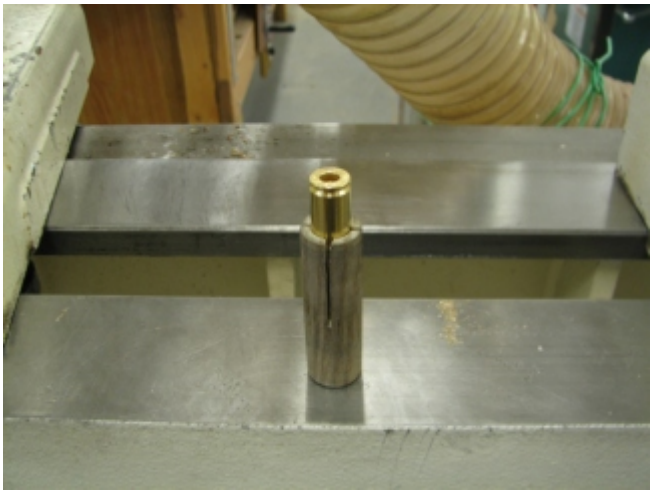
Streamlined Cartridge Pen
and
Bullet Drilling 101

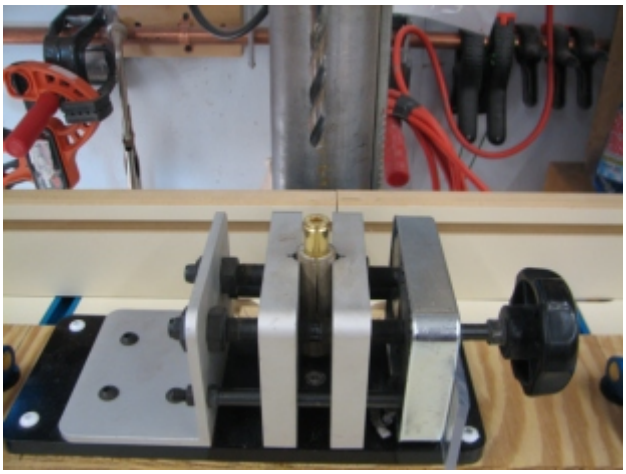
Before I begin this tutorial I think it's only fitting to acknowledge Don Ward, aka its_virgil. He has a fine tutorial in the IAP library that got me started making this type of pen. Although Dons tutorial is about making a segmented type cartridge pen, a lot of the principles are the same and can be used with either style pen.

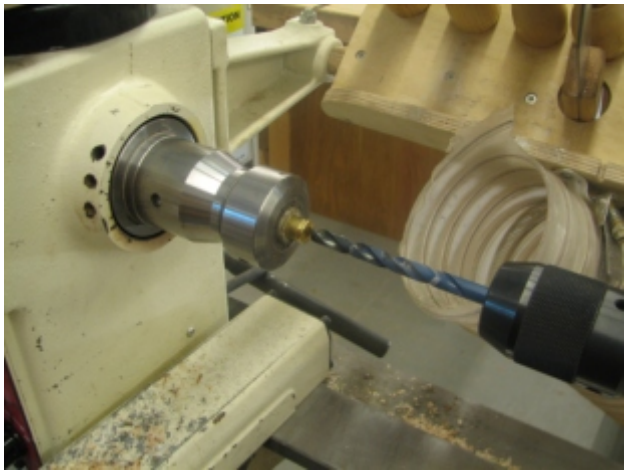
That bring us to the question.....Why do we need another tutorial on basically the same thing? The short answer is, why not? You can never have too much information. The long answer is.....
.....A few days ago I posted a photo of this style pen on the SOYP forum at IAP. Well, a friend saw it and in that same post asked me how I turned down the cartridge and drilled the bullet.
I told him that I would be glad to email him the drill sizes and that I would include some photos of the process. Over the next couple of days I received 8 emails from IAP members asking if they could have the same information. I emailed them all back and said O.K.. I figured what the heck, as long as I'm doing it anyhow it won't be a problem to shoot everybody an email. So, I began putting a LITTLE something together and pretty soon it turned into a BIG something.
Before I started, the thought of a full blown tutorial never crossed my mind, but now I thought heck, I've come this far, why not?
So that's the long answer.
Before you read this I want you to realize that this is my way of doing things. It's not the right way nor is it the only way. If you learn something, take it and run with it. I'll be looking forward to learning from YOUR tutorial in the future!

