Terry Fritz's

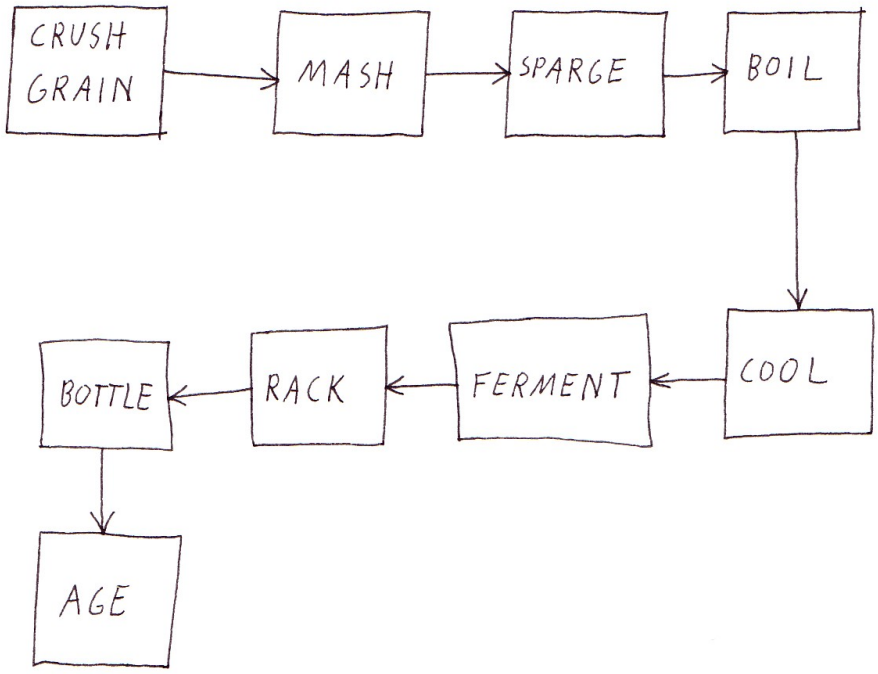
Old Beer Brewing Notes From The Past...

Old bottle label artwork follows. Just print them out, cut to size, and past with a little Elmer's glue to the bottles...

Beer

MAY 3, 1987

Procedure



Crushing the Grain

Theory

The grain must be crushed in order to expose the starchy interiors of the grain so that the starch may be converted to sugar during mashing.

Equipment

Grain Crusher - Coffee grinder attached to power drill.

Scale - To measure the grain.

Mash Pot - To put the crushed grain in.

Practice

The grain is simply crushed a little at a time and placed in the mash pot.

Cautions

Each individual grain must be crushed or the beer may be weak due to lost extract. If the grain is crushed too fine it will set in the Sparger making sparging difficult.

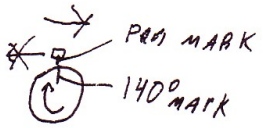
Mashing

Theory

The crushed grain is mixed with hot water and heated to 146°F for 2 hours so that the enzymes in the malt will convert the starch into sugar.

Equipment

Mash pot
Large wooden spoon
Stove
Thermometer
Boiler



Practice

The grain in the mash pot is mixed with 160°F water from the boiler so as to just cover the mash. The mash is then evenly heated on the stove to 146°F while stirring. The pot is then placed in the oven set to 146°F for 2 hours. Periodically check and adjust the temperature.

Sparging

Theory

The hot sugary wort must be washed out of the spent grain. Hot water is splashed on top of the grain and allowed to seep through it.

Equipment

Bucket - to catch wort.

Sparger - a seive to put the grain in.

Siphon - to convey hot water from the boiler to wash the grain.

Boiler - to prepare the hot water.

Practice

The sparger is placed on the bucket and the mash is poured in. Then hot water is sprinkled on the grain and allowed to wash through. Collect about $2\frac{1}{2}$ gal of wort.

Boiling

Theory

The wort is boiled for 1 hour to bring out the flavor of the hops and help clear the wort.

Equipment

Stove - To heat the wort.

Large wooden spoon

Boiler - with lid.

Practice

The wort is simply boiled for 1 hour with the hops.

Cooling

Theory

The wort is cooled to allow sediment to settle out.

Equipment

Cooler - cools the wort quickly.

Bucket - collects the clear wort.

Screen - to catch hops.

Sink - to supply cold water to the cooler.

Siphon - to remove clear wort from the sediment.

practice

Add cold water to the boiler and cool the wort to about 90°F with the cooler. Let settle and strain the clear liquid into the bucket. Add more cold water to rinse out the rest of the wort and let settle and siphon more wort into the bucket.

Fermentation

Theory

Yeast breaks down the sugar in the wort to produce alcohol and CO_2 gas.

Equipment

Fermenter - airtight container

Large wooden spoon

Jar - to use as an airlock

Hydrometer - to test the specific gravity of the wort.

Practice

The wort is placed into the fermenter and the yeast is stired in. The specific gravity is checked and the lid is put on. If the fermentation is very active loosen the lid. fermentation is continued until the bubbling slows considerably.

Racking

Theory

After a few days the fermentation will slow down. We want to remove the beer from the yeast and other debris and let it finish in a fresh and clean environment

Equipment

Rack Bag

Siphon

Practice

Siphon the beer into the bag and squeeze out the air. Release excess gas as needed.

Bottling

Theory

Put the beer into bottles for aging and drinking.

Equipment

Capper

Siphon

Bucket

Scale

Practice

Siphon the beer into the bucket and add 4 oz of sugar disolved in hot water. Fill the bottles to $\frac{3}{4}$" of the top and cap.

