Bottoms Up Brewery
Nokomis, Florida, U.S.A.

http://bubrew.org

Fermenting Under Pressure

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One night not long ago I had a batch of beer in the bucket that was fermented out and was ready to rack into a keg for clearing. After racking, I hooked up the CO_2 and started rolling the keg around on the floor to get the carbonation process started. After a few minutes of this a drop of sweat fell from the tip of my nose and I realized that this was probably more work than it needed to be. I also considered the triple-bogey of my situation: I was doing **work** to force CO_2 I had to **buy** into a fluid that had just finished **wastefully releasing** copious amounts of the same stuff! That's just not right!

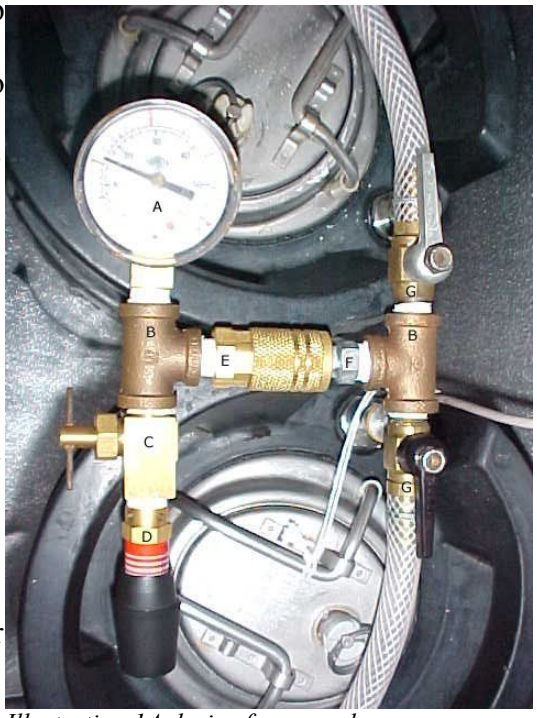

Illustration 1A device for secondary fermentation with controlled pressure relief to retain natural carbonation

The frugality and efficiency/laziness typical of home brewers had risen up in me so now I had to do something about it. It seemed a simple change in procedure might do the trick. I could rack to the corny secondary a little earlier, while there was still a little fermentation activity going on, and capture the the last wisps of CO_2 so that rather than being wasted through the airlock, they would stay in the beer and effortlessly carbonate for free!

I tried this on a couple of batches, using just the built in pressure relief valve on the corny

or the needle valve on a keg pressure tester[i] to manually release excess pressure a couple of times a day. There were a couple of problems with this approach: first, it still seemed like work because I had to remember to go out to the garage a couple of times a day, move the kegs to where I could get at the tops, and pull the valve. Second, the pressure would build up so high – 50 or 60psi sometimes -- that it was impossible to bleed off the pressure without causing foaming either through the pressure relief valve or up into the pressure tester. After disassembling and cleaning the pressure tester about five times I realized enhancements were in order.

The silver bullet for the whole operation turned out to be Grainger part number 4TK26, a $9 adjustable (0-100psi) pressure relief valve.[ii]

With this relief valve attached to my pressure tester, I can rack from primary when the airlock slows down but has not yet stopped, attach this gizmo set according to a carbonation chart[iii] at about 25psi, and forget about it. With my fermentation freezer set at 65F for ales, secondary fermentation and clearing can run its course without intervention by me and will finish ready-to-serve with about 2.5 volumes of CO_2. Once all fermentation is done, the keg can be chilled and served at about 10psi with no further adjustments.

Now that this is all put together and working, I'm already reaping benefits both by not having to remember to manually vent and not having foamy beer squirt all over my fingers when I do so. There are other benefits too:

- It's cheaper, since I don't have to buy the CO_2 used for carbonation
- It's maybe a little more environmentally friendly since I'm saving 12.5 gallons of CO_2 and not venting it to the atmosphere
- The beer can be ready to serve faster, perhaps as little as a week from kettle to glass in the case of a low gravity ale like a mild or a weizen in which clarity is not important.
- With careful racking, O_2 contact can be eliminated, rather than just reduced.
    1. Rack from primary into secondary corny while fermentation is still a little active. Attach pressure relief. Vent the keg with CO_2 if you wish.
    2. Secondary fermentation will scavenge any O_2 left in the headspace
    3. Fill serving keg with water, push water out with CO_2 at the same pressure as the secondary.
    4. Siphon-rack from secondary to serving with gas-gas and beer-beer jumper hoses. Because the pressure is the same in both, the beer will not foam and will gently fall from the secondary to the serving keg.
    5. Disconnect when you see cloudy sediment first start to go down the line to the serving keg
- Happy reuse of components. For some reason, it just pleases me to have many brewery items serve more than one purpose. The tester is still a tester when it's not being a pressure reliever, and it can provide relief for one or more kegs. The dual gas line is used for serving when taking kegs on the road or when doing the siphon-rack mentioned above.
- For what it's worth, you have authentic “cask conditioned” beer this way. Serve it by gravity with an air vent rather than pushing it with CO_2 and CAMRA will probably send you a card on your birthday.

