other natural chemicals found in sea water. One teaspoon sea salt equals 6/10 weight of plain (granulated) salt. Granulated bleached sea salt weighs the same as plain salt.

Use only one of the above varieties for your salt additions, not all three. If you are on a low-sodium diet, you can substitute potassium chloride or "salt substitute" for table salt at no loss in quality.

**Gypsum (Calcium Sulphate, CaSO<sub>4</sub>):** As we stated earlier, calcium is important in beer because it initiates certain reactions with the constituents of beer wort to cause a mild decrease in pH, which in turn has a beneficial effect on the beer. Gypsum improves the flavor because it takes up less hop resin (or extracts the hops less)<sup>9</sup>, which makes it good for well-hopped, bitter beers. Gypsum assists in clarifying the wort by ridding it of insoluble proteins during the boiling period. Gypsum is good for stronger, well-hopped lagers and ales. One teaspoon of gypsum (U.S.: 3-gm, 50 gr; Br: 3.6-gm, gr.) will increase hardness of one gallon by 820 ppm. It is not readily soluble in water, but if you place the gypsum and other hardening salts in a cup of hot water and then bring that to a boil for a few minutes, it will dissolve more readily.

**Epsom salts (Magnesium sulphate, MgSO<sub>4</sub>):** Epsom salts have an effect similar to gypsum and are a good deal more soluble; but they should be used sparingly, since they have a strong aperient effect, as some of us may remember from our childhoods. Not more than about 50-75 ppm would be desirable, One tea-

spoon of epsom salts (U.S.: 4-gm, 60 gr.; Imp.: 5-gm, 75 gr.) will increase hardness of one gallon by 1050 ppm.

**Burton salts:** Commercial breweries buy a blend of gypsum, salt and epsom salts, blended in the same ratio as those chemicals are found in the water of Burton-on-Trent, near London, England. My formula: buy 1-oz. of gypsum (28.4 gm) at your winemaking supply store, and add 3½ level teaspoons (U.S.) of plain salt (or 7 tsp. kosher salt) (½-oz., 15 gm.), and 1½ teaspoons (U.S.) epsom salts (6-gm)—found very cheaply in any drugstore or apothecary shop. Canadian readers can add 3 tsp. salt, 1¼ tsp. epsom salts to 1-oz. gypsum. This is a 5:3:1 ratio by weight, and should be easy for you to mix. One teaspoon of this "Burton" formula weighs 3.5 gms, 55 grains (Imp. tsp.: 4.2 gm; 65 gr.) and will raise one

gallon 925 ppm. Wade<sup>11</sup> suggests making up a liquid formula, but I think the dry formula will prove easier to store. You can add the required amount called for in each recipe to a cup of hot water and then bring it to a boil to dissolve the gypsum. This is portioned out in accordance with the proportions of the total water being used in each step: so much for mashing, so much for sparging, so much in the kettle, and the balance in the primary.

Each of our recipes will give the total ppm (mg/l) hardness required for the brew. You can adjust each recipe by subtracting the ppm hardness of your water from that called for in a given recipe. Suppose you live in San Francisco. As Table I shows, it has 150 ppm hardness, so we must add 900 ppm (1050-150=900). You are brewing

5-U.S. gallons (4.2 Imp. gallons; 19-liter), and we know that one tea-spoon of the burton formula (3.5-gm; 3500 mg) will raise the wort 925 ppm or mg/l ( $\frac{3500 \text{ mg}}{3.78 \text{ liter/U.S. gal.}} = 925$ ).

On a "per gallon" basis, this is 185 ppm ( $\frac{925 \text{ mg}}{5 \text{ U.S. gal}} = 185$ ); therefore, you need

900 ppm needed

$\frac{900 \text{ ppm needed}}{185 \text{ ppm per tsp. in 5-gal.}} = 5 \text{ U.S. tsp.}$

(15 gm) in the beer recipe instead of the amount called for in the recipe.

In this manner you can adjust the recipe wherever you live. If you live in Burton-on-Trent? You would

brew four Imperial gallons. To get these figures: first, find the total hardness degree required (1050 ppmx4 gallons=4200 hardness degree required). The Burton-on-Trent water has 1790 ppm, so that  $\frac{4200}{1790} = 2.3$  Imperial gallons (10.8 liters) of that water would be blended with 1.7 gallons (7.2 liters) of distilled water to make up the 4-gallon total (4.8 U.S. gal., 18-liter).

Reprinted from Winter  
1974, 4:1 The Amateur Enologist

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## BREWING INDUSTRY NEWS

FEDERAL BOTTLE DEPOSIT--Wash. DC, Sept 10, 1976  
EPA Administrator Russell Train signed the EPA guidelines, which basically call for implementing a five-cent deposit on beverage containers on federal installations on a voluntary basis.

BEER WHOLESALE PRICE INDEX UP--New York.  
The U.S. Brewer's Assn announced a rise of  $2\frac{1}{2}\%$  in the beer wholesale price index the first half of 1976. During the same period the soft drink index rose 0.4%, distilled alcohol up 0.5%, and wine up 1.2%. Consumption of beer was up by 2.9% in 1975 over 1974.

