



FORGE

Dedicated to the revival of the King of Crafts

Vancouver Island Blacksmith Association
www.viblacksmiths.com



VIBA Blacksmith Shop 2017

Old School" #4 - The Suffolk Latch, Part-1, hot work

By Mark Aspery

<https://www.youtube.com/watch?v=4LgmLPpC4bU>

Current Events:

Monthly meeting Sunday, April 30, 2017

Leatherworking course see below for details

Demo/production The first Sunday of the month. John W will be demonstrating Italian leaves. April 2

2017 Executive

*President: Neil
Gustafson*

VP: Dan Cram

Secretary: Charlie Low

Treasurer: Norm Norby

Editor: Brody Smith

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Secretary's Report

By: Charlie Low

February 2016

Show and Tell:

Benoit brought a lovely leather sheath he made for his folder, with white leaves on a dark brown background. John brought in his production for the fairs from the last couple of months. There were 18 items including hooks, gate latches, and a whole raft of other things. He also brought in a nice bit of ebony which he paid \$10.00 for. Wes brought in a lovely dagger and a bracelet, Deryk brought in a set of straight razors and a punch, Charlie L brought in a boxing octopus coat hook, which had led a hard life- it had been welded back together 3 times. He also brought in a rasp asp, complete with emerald eyes. Neil brought in the print-out of the 366 hooks made by a pretty talented smith, at Cloverdale forge, available on instagram, one a day for a year, and all different. He also brought a picture of a very well made pair of callipers.

Financial:

We are still well in the black. As well, we have the finances organized for Caniron separate from Viba now. Now it is just a matter of organizing payments through the internet (I am sure glad I am not involved in that! C.)

New Members:

Steve Martin and Raven Robinson

Old business: N/A

New Business:

Glen thanked the club for electing him a lifetime member. He got a round of applause.

Ben is working on the library, with more shelf space on the right side of the pantry. Books must be signed out and signed in, since when they are just borrowed, they have a real tendency to go missing.

The Blacksmithing Course will be starting in about 2 weeks, on March 11. At the moment this was announced, there were 14 students signed up, but I had a distinct impression that 3 more signed up on the spot.

We are making progress with getting Caniron up and running- the governors of the college are in the last stages of giving a final OK. We still need a theme. Canada 150 seems popular, but if anyone has any other suggestion, feel free to get in touch and let us know about it. We are going to need coke for Caniron. The college has LEEDS certification, which means, among other things, that we can't burn coal. Neil is in touch with Jake about getting coke. We can also use propane, and if we want, charcoal. There was a suggestion that we get organized and make a bunch of charcoal, for use, but also as a demonstration, or possibly, since none of us has ever made it in quantity, as an experiment.



Have something you would like added to the newsletter Email it.

Arcingbrody@gmail.com

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Secretary's Report

By: Charlie Low

March 2017

Show and Tell:

John brought a barbecue fork, Brenden brought the 4 way axe he has been working on for quite a while. It is one axe head cut in half and welded to the sides of another, so it would make 4 pieces of wood rather than just the 2 a regular axe would make. It has a full length handle. He is planning a couple of decorative rivets in the handle, with one currently inserted into its hole and only needing a head on the far side to be finished. Harry brought a set of coat hooks, on a steel fish skeleton, probably of a coho. Ben brought in a leg vise he restored, built in 1899, and a bushing to reduce a hardy hole from 1 ½ inches to 1 inch, as well as a leather knife sheath. Terrace brought in a cleaver made from a farrier's rasp, and Laurie brought in some farrier's rasps as well as a bucket of horse shoes. Neil brought in a copy of Ignite Magazine, and Sebastian brought in the tree he has made to hang jewellery on for the fairs.

Financial:

We are still solvent, and have a bank account and a Pay Pal account set up for Caniron. We are not yet accepting registrations as the numbers have yet to be finalized.

New Members:

Dorian Bibault

Old business: N/A

New Business:

Business: Caniron (Teus Jul 4 to Fri Jul 7) is becoming more and more organized. It looks like we will have parking, including overnight parking at the church across the street from Kwantlen College, and there may be a meal package organized as well.

We have coal! Glen has a brother in Courtney who has a nephew who drives truck in Courtney, who went out to Quinsam mine and got a truck and pup full of coal and brought it down. There are a lot of fines. One of the best things to do is sort out the chunks, wet down the fines and make black snowballs which can be used just like chunks of coal. If you pile the fines on loose, they have a tendency to smother the fire.

There will be another demo/production day next Sunday, the first Sunday of the month. I understand that John W will be demonstrating Italian leaves.

There is a plan to sell personal grinding belts. Fraser has a source at a modest price, and the plan is to have a stash of nice new belts in the office, and a cash box to pay for them. People will buy their personal grinding belt(s), put their name in it, and keep it for themselves. The worn shop belts will still be around, but as anyone who has used a nice sharp new belt knows, the new belt is way better.



Have something you would like added to the newsletter Email it.

Arcingbrody@gmail.com



The difference between "Scrap" and "Someone's work"- Sunday I was working at the front forge, and there was a scrap of cable, welded at the ends, with the twist tightened. A couple of the new guys were inquiring about it, and I explained a bit about cable damascus. They wandered off, apparently taking the bit of cable with them, because when the guy who was making the cable damascus turned up looking for it, it was nowhere to be found. If a worked bit of metal is lying around where someone would have put it, like on a forge, it may look like scrap to you, but you have to realize it is actually someone's pride and joy. The material that actually is up for grabs is under the counter, at the back of the shop, and around the back. Anything else, just let it lie.

Chas

Saltfork Craftsmen Artist-Blacksmith Association

February 2015

Loop Weld Heart Handle - R.B.



1
3/8" mild steel rod.



