

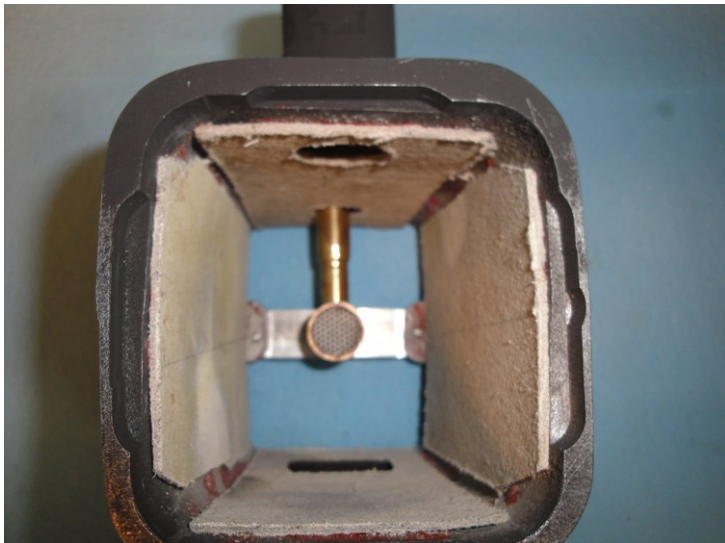
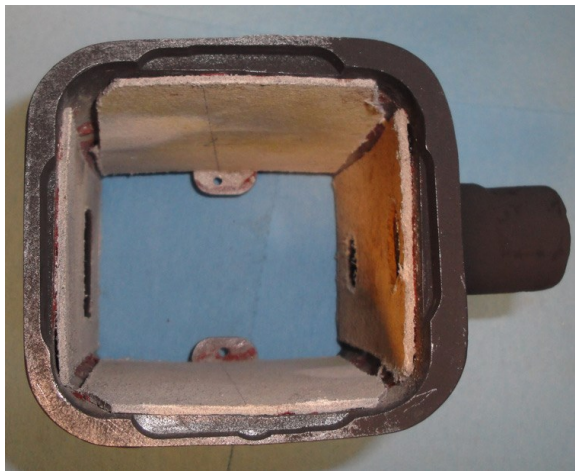
## **Burner**