RAINIER BREWERY SOLD--Seattle, WA Dec 4, 1976  
The Rainier Brewery has been sold to the G.Heilman Brwg Co., La Crosse, WI. Rainier produces one of the best beers made in the U.S.  
Rainier Ale.

BREWERY FOR SALE--A complete small brewery, which will produce up to 1000,000 bbls (3,100,000 US Gls) per year with some modern brewhouse, boiler, refrigeration, filtration, etc., equip, with glass line storage fermenting tanks, CO2 and bottling machinery, for sale. Brewers Digest, box 1101, 4049 W. Patterson Av., Chicago, 60646 for location and details (not a paid ad).

TAX REDUCTION FOR SMALL BREWERIES--H.R. 3605 will become law this year, reducing the fed excise tax on the first 60,000 bbls (960,000 gals) from \$9 to \$7/bbl (31 gal), for about 36 small breweries producing less than two million bbls annually (6,200,000 gals). The law may help save small breweries which have been gradually disappearing from the US scene.

## OTHER NEWS OF INTEREST

LEE COE SAYS BEERMAKING LEGAL--Oct 1976  
Lee Coe, author and lecturer on beermaking, said recently that he believes home beermaking to be legal, and there should be no laws passed concerning its regulation. Coe (over)

bases his conclusion on the text of laws concerning brewing, and its definition. He thinks we should leave well enough alone.

The Crafty Winemaker (Box 1004, Fostoria, OH, 44830) a winemaker's magazine claims that a law is necessary, because the government has used vague laws existant to harass beermakers and suppliers. If you are interested write them, or Rep. Barber B. Conable, Jr., Washington, DC., or your own congressperson.

The Amateur Brewer contacted the local Internal Revenue office, and was informed that the government believed beermaking to be illegal, and that they would prosecute. The AB has never heard of any such prosecution, and no one at Internal Revenue could point to any actual prosecution or conviction.

#### BEER CLUB NEWS

Woodland Hills Beer Club (CA)--Hosted author Lee Coe at their December meeting. They have 48 members and recently purchased Malting and Brewing Science by Hough, Briggs, and Stevens, 1971 London: Chapman-Hall (US dist. Barnes & Noble). The book cost \$45, and is the best modern text on professional brewing, but very technical.

WE NEED YOUR CLUB NEWS, let us know how your club is doing.

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#### BOOK REVIEW

QUALITY BREWING, A GUIDEBOOK FOR THE HOME PRODUCTION OF FINE BEERS (Second Ed), by Byron Burch, 1975 El Cerrito, CA Joby Books 48pp, illus. \$1.50. This is a much more presentable book than the first ed., the information is timely and well presented. That on hops is of an especially high usefulness, particularly the comprehensive table on p45. I would disagree on the reccomendations on Koji, since that mold is not, in my opinion, suited to brewing use. This book will sit well in any home brewer's library. --F.Eckhardt



## LETTERS TO THE EDITOR

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

Mr. D.G. Miller of Kansas City, Mo. asks about his water. The local supply from the Missouri R. is high in calcium bicarbonate, softened with calcium hydroxide, leaving the  $\text{CaCO}_2$  at 110 ppm, which can be lowered to 50 ppm by boiling, leaving about 150 ppm sulfates, but high in hydroxide, with a pH 9.5 at tap. What to do? Dr. McClure of the Portland St. U. Chem dept. suggests the following:

Add lactic acid to bring pH (after boiling) to around 7, verified with pH meter if possible, or short range paper. Next add the usual hardening salts called for in the recipe, (see article "Water", p8), less about 20%, then proceed with beermaking or mashing.

Mr. E.P. of Jacksonville, FL asks: Our water is 289 ppm, pH 6.8, how can I know the correct water treatment needed? When should water treatment be added to the mash? I am making lager beer.

The beer you want to make needs about 600 ppm total hardness, and you will need to add  $(600 - 289 =)$  311 ppm per gallon, so for 5-gallons you'll need  $(5 \times 311 =)$  1555 ppm total (divide by 925 (per tspn Burton) =  $1\text{-}3/4$  tspn) Burton formula. This is about 1-tspn less than the  $2\text{-}3/4$  tspn my recipe called for originally. Water treatment is best stirred into a cup of hot water, (actually it won't dissolve until later,) so just stir to keep in suspension, and add proportionately to the mash, the sparge, the kettle, and the fermentor, whenever you are adding part of the total water used.

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BOOKS

Eckhardt, F., A Treatise on Lager Beers, Third Edition  
1975. Illus., 52pp. Postpaid \$1.55

MISCELLANEOUS PAPERS by Fred Eckhardt,

1. Supplement, A Treatise on Lager Beers, an Outline of Advanced Beermaking Procedures.  
1972, 14pp,.....\$0.80
2. Procedure for Making Authentic Japanese Sake, the only published recipe for home use. Ditto 6pp..... 0.60
3. Mashing for the North American Home Brewer, 2-articles from Amateur Enologist giving all details necessary to mash American barley malt, 6pp 1973,..... 1.00
4. An outline of Winemaking Procedures for the Home Winemaker, 9pp ditto, used in Port. Comm. College classes..... 0.75

SLIDE-LECTURES Produced and narrated by Fred.

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