Aging

Theory

The beer must be allowed to age for proper conditioning and flavor.

Procedure

Let the beer stand in a cool place until it tastes as it should and then refrigerate it. This will take 1 week to 6 months.

Equipment Specifications

Grain Crusher *-(see special sheet)

Scale - 0-16oz letter or kitchen scale.

Mash Pot - 3½ gal. enameled steel stock pot.

Large Wooden Spoon - 18" wooden ladel.

Stove - oven must be large enough to hold stock pot.

Thermometer - 100-200°F stainless steel meat thermometer. Must be very accurate.

Boiler - 3½ gal. enameled steel stock pot.

Sparger *

Siphon *

Cooler *

Screen - 9"×9" peice of aluminum window screen.

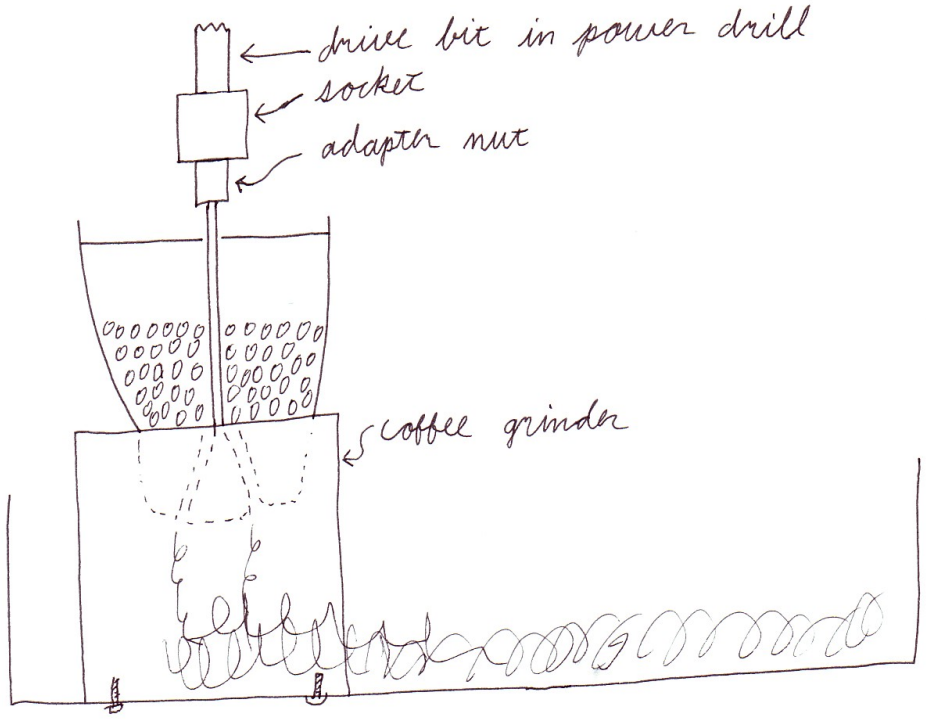
Fermenter *

Hydrometer - Type used with salt water aquariums 1.00-1.100 sg. with thermometer.

Rack Bag - 5 gal poly bag used by campers.

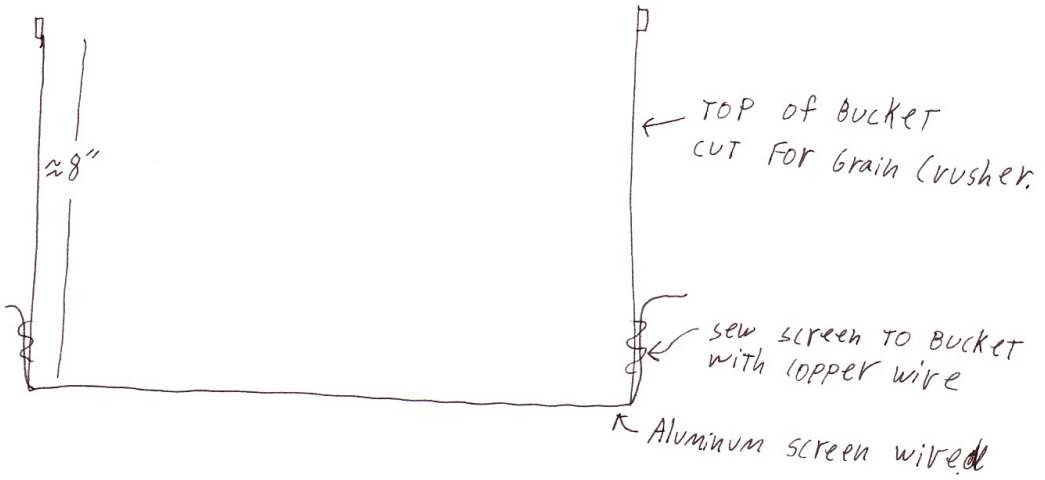
Capper - lever type to apply bottle caps.