2
Upset an area at about 10" or 12" from the end. Then upset and scarf the end.



3
Bend scarf flat against upset area, heat, clean and flux.



4
Forge weld joint and then flatten out the remaining loop.



5
Forge a blunt taper on the end of the loop. Keep to the outer end as much as possible to avoid thinning the loop sides.



6
Begin spreading loop with a chisel. Avoid stressing the weld. Gripping weld with tongs while spreading can help if needed.



7
Continue spreading on the anvil horn. Spread the outer end most.



8
Bend outer 1/3 of loop on rounded edge of anvil then turn over and roll point in on anvil face until you have a flat heart shape. Fine tune curves on the horn as required.



Happy Valentines Day!

Patch Knife

Franklyn Garland
The Hammer's Blow, Winter 1993-94

This knife is made out of an old file --recycled. Some folks forge the blade first, then the handle I find the shorter, smaller, forged handle easier to hold for forging the blade. But sometimes, depending on the maker, it's easier to forge the blade with the handle half finished. Complete the handle when the blade is finished.



6 Forge the point.



7 - Curve into cutting edge.



8 - Pack (thin out) edge. Blade will straighten, and also widen, as edge is forged.

9 - Anneal entire piece in wood ashes, lime, or sand. After annealing, clean up the profile and grind the cutting edge. DO NOT grind cutting edge any thinner than approx 1 mm.

HEAT TREAT: For best durability, heat treat as follows.

Using acetylene torch, "paint" the cutting edge with flame until non-magnetic. Note: magnet will not stick - it's a full orange color.

Quench in light oil.

Clean off all excess oil and temper in a household oven at 450 degrees for 30 minutes.

Grind and hone to final edge. A wire brush finish looks good.





Tenon Ratio Tables

Gerald Franklin

Use the tables below to quickly determine correct shoulder placement for drawing out tenons. The tables give the amount of increase per unit length of tenon given the starting and ending dimensions:

Example: If you have a 5/8" square bar and want a 1/2" round tenon on it, Table 2 tells you that the finished tenon will be 2.0 times longer than the shouldered piece. So, if you want a tenon that is 1 1/2" long, shoulder the piece 3/4" from the end (the desired finished length divided by the number from the table.) This should give you enough material for a tenon of the desired length (3/4 X 2.0 = 1 1/2). Always start shoulders a minimum of one half the cross section from the end of the material.

Table 1: Round to Round and Square to Square


		Finished Tenon Size							
		1/4	5/16	3/8	1/2	5/8	3/4	7/8	1
Starting Bar Size	1	16.0	10.2	7.1	4.0	2.6	1.8	1.3	1.0
	7/8	12.3	7.8	5.4	3.1	2.0	1.4	1.0	
	3/4	9.0	5.8	4.0	2.3	1.4	1.0		
	5/8	6.3	4.0	2.8	1.6	1.0			
	1/2	4.0	2.6	1.8	1.0				
	3/8	2.3	1.4	1.0					
	5/16	1.6	1.0						
	1/4	1.0							

Table 2: Square to Round


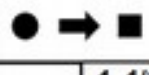
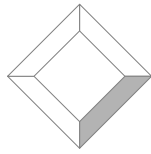
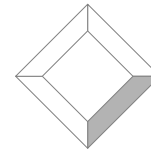
		Finished Tenon Size							
		1/4	5/16	3/8	1/2	5/8	3/4	7/8	1
Starting Bar Size	1	20.4	13.0	9.1	5.1	3.3	2.3	1.7	1.3
	7/8	15.6	10.0	6.9	3.9	2.5	1.7	1.3	1.0
	3/4	11.5	7.3	5.1	2.9	1.8	1.3		
	5/8	8.0	5.1	3.5	2.0	1.3			
	1/2	5.1	3.3	2.3	1.3				
	3/8	2.9	1.8	1.3					
	5/16	2.0	1.3						
	1/4	1.3							

Table 3: Round to Square

		Finished Tenon Size							
		1/4	5/16	3/8	1/2	5/8	3/4	7/8	1
Starting Bar Size	1 1/2	28.3	18.1	12.6	7.1	4.5	3.1	2.3	1.8
	1 3/16	17.7	11.3	7.9	4.4	2.8	2.0	1.4	1.1
	1	12.6	8.0	5.6	3.1	2.0	1.4	1.0	
	7/8	9.6	6.2	4.3	2.4	1.5	1.1		
	3/4	7.1	4.5	3.1	1.8	1.1			
	5/8	4.9	3.1	2.2	1.2				
	1/2	3.1	2.0	1.4					
	3/8	1.8	1.1						
	5/16	1.2							
	1/4								



New VIBA Raffle



Below is the new raffle tickets for every item/items made. The value must equate to 20 dollars per entry, there will be four draws this year. The prize will be one of the three volumes of Mark Asperys books and mystery fourth prize.

Volume I:

Mastering the Fundamentals Of Blacksmithing

Volume II:

Mastering the Fundamentals of Leafwork

Volume III:

Mastering The Fundamentals Of

Traditional Joinery

A box will be placed in the shop for tickets. You must place a price tag on your item to be considered entered or you be **Disqualified!**



VIBA Helping Hand Raffle Ticket

Name: _____

E-mail: _____

Item made: _____

_____ How many _____

Note: Minimum item value 20\$ per raffle entry. Items without A price tag will be **Disqualified!**



VIBA Helping Hand Raffle Ticket

Name: _____

E-mail: _____

Item made: _____

_____ How many _____

Note: Minimum item value 20\$ per raffle entry. Items without A price tag will be **Disqualified!**

Patented Sept. 21, 1926.

1,600,602

UNITED STATES PATENT OFFICE.

GEORGE SCHRADER, OF BRIDGEPORT, CONNECTICUT.