There are a couple of tips I'd like to pass along so that if you do try this, you might not worry too much. First of all, select your very best sealing corny kegs for this. The pressure will build only slowly, and cornies are not really designed for this. They are made to seal with a bunch of pressure all put on at the same time. Second, don't be to concerned if it takes a few days for the needle to lift off the peg at all. I thought I must have a leak somewhere when it took several days to get any pressure at all from a Kolsch-style beer I had going at about 58F, but that slow, steady fermentation did eventually rise to the set pressure and vent the excess as designed.

Common Parts List (Letters are marked on Illustration 1)

(A): 0-60 psi gauge I removed removed from a spare regulator. Beer, Beer & More Beer (B3) has them at morebeer.com as part number D1090 for $7.50
(B): 1/4" FPT (female pipe thread) T fitting from the local hardware store in the plumbing aisle. Costs about $1.50.
(C): needle valve from the hardware store,. Used for manual venting. FPT on one end and MPT on the other. Can be nice for manual venting while leaving the adjustable valve where you want it. Not absolutely necessary I've found; I have since removed it. Costs $3-$4.
(D): 0-100psi adjustable relief valve. Grainger part number 4TK26.
(E): Pneumatic quick-disconnect, Female side with MPT. This is from Home Depot in the air tools section. This half cost about $4.

Up to this point, all the parts are the same whether you are doing 5 gallons at a time or more than 5 gallons at at time. Since I normally brew 10 gallons at a time, I use two cornies for secondary, and thus either need two pressure testers with relief valves, or I can gang the gas lines from two (or more) kegs into one tester and let all the kegs reach equilibrium at the same pressure. This makes me extra happy because I can also use the split gas line (downstream of part F) for dispensing two kegs at at time.

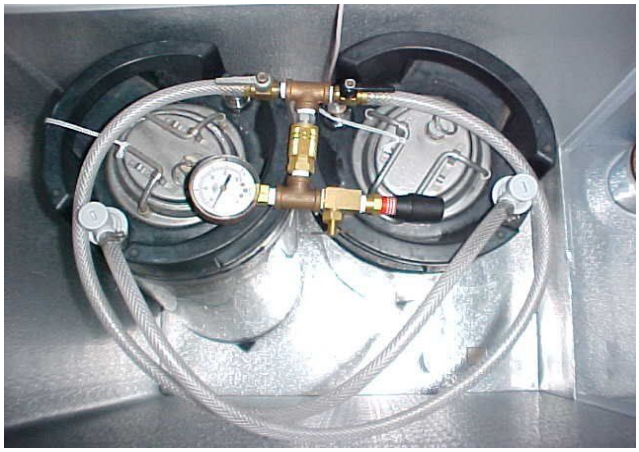

Illustration 2Secondary ferment of a 10 gallon batch with automatic pressure relief

Multiple Fermenter Parts List
F: Pneumatic quick disconnect, male side with MPT. Matches up with part E and is found in the same aisle among the orange-aprons. This piece is only about $1.
G: Shutoff valves **without** backflow preventers. These ugly, mismatched ones came from the same spare regulator as the gauge, but you can get them at B3 (part D1120) for $7.95 each.

Single Fermenter Parts List[iv]

H: Pneumatic quick-disconnect, male side with FPT. You can probably guess by now where to find this.

I: Union, ¼" Male Pipe Thread x ¼" Male Flare Union. Hardware store.

J: I think this is called a "swivel." It is a 1/4" Female Flare Thread Swivel. It has two female flare fittings joined by a short piece of copper tubing. I'm not sure why it's called a swivel because it doesn't turn when its all tightened down.

K: Gas-in corny quick disconnect from your friendly local brew store.

Illustration 3Adapter for single keg fermenting or pressure testing

Use three wraps of teflon pipe tape on all the threaded fittings **except** the flares.

Illustration 4Attached to a single fermenter for pressure testing or fermenting under pressure

i Mike Dixon, mpdixon@ipass.net, is the rec.crafts.brewing evangelist for these things. His excellent design is at http://www.hbd.org/carboy/kegpresstester.htm

ii http://www.grainger.com/Grainger/productdetail.jsp?xi=xi&ItemId=1611571470&ccitem=

iii A fine example is at http://www.zahmnagel.com/pdf/Beer.pdf

iv B3 has these pre-made, but without the gauge. Part FIL42, $18.50 includes a quick disconnect.