I use 25/06 brass and bullets. It fits an A mandrel perfectly which makes it easier, especially when making 7mm pens.



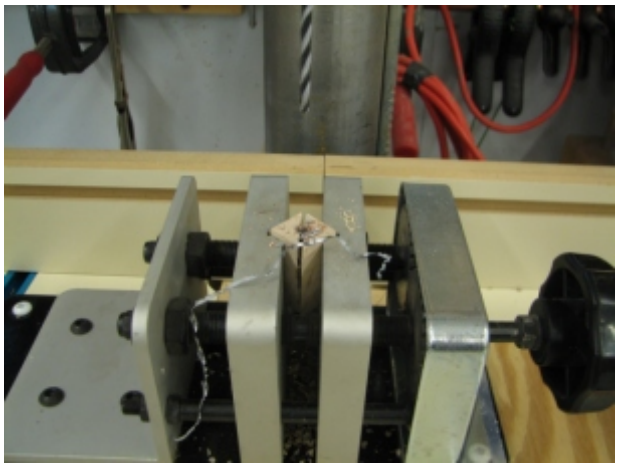
This is what I use for working with the cartridge. It's a piece of hardwood turned to 3/4" with a ½"hole all the way through. Cut a cross in it with a bandsaw and you end up with a collet. You can then put it in a Beall chuck, a drill chuck or a pen vise. It also keeps the brass from getting scratched.



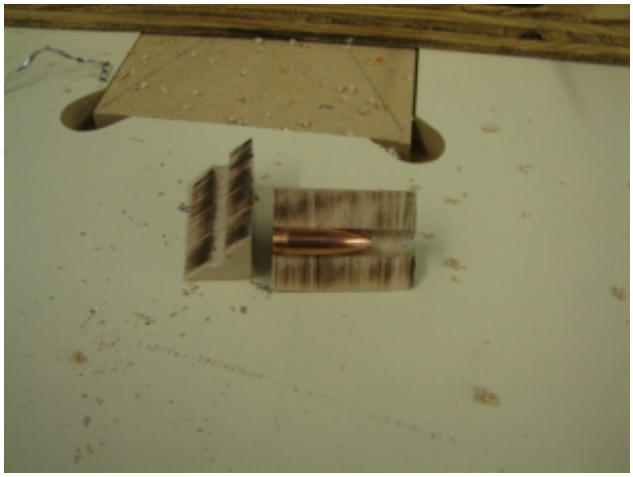


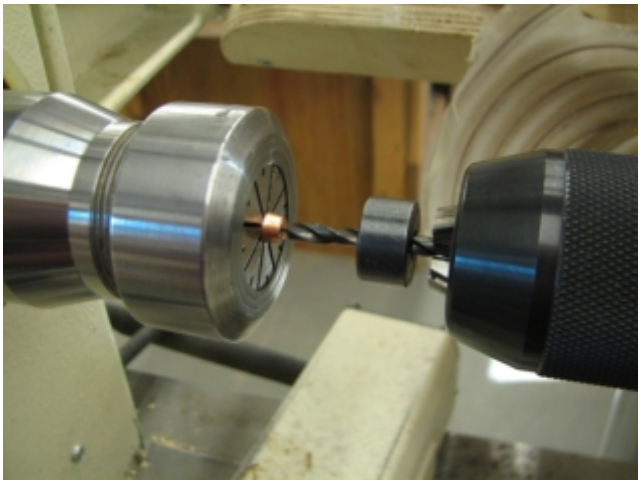
See this?

If you have a vise like this try cutting a shim to fit snugly in this position. It cuts down on movement which is good.