POCKETKNIFE.

Application Filed October 6, 1925. Serial No. 60,731.

Editors Note: The entire patent can be seen on the US Patent website: www.uspto.gov -search by patent number.

Excerpts from the patent text.

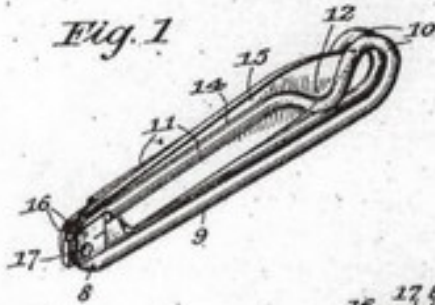


Fig. 1 shows a perspective view of my improved form of pocket knife;

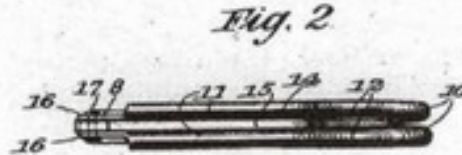


Fig. 2 is an edge view of the same;

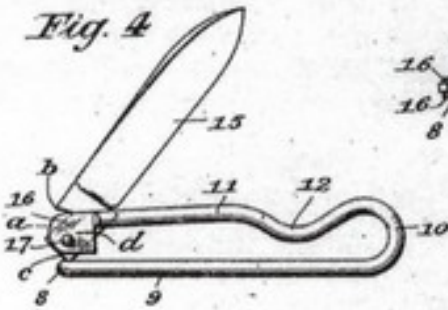


Fig. 3 is a back view as seen from the opposite side of that shown in Fig. 2

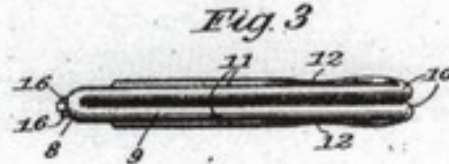


Fig. 4 shows a side view of the same knife with the blade in open position;

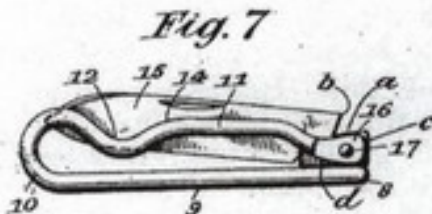


Fig. 5 shows an end view as seen from the near end of Fig. 1;

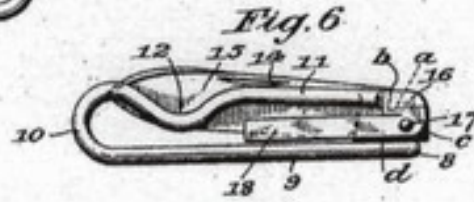


Fig. 6 shows a side view of the knife illustrating a slight modified form of wire handle, and



Fig. 7 Shows a further side view of knife including a simplified feed form of handle.

As before suggested the handle is formed throughout of a single piece of heavy wire, that is bent and shaped to form a handle.

INVENTOR
George Schrader
BY
Chambulain & Newman
ATTORNEYS



Finding the U.S. Patent reminded me of this small pocket knife that was made by Brent Cole, a MABA member-
The blade is made of L-6 (a band saw blade) and 5160 for the spring handle.

Photo and text by Steven Sporre

Labyrinth Leathercraft

Local leathercrafters Campbell Orr and Amanda Bennett of Labyrinth Leathercraft will be offering a course in leatherworking, introductory tooling, and knife sheath making that a few VIBA members have taken already. The classes will include two full days of instruction, and include all materials and use of all tools necessary to learn on and to craft a final knife sheath to take home.

There will be two instructors and only three or four students, so there will be a great deal of personal attention. The class will cover how to prepare leather for tooling, the basics of tooling designs into the leather, how to dye and antique leather, how to finish and seal leather, and how construct and hand stitch a friction-fit knife sheath. There will also be time allotted for questions such as how to adapt the techniques shown to other styles of sheaths. After the class, students may purchase blank leather sheaths suitable for tooling from Campbell and Amanda in one of three sizes for future tooling projects, at near cost.

The classes are to be held in their workshop near the Bay Street Bridge downtown, and run on a Saturday and Sunday, from 10:00 AM to approximately 5:00 PM each day with a break for lunch.

Labyrinth Leathercraft is offering VIBA members a \$11.20 discount off the cost of the class, so be sure to mention your membership when signing up! The discounted cost is \$165 plus taxes, and includes all materials. Payment can be made via cash, credit card, etransfer, or PayPal. If you are interested in participating in one of the above dates, please contact Campbell by a method below (email is preferred):