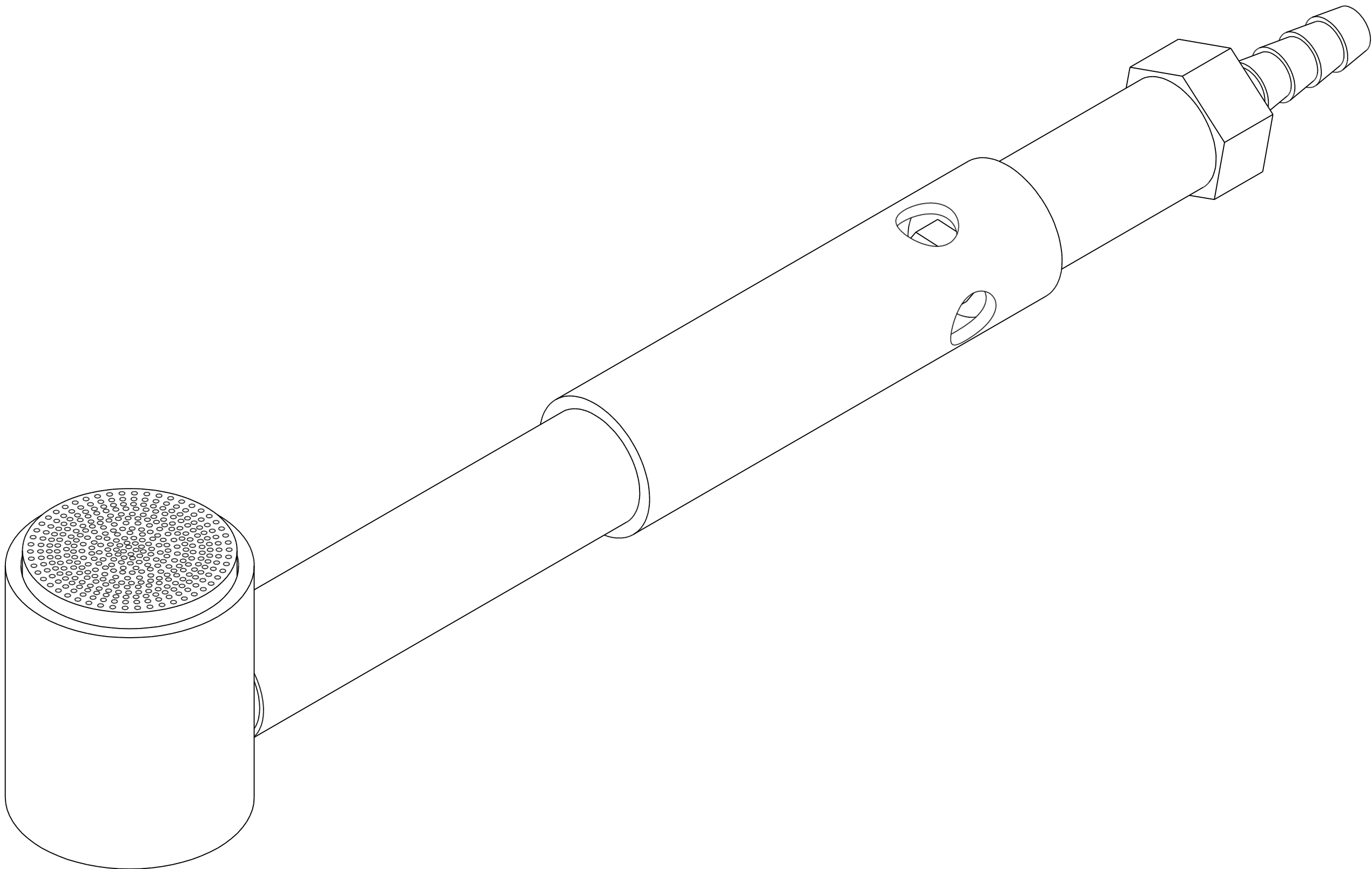
I made the burner a little different. First I decided to make it smaller. Fundamentally I used Sandy Campbell's design. Bill made his 2" and I see in Stan's thread he made his 1.5". I used a .75 hole drill that gave me a .700 burner diameter. I made up the ceramic holder similar to one used by Sandy just smaller. At the suggestion of a fellow modeler I used propane torch components. I sawed off the end of a torch. Then unscrewed the top part and removed the orifice. I pulled out the torch components from the end. I had purchased a .010 from McMaster Carr. When I compared the two under a microscope the hole size of the propane part was miniscule ( about .004) compared to the hole in the purchased one. Next I measured up the distance the tube needed to be so the air intake was outside the furnace. You can see in all the photos the parts and the soldered up finished product. I added an air intake flow restrictor. I used the regulator from Gentec. You can see the result with the nice blue flame. It runs nice from about 2# to 10# without air adjustment. I think it will still be too hot so I may plug some holes after some run time. (It actually worked out well, later post will give results from first test run at NAMES, you can get a look at the results in the PDF which contains all the parts drawings)

Total time was about 10 hours.

A much better regulator is a Smith 249-500b Propane, it controls down to .2psi and holds nicely, I use about .8psi with the small orifice







<b>1/4 Scale Rider-Ericsson Burner</b>		SUBASSEMBLY	
PART Ceramic Burner	DWG NO.		REV 1
SCALE None	DATE 04 / 23 / 2015	DRAWN BY: <b>Bob Nawa</b> © 2015 All Rights Reserved	

## Burner Design

The drawing shows the approach taken by Brad Smith with respect to using existing Propane torch Parts. You cut the torch at the bend and machine it square. You take the guts out of the end of the burner tube. Then unscrew the orifice holder piece from the burner tube. Unscrew the orifice and machine as shown.