Grain Crusher



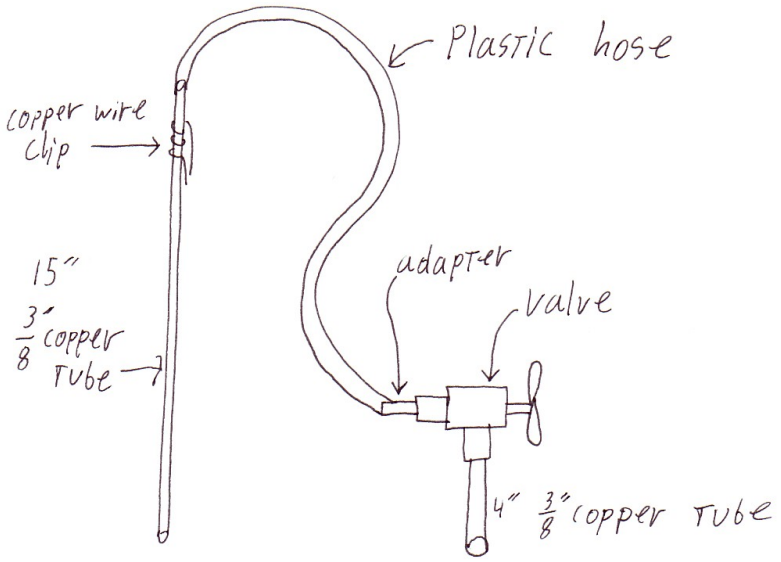
The coffee grinder is placed in a plastic bucket bottom and screwed to it.
a coupling nut is placed where the handle was and a variable speed power drill with a socket and drive bit is used to turn the grinder.

Sparger



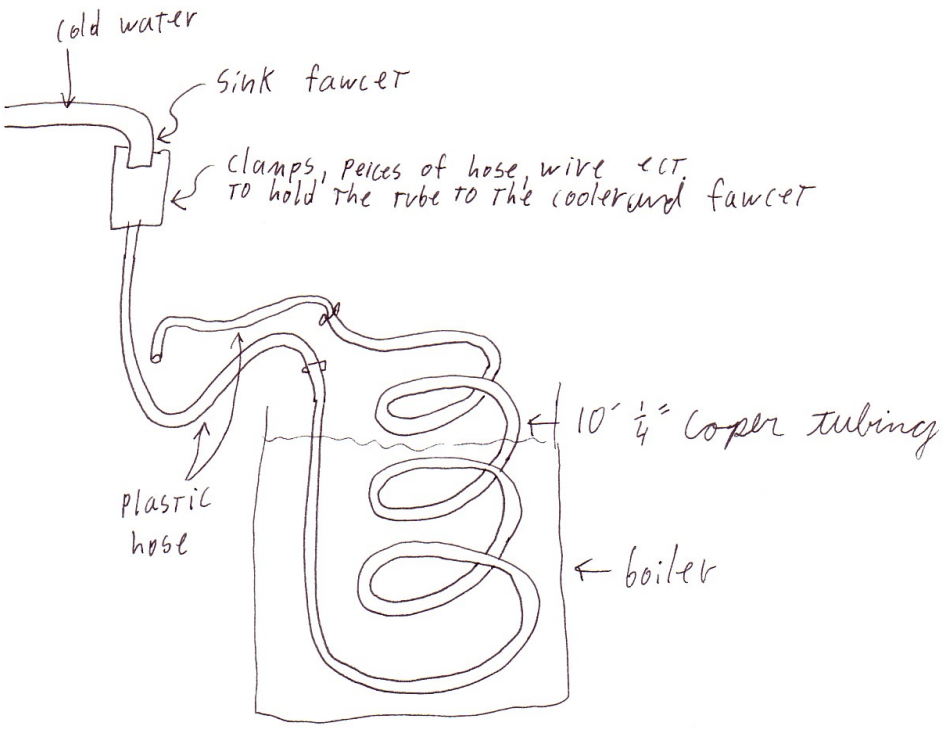
The bottom is cut off of a plastic bucket and screen wire is sewn to the bottom to make a seive. The screen ~~to~~ must be sewn well to hold the weight of the wet grain

Siphon



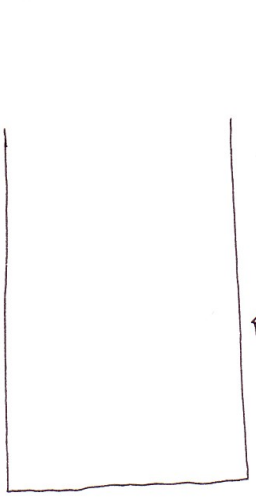
The siphon consists of a 15" copper dip tube with a wire clip to hold it to the side of a bucket in the proper position. A 5 foot plastic hose goes to a brass adapter to a brass valve with a short copper tube. The siphon is used in sparging, cooling, racking and bottling. The parts can be purchased at a good hardware store (≈$10).

Wort Cooler



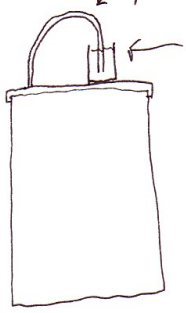
Note: set up must be able to withstand considerable presure and it must be reliable.

Fermenter



← air tight lid with a hole drilled for ½" plastic tube

← 5+ gal plastic bucket sold at paint supply stores must be clean or not exposed to toxic substances.