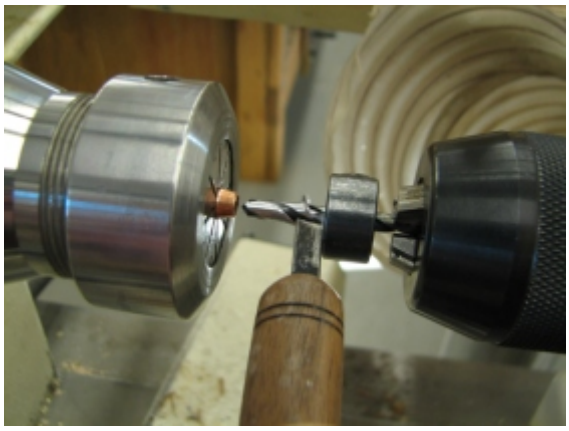


For drilling the bullet I have found 3 methods that work for me. The v-block above, my little wood block or the Beall chuck below. The wood block is 3/4" square with a 1/4" hole drilled in it. I then cut it in half and use it in my pen vise. Whatever method you use, the little centering drill pictured below will help. Use it to put a little indentation in the back of the bullet before you start drilling. As it's name implies it keeps your drill bit centered and prevents wandering. I used to use it on both ends but now I do all my drilling from the back of the bullet. It saves me a step and seems to work just fine.

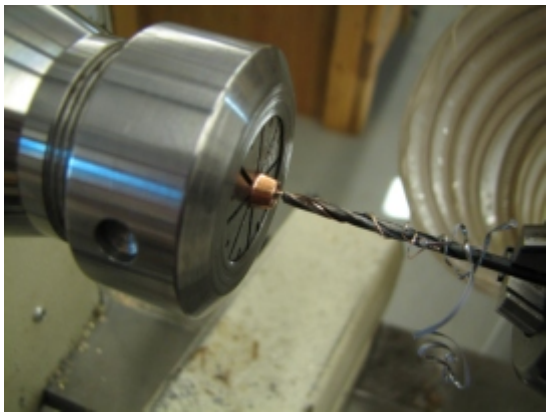




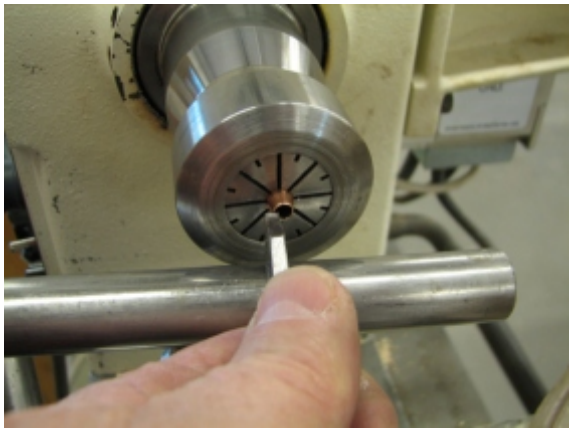
These top two photos show bullet length and drilling depth for a Parker style pen. A Parker refill uses a 5/32" drill for the back and a #38 drill for the tip. A Cross type refill uses a 9/64" drill for the back and a 5/64" for the tip. Also, on a Cross refill you need to leave about 3/16" at the tip for the small drill whereas with the Parker I leave just over 1/4". Your bullets might not be the same as mine but the diameters of the drills won't change. Neither will the amount of bullet left at the tip for the small drill to go through. The only thing that will change will be the depth at which you drill with the larger of the two bits.