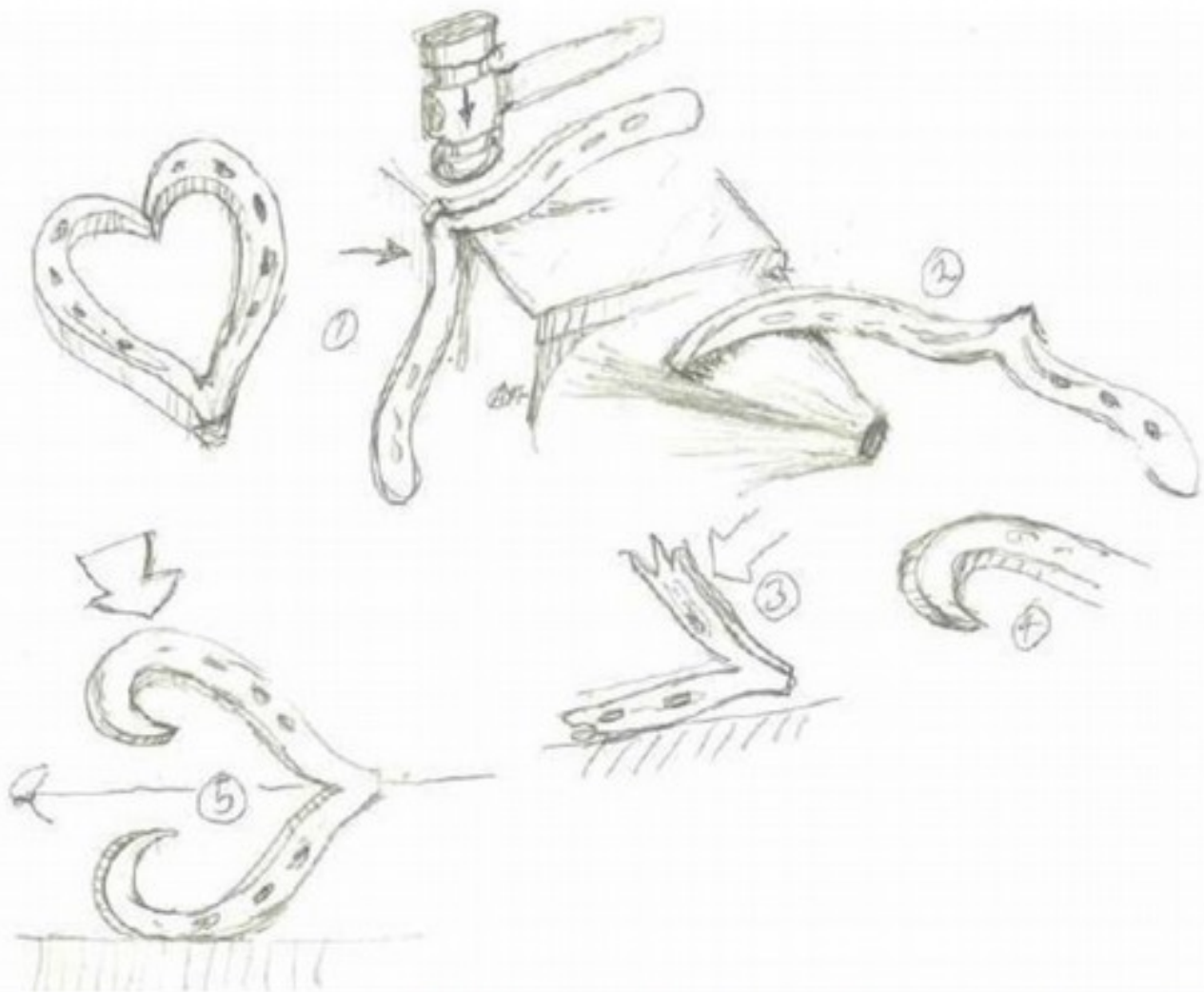
Website: <http://labyrinthleather.com/>
Email: labyrinthleathercraft@gmail.com
Phone/Text: (250) 507-4884