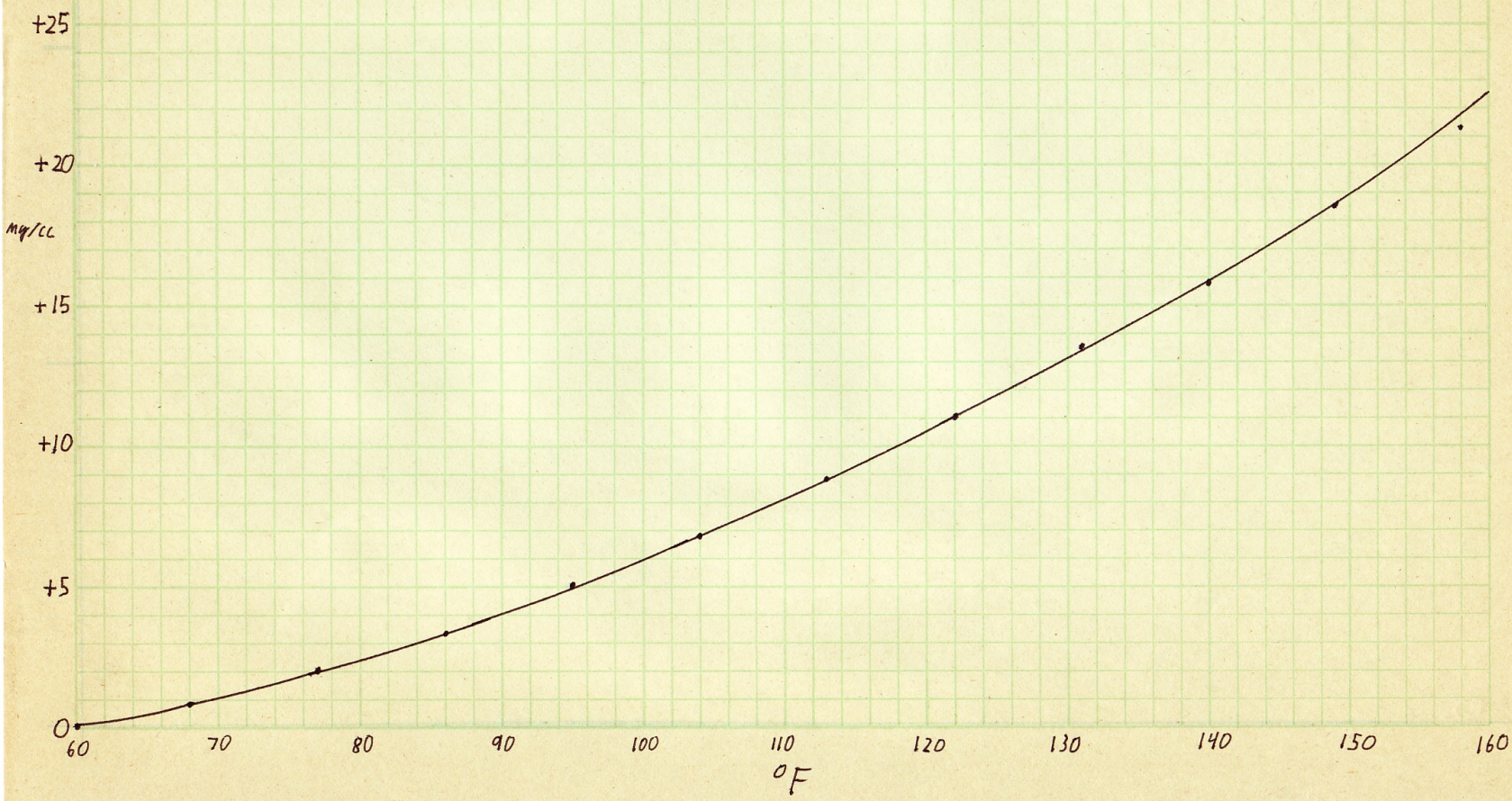


← plastic tube

← jar filled with water to serve as airlock.

HYDROMETER TEMPERATURE CORRECTION

Δ 7.5 pts = 1% Alcohol



good Hallertau hops best
river water best
1 tsp gypsum to mash best
long mash best
Irish moss is useless
~~I should crush grain~~
Home crushed grain is best
boil 90 min.
Yeast 15 SPARGings back
long mash best
wort krausen best

HYDROMETER TEMPERATURE CORRECTION

	Points	S.G. / Gal. / lb
Light Malt	36	30
Crystal Malt	29	24
Flaked Grains	37	31
Sugar	44	37
MALT Extract	36	30