The rest of the burner is based on the Sandy Campbell design, see last two pages of drawings. There have been several built on the Model Engine Maker Site where my build is running. The first one used a 2" burner and he suggested making it smaller. The second one used a smaller one not sure of diameter. I choose to make it smaller yet. I used a .750 hole saw which produced about a .690 diameter ceramic insert. I used two deflectors as shown in Sandy's design. I just guessed at distance apart based on the smallest diameter I could use for them with a 5 - 40 thread inside. This is all experimenting.

When I made my burner I misunderstood Brad when he told me to drill through or remove the screen. I thought he meant the burner guts at the top and not the orifice. So my burner used the propane orifice as it came with the torch - no modifications. I also insulated my furnace with .06 asbestos sheet on its walls (see picture) and the gasket between the engine base and the displacer cylinder was of the same material. The asbestos sheet extended beyond the displacer flange to cover the top of the furnace. My entire objective was to keep the heat in the furnace not on the upper part of the engine. To that end the bottom of my Stainless Steel Displacer Cylinder is capped with copper not Stainless. The heat needs to go into the cylinder not up to the base. This method was suggested by Brad Smith.

The unmodified orifice hole has worked fine.

## Results of First Long Run

I finished the engine at 3pm the day before leaving for NAMES. I ran the engine for about 10 minutes just to make sure everything was OK. It had only run once before before being painted for about 20 minutes with an alcohol burner, no furnace. So the NAMES show was the first trial runs. The regulator was purchased at <http://contenti.com/gentec-preset-tank-regulators>. It says preset but I was able to adjust it. I will be experimenting more with it and will be reporting in my build aritcle. I my gauge only read from about 2# to 30#. The burner worked effectively from the 2# all the way to 15# before it started to jump off the ceramic. At startup I took it up to 15# and it would take off in about 90 seconds. I then turned it way down. It ran nice and smooth at the 2 - 3 # range. I need a guage that reads to tenths of a pound in order to see just how well the regulator works. Brad lent me his regulator with a tenths reading gauge. He runs his at about .2# pressure. Using his setup the engine ran nice at .8 to .9# pressure. When I used his guage is when I discovered that I had not set up the orifice as he did. Brad did not understand why I had to restrict the air flow around the inlet. He runs his wide open mine is almost 95% closed.

The bottom line is the engine ran nice and slow - about 80 to 100 RPM by my my watch. It ran the whole day and you could put your hand at the base of the cylinder and just leave it there so there was very little heat transfering up from the furnace. The water never got hot just very luke warm if anything, I did not have a thermometer to test it. You could put your finger on the furnace and it would not burn you but it was hot, you could leave it there for a bit.

## Next Experiments

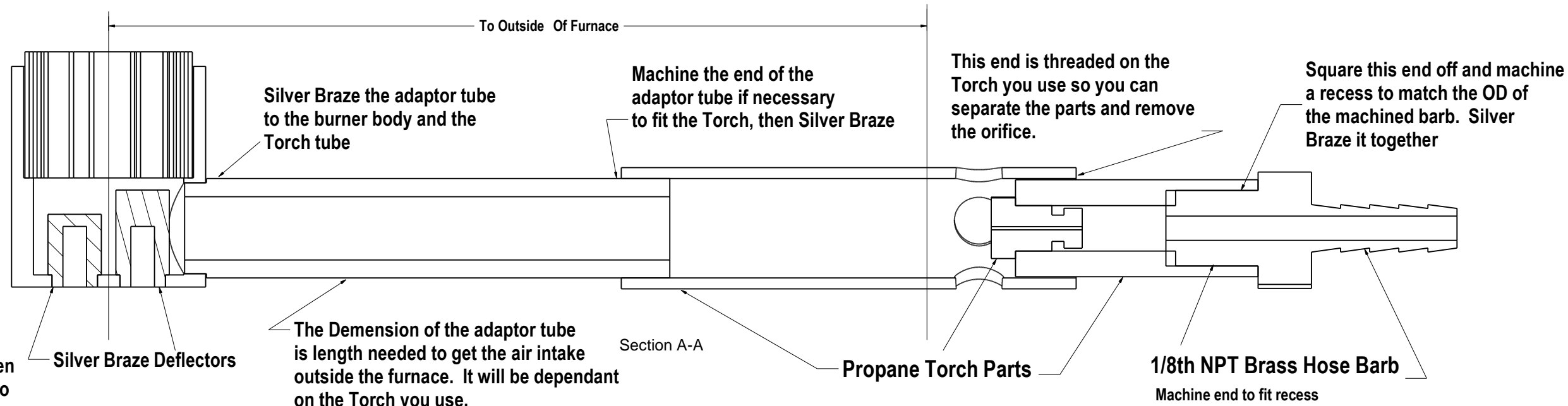
My next steps are to change out the orifice. I have the one from McMaster Karr with a .010 orifice. I need to figure out an adaptor to put it in the current unit. Next I will take another orifice from another burner and drill out the hole to the #80 and try it. I am also going to get a gauge that reads to tenths - ie a 10#. I should then be able to test out the regulator as well as the the different orifices.

