

**Creating  
Bubbleless Gel Candles  
with the  
BBB Vacuum Bubble  
Buster**



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## The Genesis of the name *BBB* (*Boyle's Bubble Buster*)

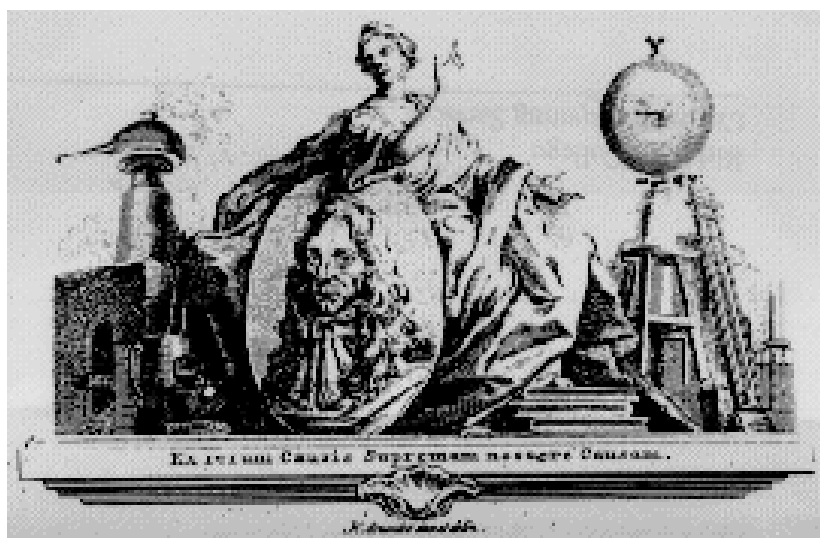


*Boyle's Bubble Buster* is our nickname for the Gel Candle Debubbler. It is named in honor of Robert Boyle (1627-1691).

Boyle was a chemist and a natural philosopher. He was noted for his pioneering experiments on the properties of gases and his views of matter. His work led to the modern theory of chemical elements.

While at Oxford Boyle collaborated with Robert Hooke in constructing an air pump with which he conducted the experiments leading to his publication (1662) of the relationship, now known as Boyle's law, that at constant temperature the volume of a gas is inversely proportional to its pressure.

The complete story of the origins of the *BBB* can be found in the article *Bubbles and Gel Candles* which can be found on the Web at <http://www.belljar.net/034gel.pdf>.



# Overview of the *BBB* Vacuum Debubbler

The *BBB* has been developed specifically for maximum elimination of bubbles in gel candles. Nothing works as well and as dependably. Vacuum debubbling is a standard technique in industry for eliminating bubbles in plastic moldings and potted assemblies where the presence of bubbles could cause anything from performance problems to catastrophic failure. The wide use of vacuum debubbling is a testimony to the efficiency of this method. While other techniques can work under some circumstances, only the application of vacuum technique can assure consistent success and productivity.

The team of Deb Puerini and Steve Hansen have developed a simple to use system, the *BBB*, that will make the production of beautiful, clear gel candles an easy and relatively straightforward task with immediate results and no guesswork.

## What's Included

When you receive the *BBB* you will find two major items: the vacuum pump & manifold and the plastic debubbling chamber. Other parts with the kit include:

Vacuum pump fluid (oil) with Material Safety Data Sheet (MSDS)

Pyrex glass beaker

Operating manual for the pump

A full set of detailed instructions on how to set up, safely use and properly maintain your *BBB*.

The picture below shows a typical set up.



**Specially Modified High Vacuum Pump with Manifold, Connecting Tubing and Debubbling Chamber**

## What Goes On During the Debubbling Process?

When gel is prepared the mixing process introduces tiny amounts of air. In addition, embeds that are inserted into the gel will also carry with them some amount of air. The whole idea of the BBB is to use vacuum to make the trapped air bubbles expand, float to the surface and break.

The amount that the bubbles expand is directly related to the change in pressure in the vacuum chamber. When the pressure gauge, which is calibrated from 0-30 inches, reads 29 inches a bubble will expand by a factor of 30. As noted before, this relationship between pressure and volume was discovered by Robert Boyle and is referred to as Boyle's Law.

The degree of vacuum is critical. Simple vacuum pumps such as those supplied with food dehydrators will not work properly. The only suitable pumps are oil sealed rotary vane pumps.

When debubbling you place the melted gel in a glass beaker which, in turn, is placed in the debubbling chamber. The chamber is closed and the pump turned on. By means of a special pressure control valve you drop the pressure to a point where the bubbles start to expand and rise. Initially this can be quite vigorous. As the bubbling slows down you adjust the pressure even lower to get rid of all of the bubbles. The whole process only takes about 3 minutes. The picture below shows a batch of gel that is being debubbled.



**Air bubbles dutifully obeying Boyle's Law by expanding like crazy and rising to the surface whereupon they break and are never seen again.**

## What's Required to Maintain a Vacuum Debubbler?

The *BBB* requires very little maintenance. Just keep all of the parts clean with an occasional wiping with a clean, dry, lint-free cloth. For a more thorough cleanup, if required, you may use warm water with a mild, pure & unscented soap (e.g. Ivory dish detergent). Do not use solvents as these may attack the seals or plastic surfaces. Under no circumstances should you use any abrasives such as scouring pads. If water has been used for cleaning, make sure all surfaces are dry before using with the vacuum pump. Water will contaminate the pump oil instantly.

The most important part of maintenance is keeping the pump oil clean and at the proper level. Before each debubbling run make sure that the oil level is midway in the sight glass. We recommend that you change your oil on a monthly basis or more often if the oil appears darkened (dirty/contaminated) or milky (a sure sign of lots of water content).

Suitable vacuum oils are usually obtainable locally but high quality oil may also be purchased through us. We can also supply miscellaneous spare parts such as o-ring seals, extra tubing, etc.

### Further Assistance

Any questions or feedback, please email:

Steve for questions with regard to the equipment  
shansen@tiac.net

Deb for issues related to candlemaking with the *BBB*  
lovesalsa@cox.net

Also be sure to visit Steve's vacuum web site, **the Bell Jar**, at <http://www.belljar.net> . If you are science minded you will also get a host of ideas for other applications that your vacuum pump can be used for. By March 2003 there will also be a message board at belljar.net which will include an area for vacuum applications in arts & crafts.

## Examples of Debubbled Candles using the *BBB*