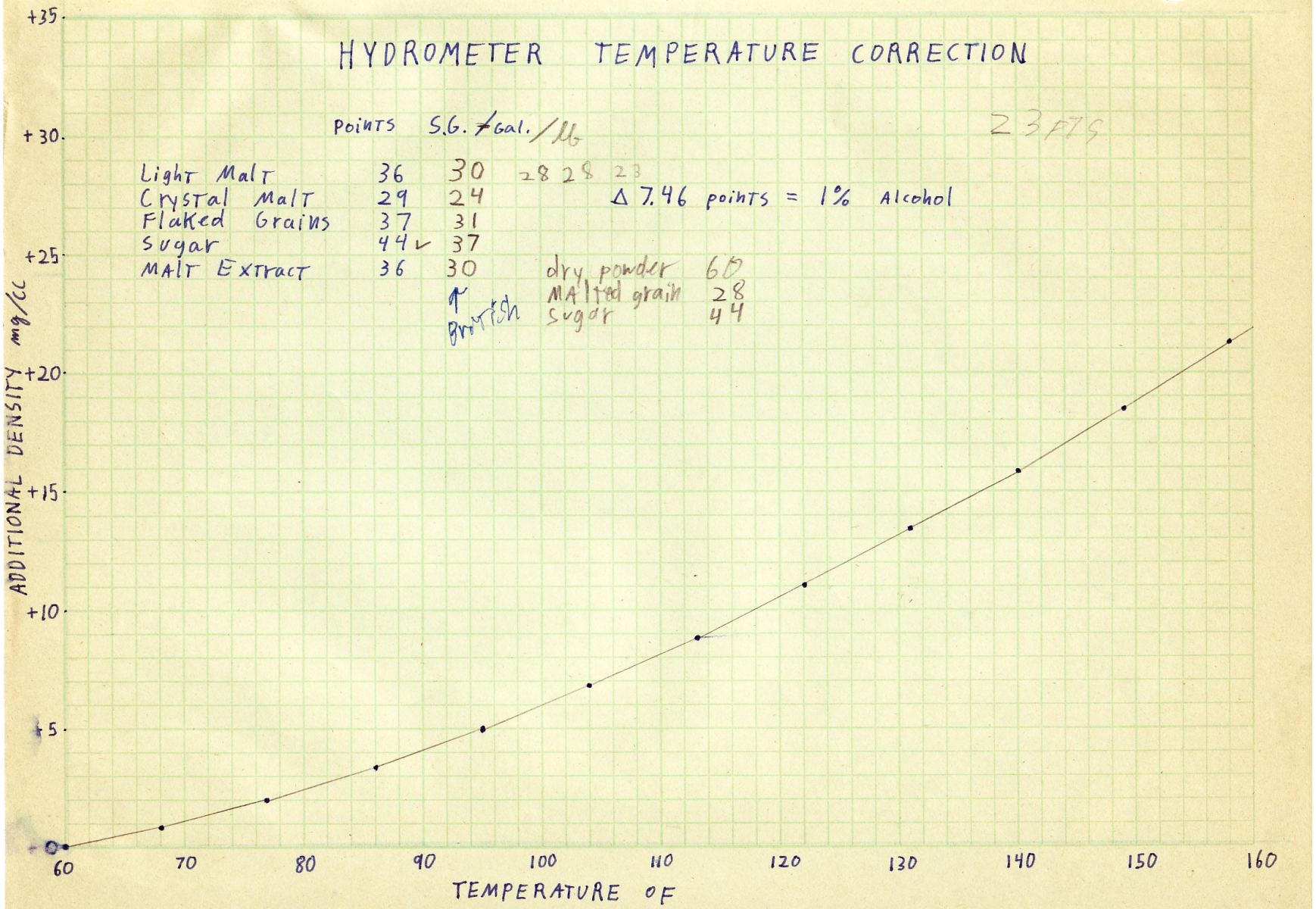
28 28 28

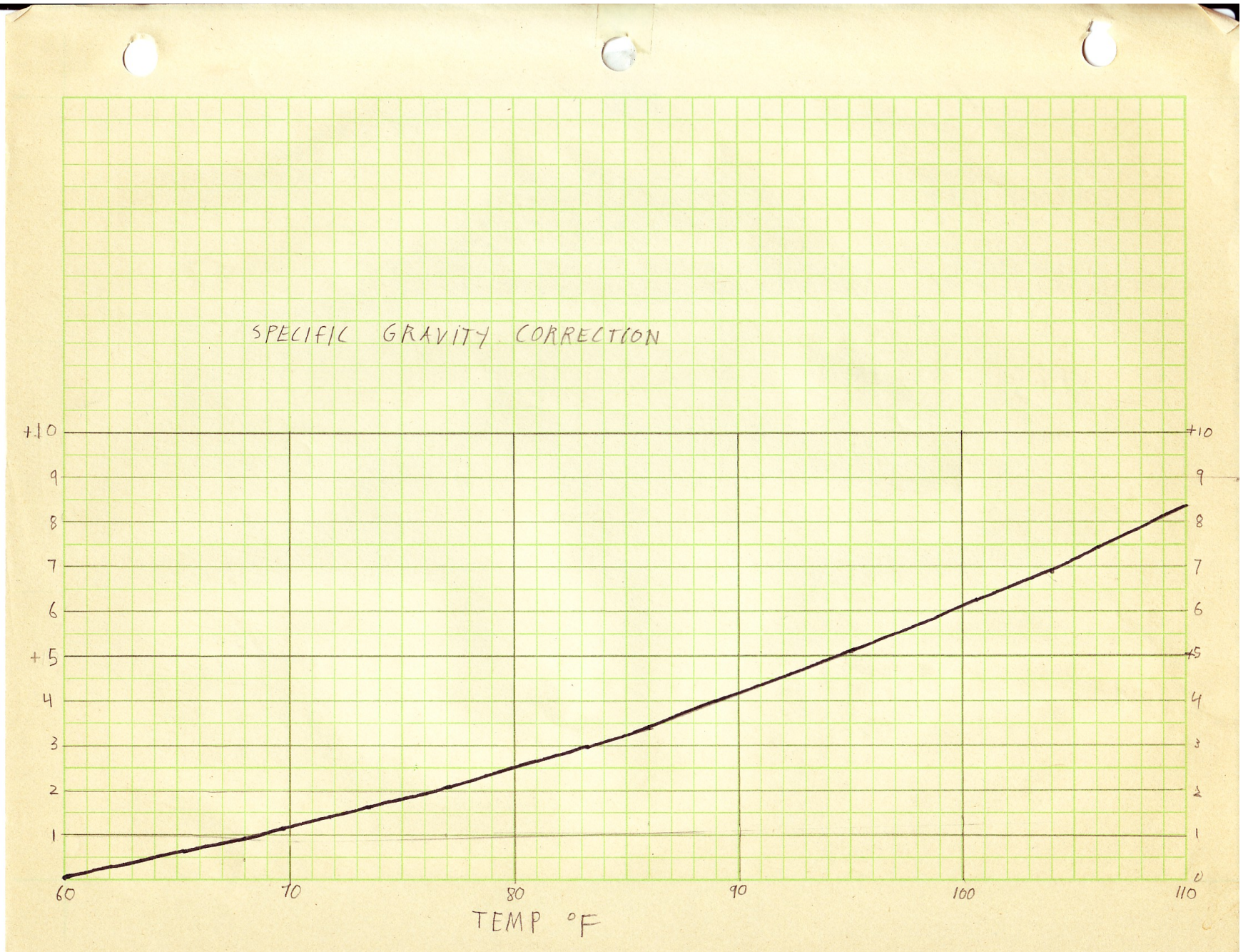
23 pts

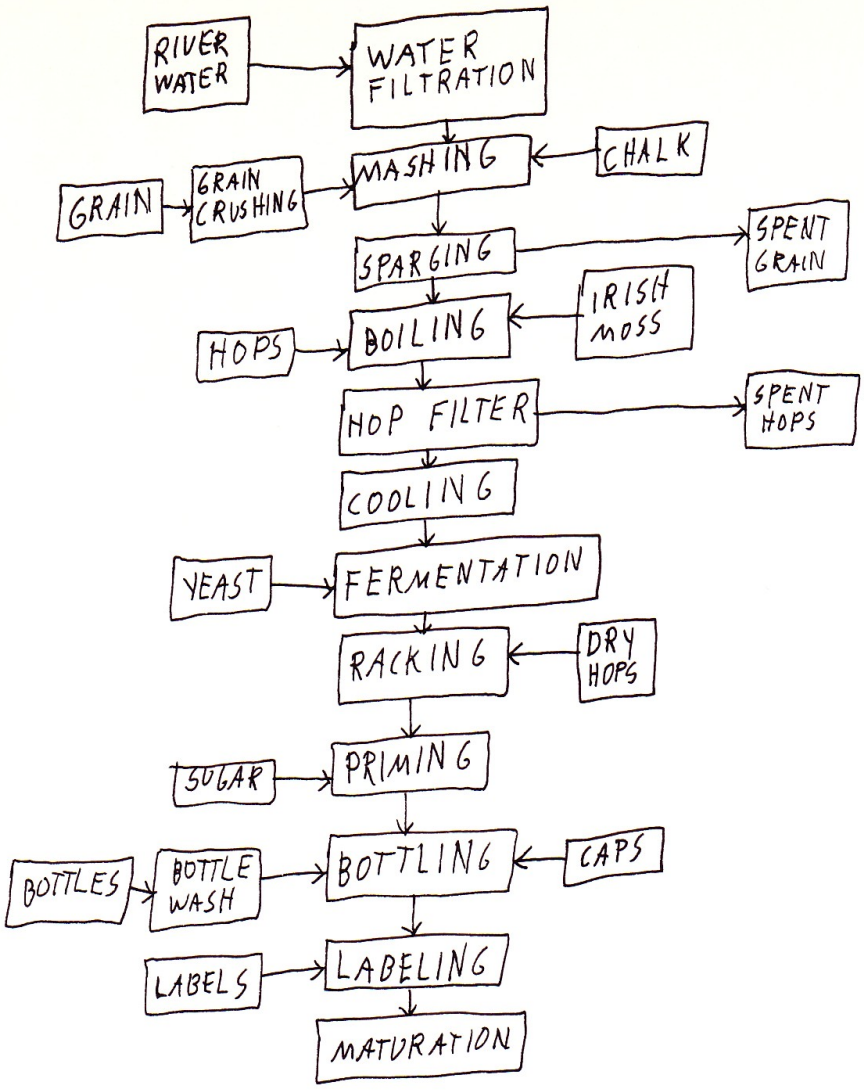
Δ 7.46 points = 1% Alcohol

↑ British

dry powder	60
MALted grain	28
sugar	44

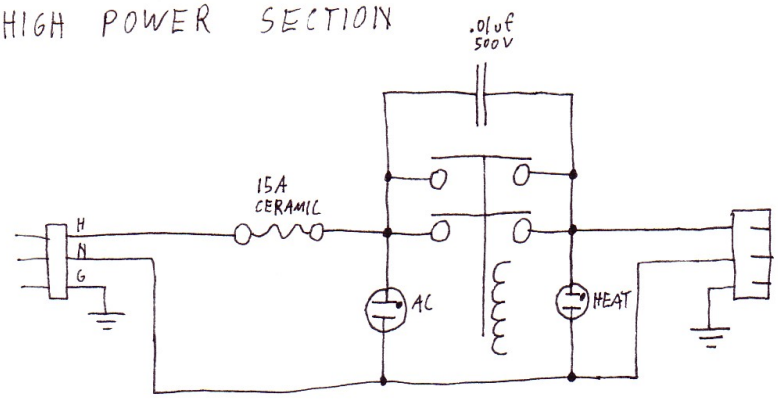



SPECIFIC GRAVITY CORRECTION
+10
9
8
7
6
+5
4
3
2
1
0
60
70
80
90
100
110
TEMP °F

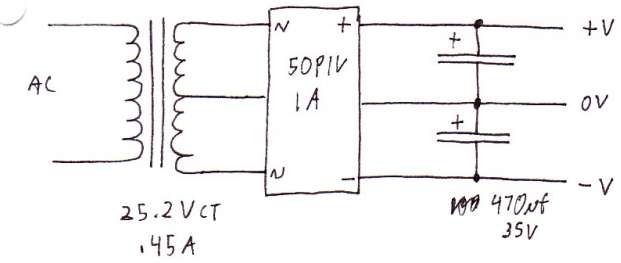

RIVER WATER
WATER FILTRATION
GRAIN
GRAIN CRUSHING
MASHING
CHALK
SPARGING
SPENT GRAIN
HOPS
BOILING
IRISH MOSS
HOP FILTER
SPENT HOPS
COOLING
YEAST
FERMENTATION
RACKING
DRY HOPS
SUGAR
PRIMING
BOTTLES
BOTTLE WASH
BOTTLING
CAPS
LABELS
LABELING
MATURATION