1/4 Scale Rider-Ericsson		SUBASSEMBLY	
		Build Notes	
PART	DWG NO.		REV
Ceramic Burner			1
SCALE	DATE		DRAWN BY:
None	04 / 23 / 2015		Bob Nawa
© 2015 All Rights Reserved			



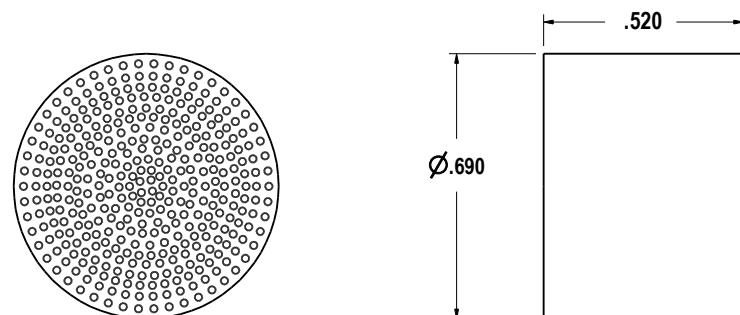
### Silver Braze

I used 1400 degree for the Torch to Adaptor tube and Body to Deflectors first. Then used 1200 degree for Body to adaptor and Barb to orifice holder



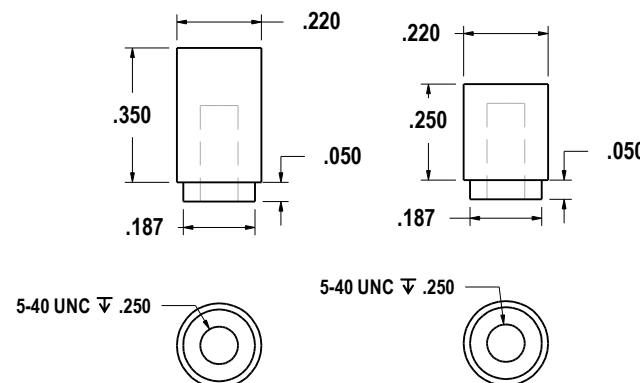
This was my error on the orifice, I should have drilled all the way through and not just the screen/filter. Even though I left the orifice as supplied the burner works just fine

Use #80 or smaller drill. Either remove screen / filter or drill through it



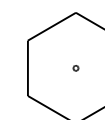
### Ceramic Insert

Cut from jewelers soldering block see photo page  
Supplier: <http://contenti.com/hard-ceramic-soldering-board>  
also has regulator