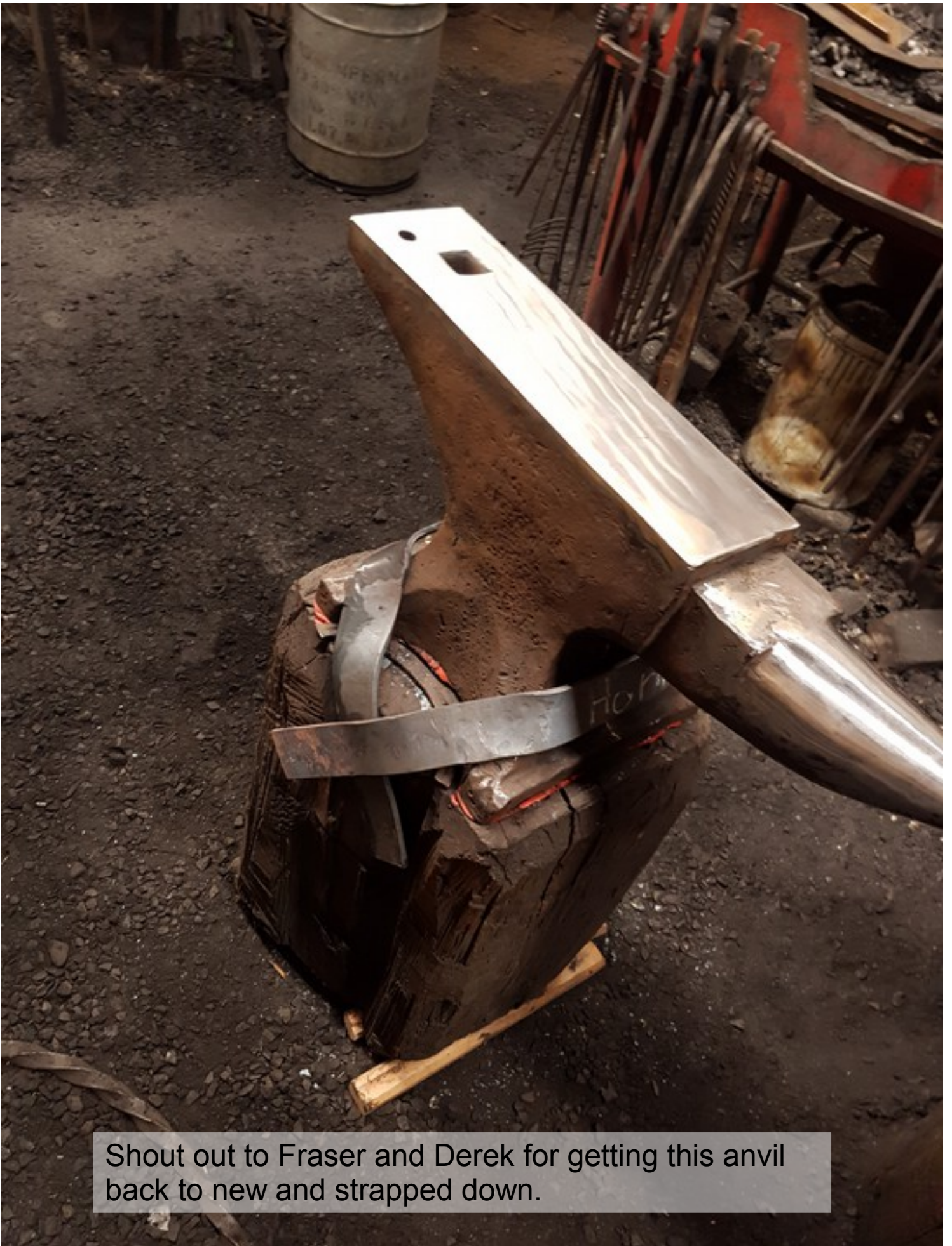
Horseshoe Heart

Drawings and text by:
Steve Alling, A MABA member

1. Find the center of the horseshoe, open out and hammer the center into a dull point.
2. Taper the two ends.
3. Close the center to sharpen the point.
4. Curl the ends.
5. Tap the curled ends closed.

Note: If the shoe has any protrusions they need to be cut off and some shoes are not symmetrical and finding the center can be tricky. Also I found that all my used shoes have been worn unevenly from side to side. When you do the taper in step 2 because of the different mass it makes it a little difficult to make the two halves the same length. If the shoes are terribly worn getting the two halves drawn out equally is a problem. I found that the hearts looked better if they were obviously not symmetrical than just a little bit unsymmetrical. So I purposely make them that way. The holes in the shoe can be used to attach it so have some appropriate nails to go with the shoe. Or it can be made into a trivet with the addition of legs.





Shout out to Fraser and Derek for getting this anvil back to new and strapped down.

Anvil Repair- © Robb Gunter and Karl Schuler

Developed with the help of several metallurgists and welding engineers at Sandia National Laboratories and used on several hundred anvils with great success.

	Anvil Buildup	Hardsurfacing Anvil
AFM		AFM 800
Arctec	41 CNMg	60 Ecoface
Arctec Ray 778 846 6207 Sales Wayne 1 866 272 8322. Shipping costs about 10\$		
Alloy Rods	SuperWH	
Certainium	245	267
Eutectic	3205	N2
Hobart	MC	TUFANHARD 550, 600
Lincoln	Wearshield 15CrMn	
McKay	Chrome-Mang	HARDALLOY 58
Messer (MG)		760
Rankin	Ranmang3	
Rexarc	MN-100	
Stoody	2110	21 / 1105

Preparation

- 1) Expose good, clean material. Grind through all folds or fractured chips.
- 2) Chamfer any holes or severe depressions in preparation for welding.
- 3) **Preheat a wrought iron base anvil to 400 degrees and a cast iron base anvil to 450 degrees.**

A propane-fired weed burner works well to preheat the anvil. Verify the temperature with a Tempil Stick crayon (available at a welding supply store) which melts at a given temperature. (i. e., 350 degrees, 400 degrees, 450 degrees. Be careful to not overheat the anvil, particularly the heel and hardy hole area, as it's a thinner cross-section and heats faster than the more massive parts.

Build Up:

For a **wrought iron** or **cast steel** anvil, use Stoody 2110 (or equal) 3/16" rod (DC reverse works best; however, it will run AC); (Hard facing Stoody 2110 electrodes are designed for build-up of austenitic manganese parts subject to high impact loading Modified high chromium - high manganese steel which combines toughness and wear resistance.)

Unlimited passes. Expect 45 Rockwell C as welded.

If the **hardy or pritchel hole areas need repair**, inserting a chill (or form) made of 1/16" sheet copper into the respective hole before welding. This will save a lot of grinding and filing to true up the hole.

Hardsurfacing:

For **no more than three passes** (or layers thick) use Stoody 1105 (or equal) 1/8" rod (DC reverse, or AC); expect 50 to 52 Rockwell C as welded, ideally consistent with the original hardness of the tool plate.

(Stoody® 1105 a particularly good match for the W-1 tool steel tops of most anvils. Designed for use on carbon and low alloy steels, it contains alloying elements in its coating. Provides good weldability and a high deposition rate. 1105 can be applied in stringer or weave beads using DC current, either polarity. Not recommended for use on manganese steel or cast iron. Typical applications include tractor idlers and rollers, sprockets, drill pipe etc.)

Hard surfacing rods are quite gravity sensitive during the welding process. Lean the anvil against a cinder block to 45 degrees while welding on the edges. (you will have more of the expensive welding rod on the anvil and less on the floor)

When welding a **cast iron** (not cast steel) anvil, a layer of NI rod (high nickel) **must** be put down first. Build up over the NI rod with Stoody 2110 (or equal); Unlimited passes (DC reverse); expect 45 Rockwell as welded. **For the last three passes** (or layers thick), use Stoody 1105 (or equal) 1/8" rod (DC reverse); expect 50 to 52 Rockwell C (if you don't exceed three passes thick.)

Repair to the Horn:

If the horn is blunted or slightly broken, put the end of the horn in a coal forge, heat it to bright orange and forge it out to the desired shape using a 12-lb. sledge to back it up and a 2-lb. rounding hammer on top.

Repair to the horn of a **wrought iron** /cast steel anvil can be accomplished with 6010 welding rod as needed. Repairs to the horn of **cast iron** anvils is usually done by welding with the NI rod and grinding.