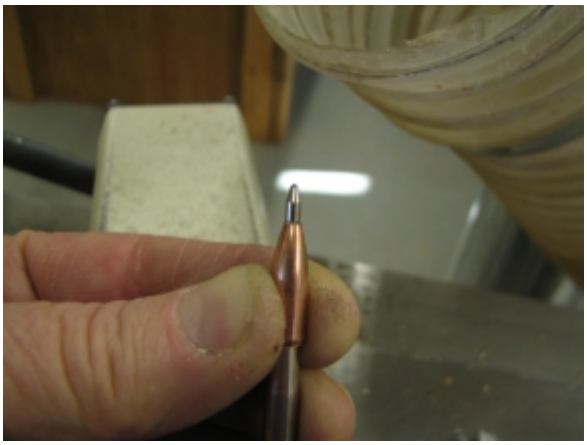
This photo shows me cleaning the lead from the bit. Back the bit out often for this. As you drill deeper it will fill up with lead and feel like it's binding up when you back out. That's normal. Drill to depth several times until no more lead comes out with the bit.



This shows drilling with the smaller bit. Not much meat to go through here so the constant backing out is not necessary. Just go slow and drill straight through.
Also, for what it's worth I drill at 750rpm.

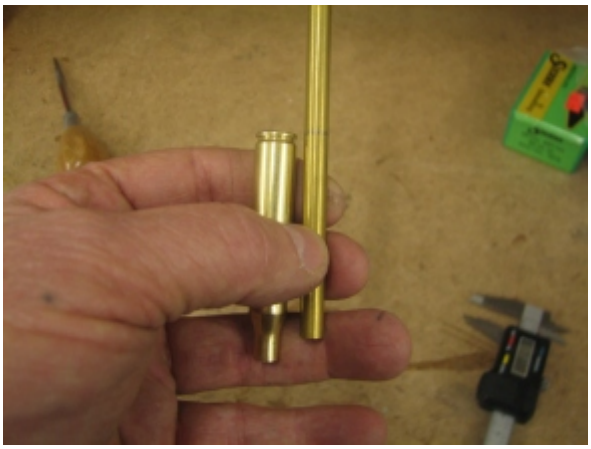


These top two photos show a step that is only necessary for the Parker type refill. I remove about half of the little "boat tail" on the back of the bullet so the shoulder of the refill won't hit. Again, your bullets might not be the same so test fit often, use your calipers and keep notes. Lots of notes!



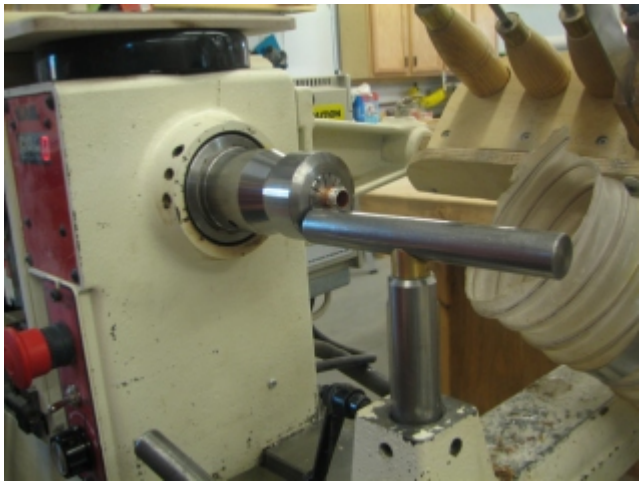
These show how much stick out you have with the Parker on the left and the Cross on the right. It seems like a lot on the Parker but you have to remember about the spring. How deep you drill the larger hole determines spring tension. This amount of stick out seemed to me like a good compromise between hole depth and spring tension.

Drilling the brass is pretty straight forward. You can absolutely use the same size drill you use to drill your blank, however, since I will be soldering the tubes in I like a tight fit. For the slimline I use a letter"I" bit. The 8mm Round Top Euro uses a letter "O" and the Cigar takes a 25/64".