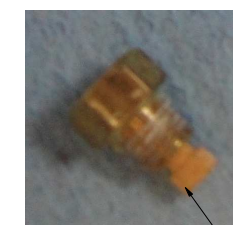


### Deflectors Large & Small

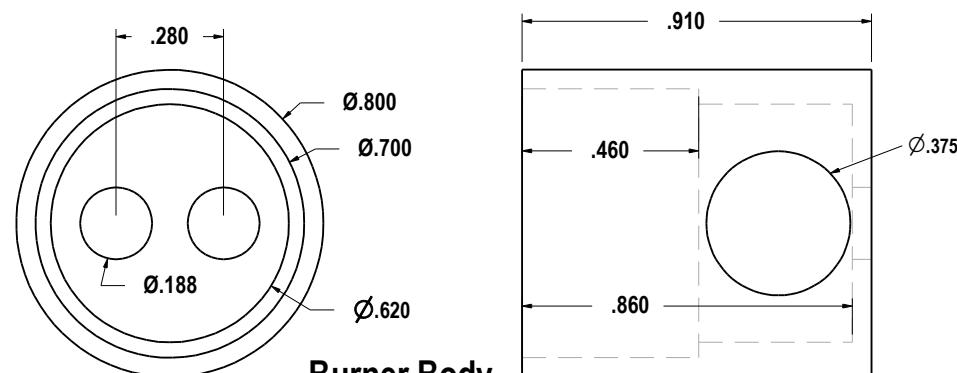
Material: Brass



### Propane Torch Orifice

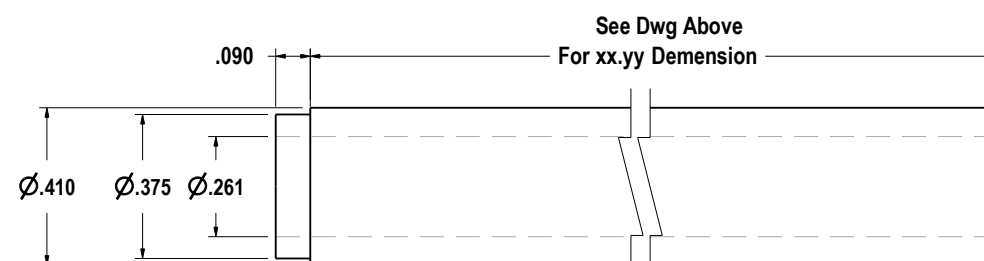


Screen / Filter on end of Orifice



### Burner Body

Material: Brass



### Burner Adaptor Tube

Material: Brass

## 1/4 Scale Rider-Ericsson Burner

SUBASSEMBLY

PART	Ceramic Burner	DWG NO.	1	REV	1
SCALE	2 to 1	DATE	04 / 23 / 2015	DRAWN BY:	Bob Nawa
© 2015 All Rights Reserved					