Minimize the potential for stress cracking from welding:

After welding and you are sure that there is sufficient buildup to allow for grinding to the desired finish (check with a straightedge), **post heat back to 400 degrees** or verify with the Tempil Stick that the anvil is still that hot from welding. Pack the anvil in vermiculite (crushed mica available at most nurseries) or wood ashes. This will allow it to cool slowly for a minimum of eight hours.

Finish:

Start with a **24-grit cup stone** on a large body grinder. Note it's quite aggressive at removing metal. Be careful to keep it running flat (sparks coming off both sides of the cup stone).

Start with **24 grit flex back metal sanding disc** and in five or six steps (eg **24/60/100/120/180/240**) work down to 240 grit. All edges should be kept sharp and square.

Radius edges to your desired shape with **100 grit or finer sanding disc**, Near the anvil step the radii are typically ground to a 3/16" or 1/4" radius and tapering to nearly no radius at the heel of the anvil. The edge of the step and the heel are usually left rather sharp and only broken with a file.

Final polish can be done with a *Scotch Brite* disc.

Making Split Crosses

An article by Dave Custer, owner/operator at Fiery Furnace Forge Blacksmith LLC in Columbia Kentucky.



Well folks, it is freezing cold here in Central Ky. Today, while I was setting the tooling up and making samples, it was around 15 degrees in the shop. We've had eight inches of snow on the ground since last Sunday night....almost a week now. So on the subject of split crosses.....

The split cross is a subject that has been often covered in smithing articles. Hopefully you will enjoy reading about how I do mine, and maybe learn a new trick or get new ideas for you to use in your own shop.

For starters, we need to determine the starting dimensions of our cross blanks. In the past I have liked using a 3 3/4-inch long piece of 3/8-inch square bar. For this article I decided to do some test runs on some different size and proportions. So I cut some 5/16-inch square bar 2 1/8-inches long and 1 5/8-inch long.

The split cross requires a series of three cuts or splits to complete! You can use a band-saw, porta-band, angle grinder with a cutting disk, or hack saw.

The first cut is longer, the second is shorter

In my 3 3/4-inch long blank of 3/8-inch steel, the first cut is 2 5/8-inch long. The second cut is started at the opposite end of the bar from the first cut, and oriented to be 90-degrees to the first cut. This second cut is 1 3/8-inch long. It should overlap the first cut about 1/4-inch to 5/16-inch. If the overlap is too little, the resulting center hole in the cross will be too small, and if the overlap is too long the hole will be too large.

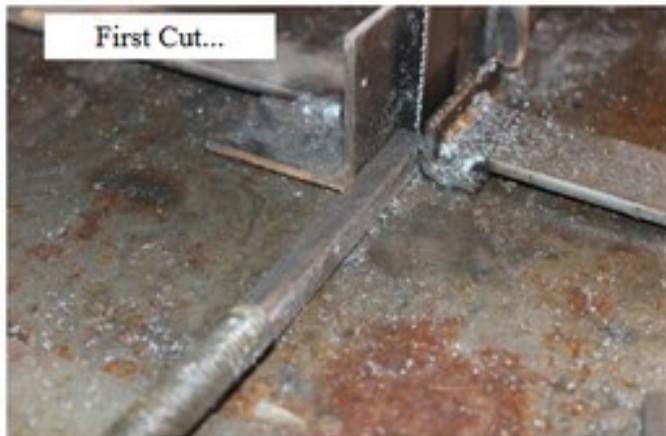
I use a horizontal/vertical band-saw with a horizontal table with a zero clearance slot cut around the blade. I have a set of jigs and stops that allow me to cut crosses without measuring. I use a long threaded rod to apply screw pressure to push the cross through the bandsaw blade. You can use a pair of vise grips to hold the steel and push it through the blade and a couple silver pencil marks to show where your cuts should be. Wear gloves, safety glasses, and ear plugs!

If you decide to use stops and guides, keep dummy blanks of your favorite cross sizes. This will allow you to set up your stops and guides quickly, without measuring. Simply slide your dummy blank onto the blade and set your stops up around it.

Blanks Ready to Cut...



First Cut...





The third and final cut is made in half of the long first cut. This will eventually be the top of the cross, so it needs to be trimmed shorter. I make this cut, approximately 1-inch from the end.

Before going to the forge, grind or file any burs off.

In the 2 1/8-inch blank cut from 5/16-inch square the long cut was 1 3/8-inch, the short cut was 7/8-inch, and the third cut was 5/8-inch.

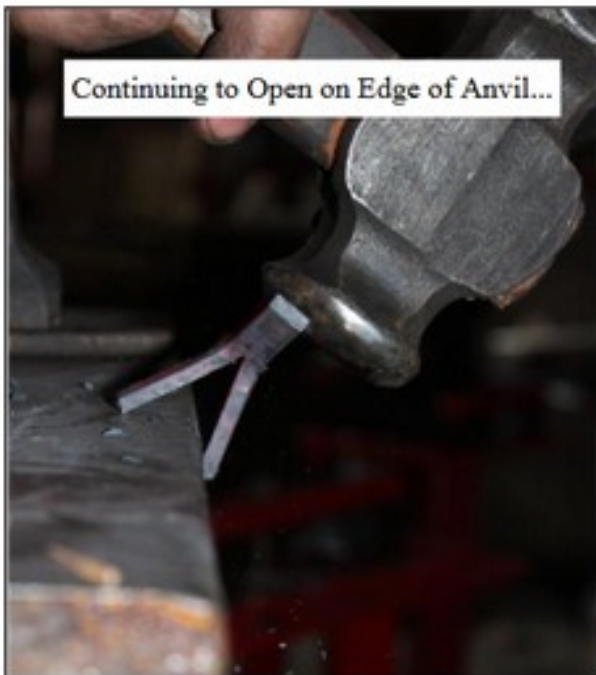
In the 1 5/8-inch long blank, the long cut was 1 1/8-inch, the short cut was 5/8-inch, and the third cut was 1/2-inch. Play with these measurements to create your favorite shape and proportion.