THE BEER MACHINE

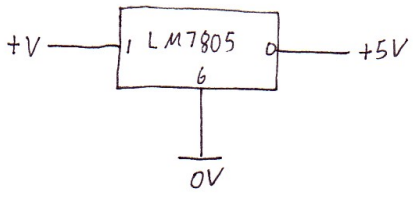
HIGH POWER SECTION



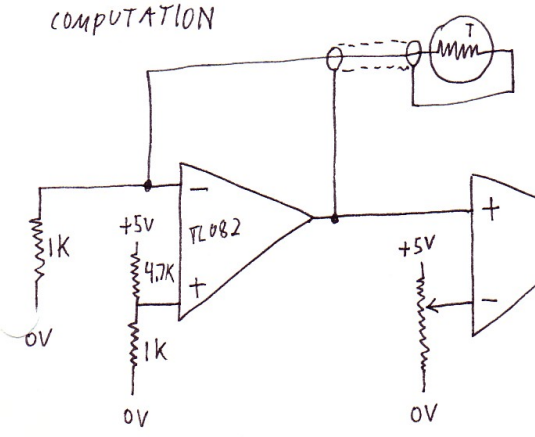
POWER SUPPLY



5V REFERENCE

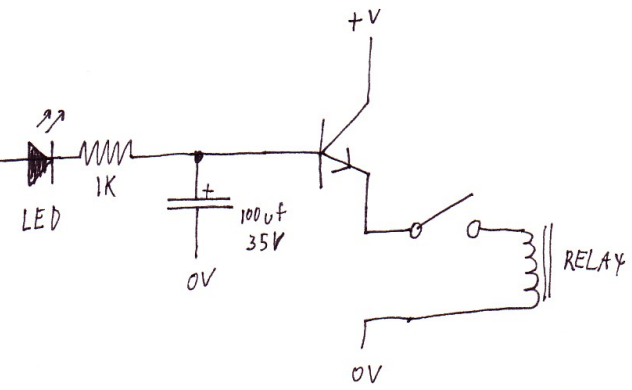


COMPUTATION

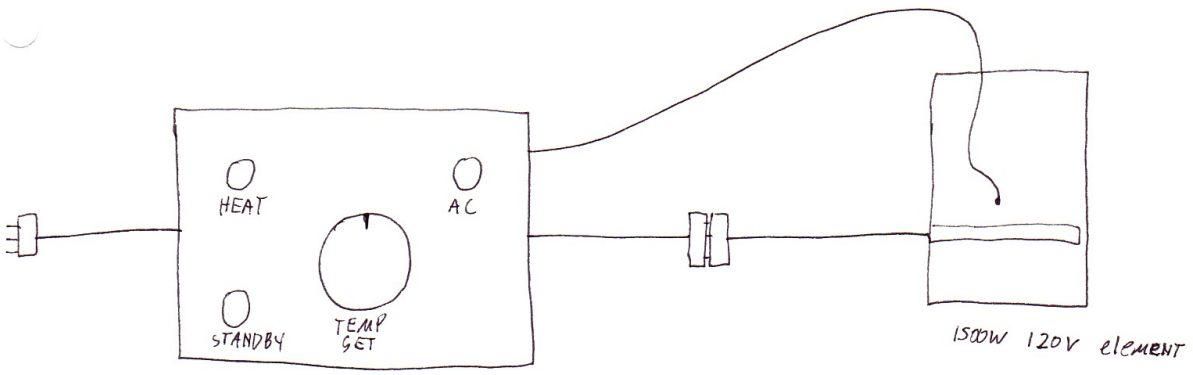


RELAY DRIVE

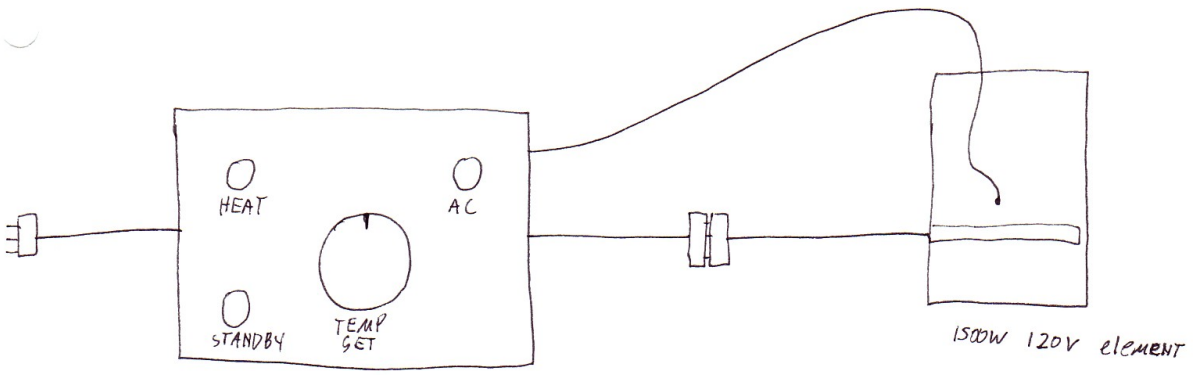
ANTI CHATER



CONTROLS



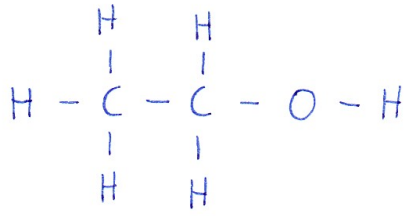
CONTROLS



$$C_6H_{12}O_6 \longrightarrow 2\,C_2H_5OH + 2\,CO_2$$

180.16 g/mol 46.07 g/mol 44.01 g/mol

Ethanol 0.79 g/cc



5% Alcohol by volume
3.93% by Weight

5 gal = 18.95 l = 18950 cc × 1.005 g/cc = 19045 g

18950 cc × 0.05 = 947.5 cc Alcohol

947.5 cc × .79 g/cc = 748.5 g Alcohol

$\frac{748.5\ g}{46.07\ g/mol}$ = 16.25 moles Alcohol ⇒ 8.124 moles Sugar
or 16.25 moles CO_2

16.25 moles CO_2 ⇒ 364 l_{STP} = 12.84 ft^3 CO_2

8.124 moles sugar × 180.16 g/mol = 1464 g = 3.22 pounds sugar

$\frac{4 \text{ cubic feet } CO_2}{\text{pound sugar}}$ ← can't Be

$$\frac{\text{Initial specific Gravity} - \text{Final specific Gravity}}{7.56} \times 100\% = \%\ \text{Alcohol by Volume}$$

From $\frac{18950 - 749\ g/_{H_2O} + 1464\ g\ \text{Sugar}}{18950\ g/cc} = 1.043\ g/cc$

IF Priming sugar = 4oz
Final volume = 5 gal

$$\%\ \text{Alcohol} = \frac{G_2 - G_1}{37.3} V_2 + .3$$ three

PRICES 7-1-86

5 lbs	PALE MALT GRAIN	~~4.25~~ ~~3.85~~ 2.90
1 lb	ROAST BARLEY	~~1.15~~ .95
1 pkt	EDME YEAST	.85
1 oz	BULLION HOPS	~~.60~~ .65
1 oz	NORTHERN BREWER HOPS	1.05
1 oz	HALLERTAU HOPS	.95
3 lbs	MALT EXTRACT powder	7.25
1 oz	cascade hops	.65
1 lb	Cryptal malt	~~1.35~~ ~~1.15~~ 1.35
6½ gal	CARBOY	12.95
	AIR LOCK	1.35
	cork	.65
1 lb	FLAKED BARLEY	1.55
1 oz	KENT GOLDINGS HOPS	.80
5 gal	CARBOY	16.20
1 gross	CAPS	2.95