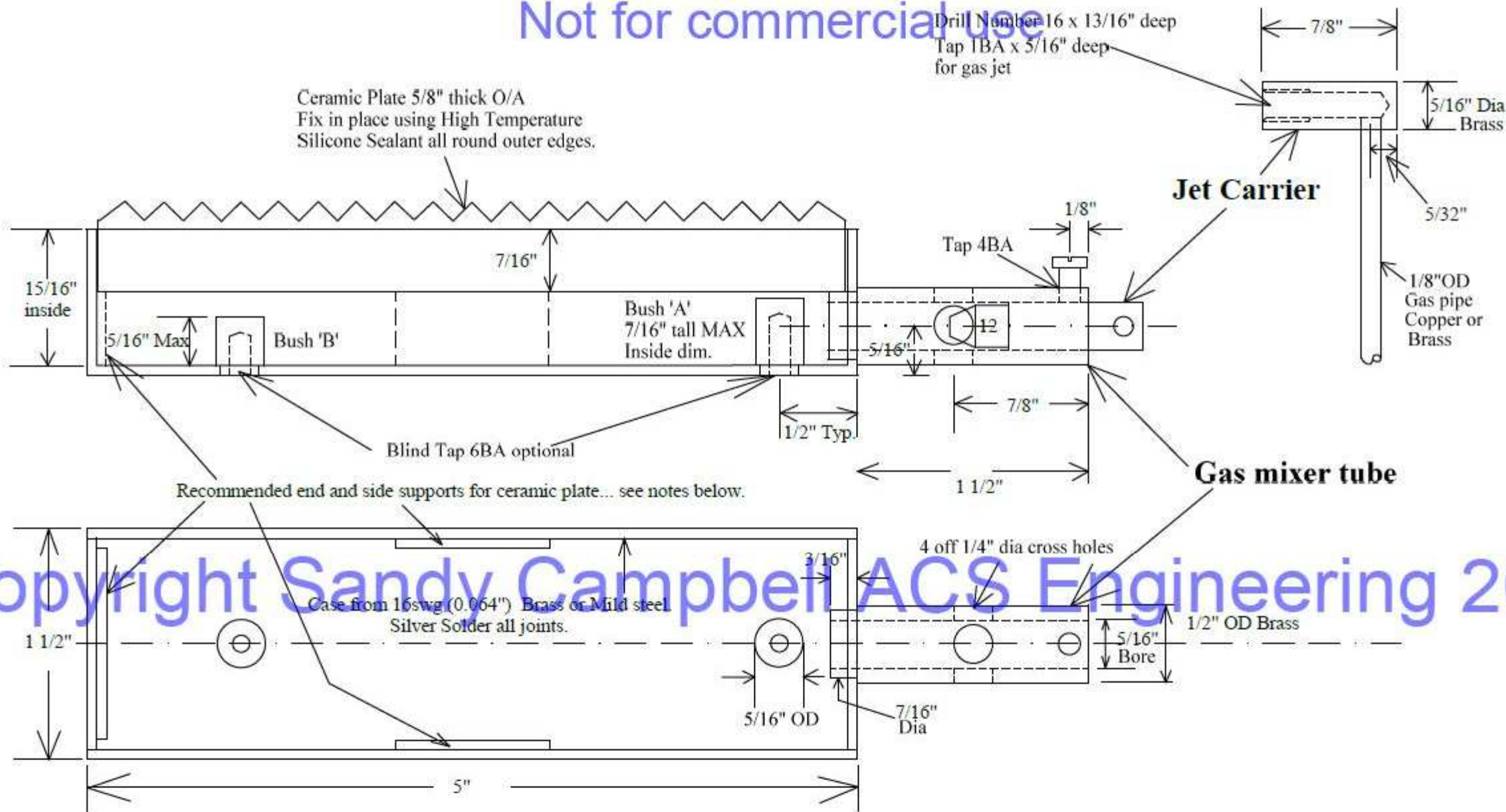




1/4 Scale Rider-Ericsson		SUBASSEMBLY	
Burner			
PART	DWG NO.		REV
Ceramic Burner			1
SCALE	DATE	DRAWN BY:	
None	04 / 23 / 2015	Bob Nawa	
© 2015 All Rights Reserved			



Not for commercial use



### Notes:

All joints to be silver soldered.

Bush 'A' is mandatory, as it also serves as a gas deflector.

Bush 'B' is optional

Recommended end and side supports are optional but they do help to keep Ceramic Plate level

Gas jet = Number 12 (shown) or Number 16

G.A. Rectangular Flat Ceramic Burner  
5" x 1.5"