Now let's heat it up. A good pair of light, 1/8-inch flat jaw tongs, makes cross making very pleasant. Grab the thin section of the cross with your tongs.

Use a long thin chisel to open up the first section of the cross.

Then use a hot-cut to open up the other cut. The thin blade of the hot-cut gets the cross open enough so that you can use the edge of the anvil to open up the cross even more.





Continuing to Open on Edge of Anvil...



Now Move to the Face of the Anvil...



...and Carefully Flatten

Finally flip the cross over with the left and right "wings" facing up, and use a hammer to flatten the cross completely. This is a very critical stage in making the cross. As you gently hammer everything down flat, you can adjust your hammer blows to adjust how the cross bends as it is flattened. If you take care, you can control it sufficiently so that the cross requires no straightening or adjusting afterwards.

If the cross requires straitening, use the pritchel hole! It is a great way to adjust your crosses. The Hardy hole may also be used, but the pritchel is best.

Now comes texturing! You can go with a simple edge chamfer texture, ball peen texture, cross peen texture, or a favorite of mine, a bark texture. There are as many ways to texture a cross as there are people who make crosses.....experiment, play around, and have fun...



Straighten in the pritchel if required...



The Bark Texture Tool



Before and After Texturing...



Texturing Tools...



Some Texturing Variations...

Once texturing is complete, do any last minute straightening that is needed.

Other options include drifting the center hole to a circular shape which makes a "Celtic cross," melting a marble into the center, and adjusting the proportions of the sides, top, and bottom. For a Celtic cross, the overlap of the long and short cuts needs to be slightly larger so a drift can open it up a little.

To melt a marble in the cross center place the marble in the center hole and gently place it in the forge. Use a low, slow heat until the marble heats and sags into the center hole. Allow it to air cool.

To make the left and right hand sides of the cross small, decrease the length of the original shorter cut. To make the bottom leg of the cross shorter, decrease the length of the original longer cut. To make the top leg of the cross shorter, increase the length of the third cut.

A brass wire wheel will make a nice finish patina on crosses, and can be applied cold. You can also use a hand-held brass brush, but you must heat the cross up to approximately 600-800 degrees before brushing.

Once the cross has cooled, center punch and drill a hole in the top of the cross. I like to drill 3/16-inch as it is large enough for most key-rings. As with any iron-work, chamfer all drilled holes with a larger bit, and make sure there are no burs anywhere on your finished product.

I have included a number of various texture ideas to help get you started.....your imagination is your limit though, so be inventive, and try new things. I have tried to cover the major steps and technicalities behind split crosses in this article, but if you do not understand something or have questions, feel free to email me at blacksmithdave@gmail.com.

I hope you have enjoyed!

Dave Custer - Fiery Furnace Forge Blacksmith LLC



Drifting for the Celtic Cross...

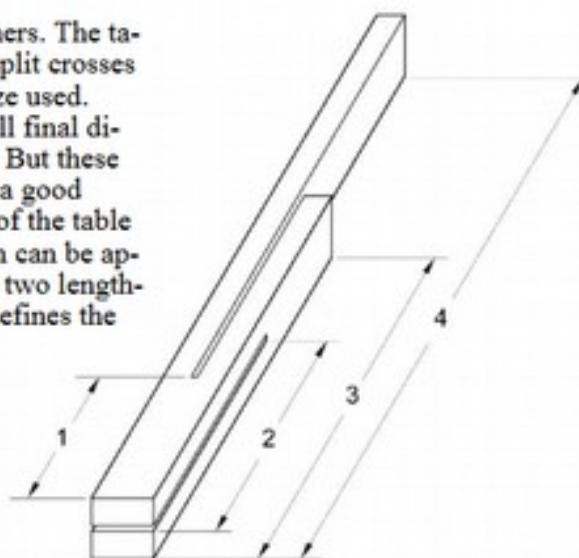


Melting a Marble...

Split Cross - Quick Dimensions

Dim	Width Dimension of Stock									
	1/4	5/16	3/8	1/2	9/16	5/8	3/4	1	1 1/4	Any Size
1	9/16	3/4	7/8	1-1/8	1-5/16	1-7/16	1-3/4	2-5/16	2-7/8	2.30 x Size
2	15/16	1-1/8	1-3/8	1-13/16	2-1/16	2-1/4	2-3/4	3-5/8	4-9/16	3.63 x Size
3	1-7/16	1-13/16	2-3/16	2-7/8	3-1/4	3-5/8	4-5/16	5-3/4	7-3/16	5.75 x Size
4	2-5/16	2-7/8	3-7/16	4-5/8	5-3/16	5-3/4	6-15/16	9-3/16	11-1/2	9.21 x Size

This information was provided by Jim Carothers. The table gives quick approximate dimensions for split crosses to get good proportions based on the stock size used. These dimensions are not really critical and all final dimensions are really subject to personal taste. But these dimensions would be a good guideline to get a good "look" to the final product. The last column of the table provides the basic ratios that were used which can be applied to any size of stock. The overlap of the two lengthwise cuts (dimension 2 minus dimension 1) defines the size of the opening in the center of the cross.



Quick Projects – Adjustable Bending Jig

Gerald Franklin

I saw this jig in Bill Phillips' shop. It's simple and adjustable by clamping in the vice. You can also drop a larger diameter pipe over the smaller one to increase the versatility of the tool.