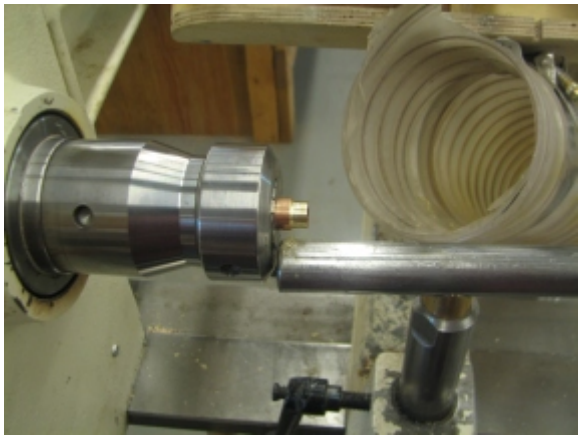


For the slimline I cut my own tubes. The standard tubes are just a hair short for me. The photo on the right shows how I treat the end you solder. I make four little cuts with the Dremel tool just so there's a little more soldering surface.
The tubes for the Euro and the Cigar are used right out of the bag.
No modifications whatsoever.
Now seems like a good time to talk a little about soldering. Absolutely the most important thing about it is CLEANLINESS. This includes the surfaces to be joined, the soldering iron and the solder itself. I use 400 grit wet/dry paper to clean the tubes and the cartridges. I have a block of sal-amoniac and a file for cleaning the iron and I use a clean dry cloth to wipe off the solder if need be. If you can't find sal-amoniac you can file the tip and wipe it on a damp towel while it is hot.

The first photo shows a liberal amount of flux applied to both parts. After I put them together I apply some more. The flux and solder are the same you use for soldering copper water pipe. You can get it at any good hardware store. The next is applying the solder and the last three show the finished product. First is the slimline, next is the Euro and finally the Cigar. You'll notice that in this step neatness doesn't count. The idea here is to get full coverage, it will all be turned away in the next step. One more thing. When you first start, the cartridge will be cold and the solder won't flow well. Just keep "bubble gumming" it on and by the time you get half way around it will be hot and will start to "flow". I'm using a 40 watt soldering iron.



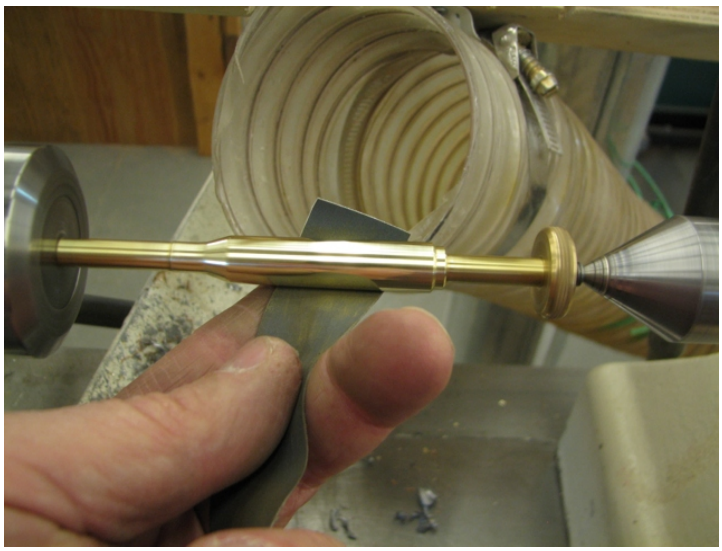
Here we are ready to start turning away the excess solder. I'm using a ½" skew but a parting tool would work fine too. The important thing is that whatever you use it has some sort of a pointy end to it so you can get in the corners. Turn down the cartridge rim at this time also.



This photo shows the solder turned away on the Parker style.
The Cross style doesn't have the tube sticking out of it so I just put it in the Beall and drill it out using a 1/4" bit. You have to be real careful doing it this way but it works for me. The alternative would be to use a smaller bit, say a 7/32", and follow with a Dremel tool. Which ever route you choose, after drilling there will still be a little solder that the drill couldn't get. This will need to be cleaned up using either the skew or the Dremel tool.

That brings us to polishing. Nothing tricky here. I start with 2400 micro mesh and continue through all the grits to 12,000. Final step is some Wrights Brass Polish. I suppose any good brass polish would work. The only reason I use Wrights is because that's what was under my kitchen sink when I started doing this and one bottle lasts a LONG time!