Drawn: A. F. Campbell

Scale: Full Size

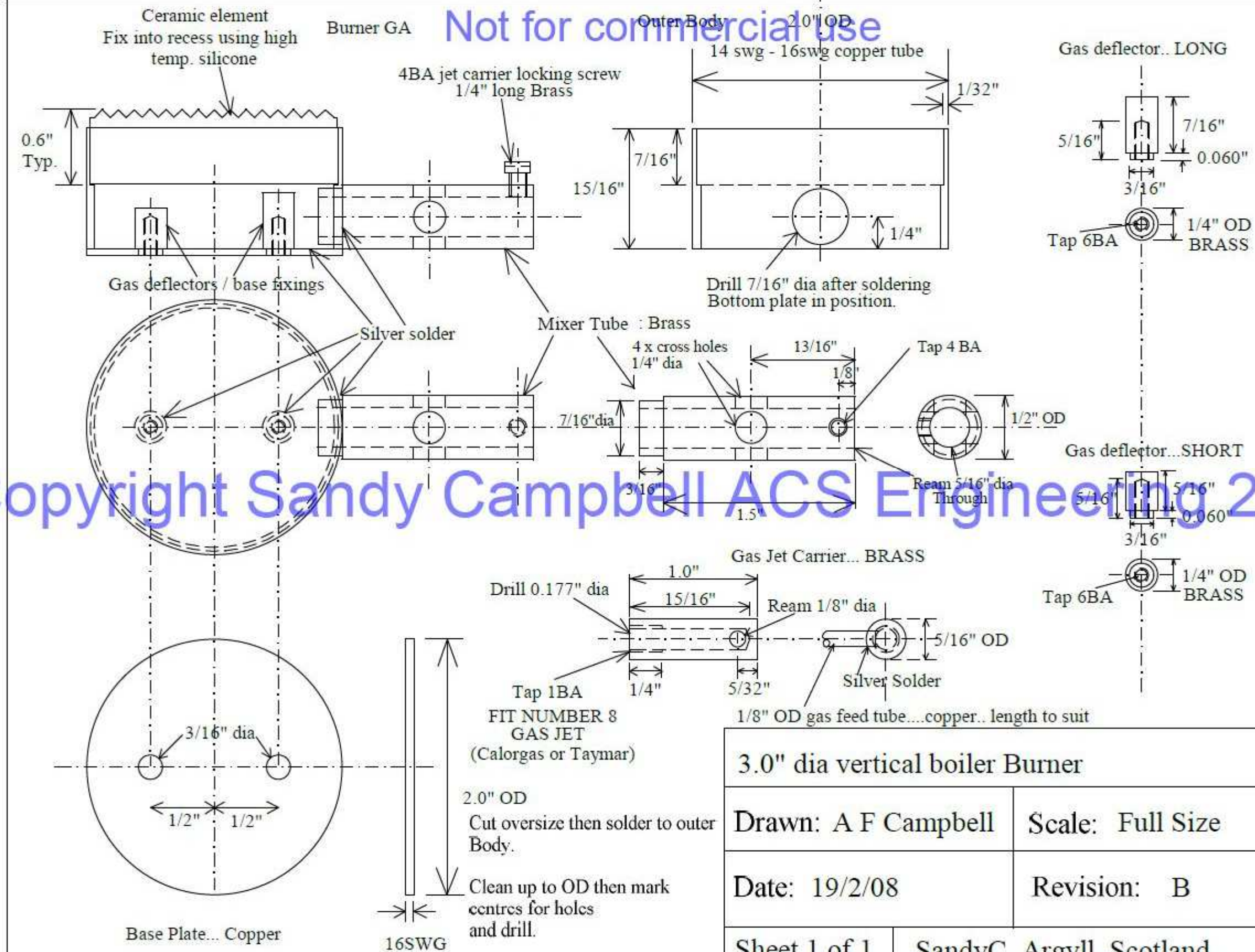
Date: 21/03/04

Revision: A

ACS Engineering, Argyll, Scotland, UK.

<b>1/4 Scale Rider-Ericsson</b>		<b>Campbell Large</b>	
PART <b>Burner</b>		DWG NO.	REV <b>1</b>
SCALE <b>None</b>	DATE <b>04 / 23 / 2015</b>	DRAWN BY: <b>Bob Nawa</b> © 2015 All Rights Reserved	

Copyright Sandy Campbell ACS Engineering 2008



1/4 Scale Rider-Ericsson Campbell Small

PART Burner		DWG NO.		REV 1
SCALE None	DATE 04 / 23 / 2015	DRAWN BY: <b>Bob Nawa</b> © 2015 All Rights Reserved		