1 LB	AMBER DRY MALT POWDER	2.75

EXTRACT POTENTIALS

Fermentable sugar	Degrees extract 1 lb/us. gallon	% Alch./5 gal
PALE MALT	36.18 usually 30.6 [28]	.97
LAGER MALT	36.18 30.6	.97
CRYSTAL MALT	28.44	.76
FLAKED BARLEY	36.54	.98
FLAKED RICE	36.54	.98
FLAKED CORN	36.54	.98
SUGAR	45	1.21
BROWN SUGAR	43.2	1.16
INVERT SUGAR	36.36	.97
MALT EXTRACT liquid	36.36	.97
MALT EXTRACT powder	45.45	1.22

Multiply by .65 For REAL EXTRACT

ALCOHOL CONTENT

G_1 = Original Specific Gravity at start of fermintation (in points)

G_2 = Final Gravity at bottling (before primming) (in points)

V_2 = Final Volume at bottling (before primming) (gal)

W = Weight of primming sugar (ozs)

V_3 = ~~W~~ Volume of water used to disolve primming sugar (gal)

$$\frac{\text{Volume}}{\text{Volume}} \text{ percent Alcohol} = \frac{V_{Alcohol}}{\cancel{V_{Alcohol}} + V_{WATER}} \times 100\% = \frac{G_2 - G_1}{7.46}$$

V_{WATER} + Alcohol

1 oz sugar gives .00378 gal Alcohol

$$\therefore V_{Alcohol} = \frac{G_2 - G_1}{7.46} V_2 + .00378\, W$$

$$\%\ ALCOHOL = \frac{V_A}{\cancel{V_A} + V_2 + V_3} \quad \text{where } V_A = \frac{G_2 - G_1}{7.46} V_2 + .00378\, W$$

$$= \frac{1}{1 + 1}$$

$$\%_0 = \frac{G_2 - G_1}{37.3} V_2 + \frac{\cancel{.0053}}{.3}$$

example $G_1 = 47$

$G_2 = 11$

$V_2 = 4.80$

$W = 7$

$V_3 = .20$

$$V_A = \frac{47 - 11}{7.46} \times 4.80 + .00378(7) = .258 \text{ gal}$$

$$\%\ ALCOHOL = \frac{.258}{4.80 + .20} = .0516 \Rightarrow 5.2\%$$

IF $V_2 + V_3 = 5.00$

$$\%_0 = \frac{G_2 - G_1}{3730} V_2 + \frac{\cancel{.000756}\ \cancel{.0053}\ .0053}{.0030}$$

$$\%\ ALCOHOL = \frac{\frac{G_2 - G_1}{746} V_2 + .00378\, W}{V_2 + V_3} \times 100$$

W = 4 oz

note: volume of added sugar is neglected.