I'm showing you my sanding set-up because it works really well and I think sanding is a process that needs to be organized and simple. Heck, it's almost a like a religion for some of you guys.(and gals!) I cut all my sanding medium into 1" strips. I use a paper cutter for the paper and scissors for the MM. I use large paper clips for the paper strips and small ones with the little handles removed for the MM. They all hang from a magnetic strip fastened to the lathe. Starting from the left is 400 and 600 wet/dry for plastic and CA. Then MM for CA, wood and metal and finally 400 and 600 for wood. 220 is kept on the back. That's the lowest grit I use and not very often. I really like using the MM this way. You start on the loose end and let it slip through your fingers while sanding. When you reach the end it's time for the next grit. All grits get equal time this way which I think is important.



This shows me polishing using a mandrel in the Beall chuck. You don't have to use a Beall. Notice I'm using tubes that I cut for spacers. You can do the same thing using a standard mandrel with a morse taper. This particular photo shows the set up for the slimline style.

Left photo is the 8mm Euro and right photo is the Cigar. These are both done using the B mandrel. If you remember correctly the 25/06 fits the A mandrel. However, both the A and B mandrels use the same size threads for the brass nut. The B mandrel will bottom out on the shoulder of the cartridge but the threads will stick through just enough to slide on a short piece of 7mm tube. The 8mm Euro just uses an 8mm tube for the spacer on the other end. The Cigar uses an 8mm tube and a standard Cigar bushing.

This last photo shows them all polished up and ready for the next step.

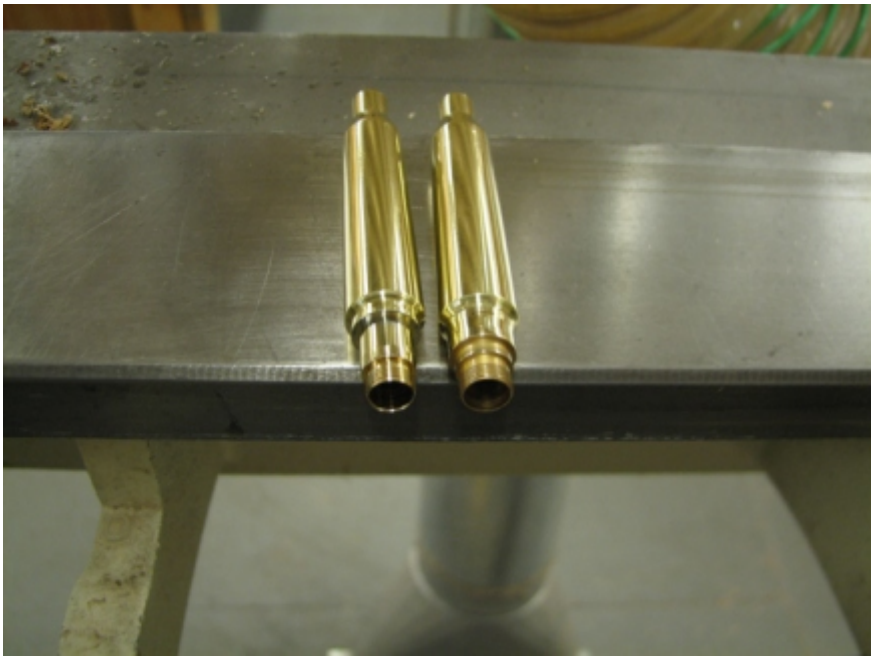
From left to right...7mm slim, 8mm Euro and Cigar.

The next step is installing the couplers. This shows the 8mm Euro. The Cigar is done the same way. The 7mm does not use a coupler.

This photo shows the Cigar on the A mandrel ready to be turned. The next photo shows the coupler with it's shoulder turned down to the same diameter as the tube it's pressed into.

This photo is the 8mm Euro. Notice how it's mounted. The coupler is too small for the A mandrel to go all the way through so I just put my live center inside the coupler. It doesn't take much pressure to turn it so don't crank down too tight on it. When doing this one space was a little tight so I used my 1/8" parting tool.

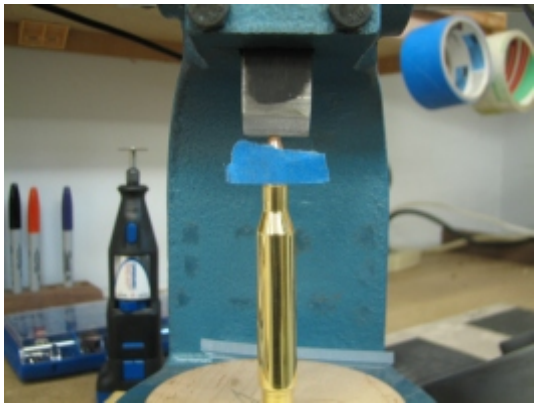
I just realized what I am calling a "coupler" the instructions call a "twist holder".Please edit in your mind!!



Parker style cartridges done and ready for bullets. Euro left, Cigar right.

First thing you want to do is chamfer the cartridge so the bullet fits better. The little tool you see allows me to chamfer both the inside and outside. The outside usually has a little burr on it so this tool is perfect. You can get them at Arizona Sillhouette. One drop of mineral spirits on a Q-tip cleans the inside nicely.

The first bottom photo shows the cartridge in the press ready to go. I made that wood block a little longer than it need be. It prevents me from slipping and going too far on the initial press. I then remove the block and try the refill. I see how much it needs and then put a little piece of tape on the bullet so I can better visualize my progress. Then it's just a matter of press and fit, press and fit, until I get it just right.

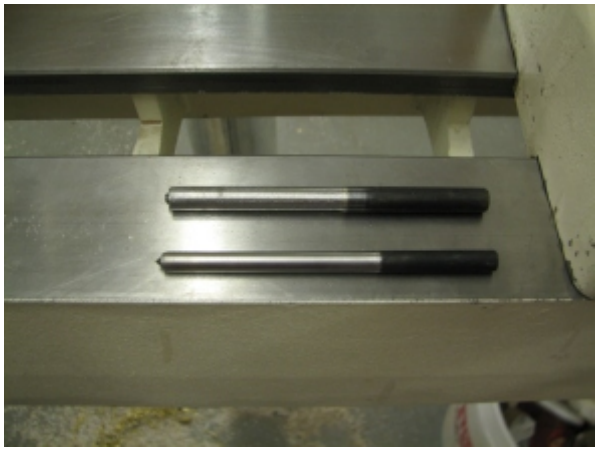


This shows how I press in the transmission on the 7mm. With the bullet already installed you need something that will allow you to press fit the transmission without pressing in the bullet as well. I made a little wooden block with a hole in it. This allows the shoulder of the cartridge to ride on the wood while pressing in the tranny and keeps the bullet from moving.

These are the final dimensions. Top left is the Cigar with coupler and bullet. Next is the 8mm Euro with coupler and bullet, and finally the 7mm with transmission and bullet installed.

That brings us to the final step, the cap end. I'm not going to say much here because this is the part where you have some freedom to do whatever you like. There are a few things though, that you need to know.

As you can see, with the cigar(top) and the Euro, the cap needs to be approx. ½"longer. I cut my blanks about 3/4" longer to start with. Because the blank is longer than the tube the bushing won't fit one end. I solved this problem by using the same set-up I use for closed end pens.

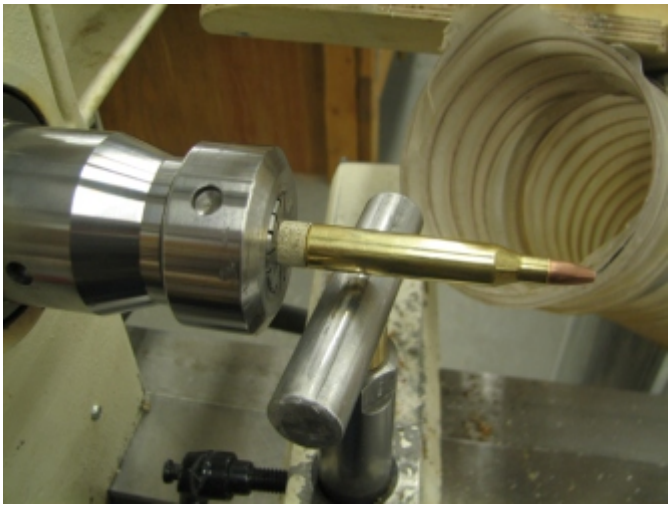


The first photo shows a couple of transfer punches ground down to fit inside the brass tube. I did this by chucking them on the lathe and used a combination of grinder and sandpaper to get them to fit.

You can also make this out of wood. The only important thing is that it is a "snug" fit. Take your time and check the fit often. The difference between "snug" and sloppy happens in a heartbeat so be careful. I realize "snug" is a relative term but you'll know it when you feel it. You shouldn't have to force it on but if you turn it upside down it shouldn't fall off either. Between the black and the shiney part is a little taper. When doing a closed end you can wedge your blank here and it will hold tight. When making these caps you need to have the end clear so I use some masking tape for a little extra hold.

While the standard bushings are a problem for final shaping, they work fine for turning the blank round. Truth be told, I have used the standard bushings to make the caps but I like the method I just showed you better. If these suggestions still don't work for you, you can always buy longer tubes and cut them to length yourself. This way you can turn the cap just like any other pen UNTIL you have to cut the recess in the end. Then the Beall or my other method will come in handy.

Here's the cap in the Beall. I start by drilling it out to a depth of ½"with whatever bit was used to drill the hole for the tube. Then I widen the recess to fit the top of the cartridge.



I don't use calipers for this step. I get a better fit by turning a little bit and checking the fit with the cartridge. Go slow and check the fit often.

This next step is for the Cigar only and is not necessary but I think it helps the overall look. As you remember, the cap needs to be longer for this pen. This next step shortens it by 1/4". Only 1/4"?
Yeah, I know, but I've tried them both and TO ME this step is worth it. Besides, it's fun! It involves these little guys. The instructions refer to them as the clip bushing and the twist mechanism. From now on referred to as the "gripper" and the "tranny". This thing is getting near the end and frankly I'm getting tired of typing!

Anyhow, the gripper comes out of the bag with the brass tube 1.777" long. I take it to the sander and shorten it to .830"

Next I shorten the tranny to 1.465" using the sander as well. Don't sand too much off or the guts will fall out of the tranny. DAMHIKT!
Back to the gripper, there's a little shoulder inside the brass tube that is .241" long. It needs to be shortened to approx. .085".
A letter "L" drill bit works fine for this. Put a piece of tape on your drill bit for a depth gauge and go slow.
Next the cap itself needs to be shortened. The full size cap I started with was 2.445". I took off 1/4" and ended up with 2.195". Thats .250 off the cap and .224" combined from the gripper and tranny.
Not the perfect 1 for 1 I was shooting for but it works, so WHO CARES!

Here's a photo of all three pens together. Top is the 8mm Euro. Next the shortened version of the Cigar and finally the 7mm. The Euro and the Cigar caps started out the same length so you can see what a difference shortening it by 1/4" made. There's no finish on these, just the brass polish for the cartridge and the Beall buff for the antler. When I do finish them I clear powder coat the cartridge and use CA for the antler.

Well, that's it. Absolutely EVERYTHING you wanted to know about making cartridge pens....NOT!!

What I hope I have done though is take some of the mystery out of it, especially for the beginner. When I first started, the first style pen I made was the Slimline. Then I read Don Wards tutorial on cartridge pens and that was it! The very next pen I made was one like in his tutorial. That was my fifth pen and that's why I know that a beginner can make this pen.

Like my first, your first cartridge might not be very good, but I GUARANTEE you'll be proud of it, and you'll want to get better.

Have fun and I'll be looking forward to seeing your photos!