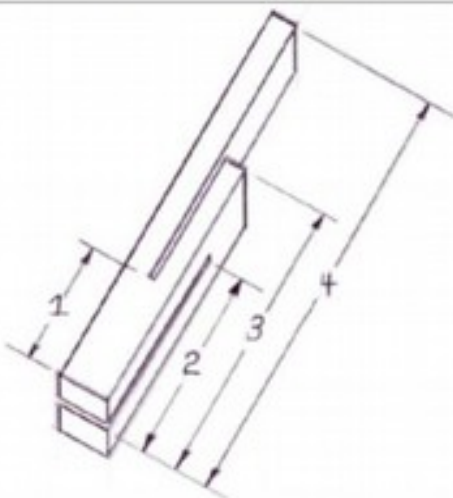
Split-Cross from a Pipe

By Dominick Andrisani

Many blacksmiths have created beautiful split crosses (a.k.a. Friedrich Cross) using solid square stock cut as shown in the sketch below. It is also fun to use the same technique to make split crosses out of pipe. When you are done the cross appears to be made out of pipe of half the original diameter. Typical dimensions are given in the table below.

Length#	Diameter of Pipe (inch)				
	1/4	3/8	1/2	5/8	3/4
	Length (inch)				
1	9/16	7/8	1+5/32	1+7/16	1+23/32
2	29/32	1+3/8	1+13/16	2+9/32	2+23/32
3	1+7/16	2+5/32	2+7/8	3+19/32	4+5/16
4	2+5/16	3+15/32	4+19/32	5+3/4	6+29/32

Dimensions for lengths shown below.



Split-cross lengths defined here for a square bar also work well for pipe (sketch and dimensions by Jeff Reinhardt)

If making your cross out of stiff copper pipe, make the three cuts shown in the sketch above. Cut the metal before annealing or the pipe may become so soft as to collapse while being cut. The second step of annealing the copper (getting it red in the fire) is very important to prevent the copper from tearing in the center where the four arms meet. You should anneal copper only in a space where there is good ventilation as some nasty fumes may be given off. If using soft copper tubing, the annealing step can

be skipped, as the copper is already soft and flexible. Allow the copper to cool or quench it in water. The copper should be worked cold.

Opening the cut-annealed-cooled pipe should be done slowly and carefully. Considerable stretching of the material in the center where the arms meet will occur. The opening should be done equally on each arm with an eye for symmetry. You can use any flat tool to help you open the cross. I used a wide chisel to get it slightly opened and gloved fingers to open it the rest of the way.



Partially opened 1/2-inch copper pipe. Take care that the opening in the middle remains symmetrical.



Fully opened piece, but the four ends have not been rolled closed to form 1/4-inch pipe.

In the photographs above the vertical arms are concave up and the horizontal arms are concave down. After fully opening the cross (as shown in the right photo above) each arm will need to be rolled closed so that the original 1/2 inch pipe closes

into a ¼ inch pipe. This can be done with a hammer on the anvil. I prefer to use a copper hammer on copper. The vertical arms will close on the top as illustrated, thereby producing a seam in the front, while the horizontal arms will close at the back producing seams on the backside. I find that laying a ¼ inch diameter steel rod on the cross helps me to align the top and bottom arms and to form a uniform ¼ inch pipe around the rod. The rod can be slid out with a little elbow grease. The rod can then be used to align and form the horizontal arms. Take care in forming the copper near the center of the cross to get smoothly varying edges connecting the horizontal to the vertical arms.

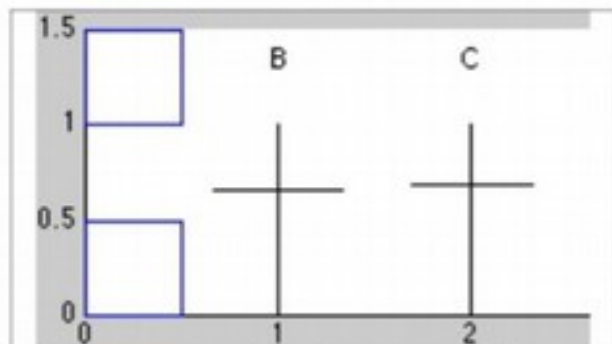
Illustrated below is a finished split-cross made from half-inch copper pipe. The finished dimensions are 6 inches tall by 4 ¼ inches wide and the arms are ¼ inch in diameter.



Split-cross made from ½-inch copper pipe showing seams along the vertical arms. Arms are ¼ inch in diameter. The top arm is a little shorter than the right and left arms.

To complete the cross, the copper was cleaned in a mild acid pickle (like pH Down available at your favorite pool store), rinsed in water, darkened by dunking in a solution of liver of sulfur (available at www.delphiglass.com) for several minutes, rinsed again in water, scratched with a hack saw blade to make the copper sparkle, and polished with paste wax. Note in the picture above that there are seams on the vertical arms. These can be filled in with braze or left as shown. On the backside of the cross the horizontal arms also have the seams.

A final word about the overall proportions for a cross: throughout history you can find examples of many different cross proportions (ratio of height to width and ratio of the length of the top arm to the height), and you can still see all manner of cross proportions in use today. The one for you to use is the one you think looks better. Several examples of overall cross proportions that I think look good are given in the illustration below.



Two cross proportions drawn to scale. The two blue squares should look perfectly square.

Method	Top Arm/Height	Height/Width
B	0.333	1.500
C	0.301	1.618
Copper Cross	0.333	1.412

Proportions for the two cross designs and for the copper cross pictured at left. The top arm is the vertical portion above the crosspiece. Method C uses the Golden Ratio (ratio of height to width is 1.618) while method B uses round numbers like 1/3 and 3/2. The top, left, and right arms are the same length in methods B and C.



We are excited to announce our 2017 membership campaign drive and would like to ask for your help in spreading the news. As a gift to a first time member we will award (while supplies last) a copy of Francis Whitaker's book, My Life as an Artist Blacksmith.

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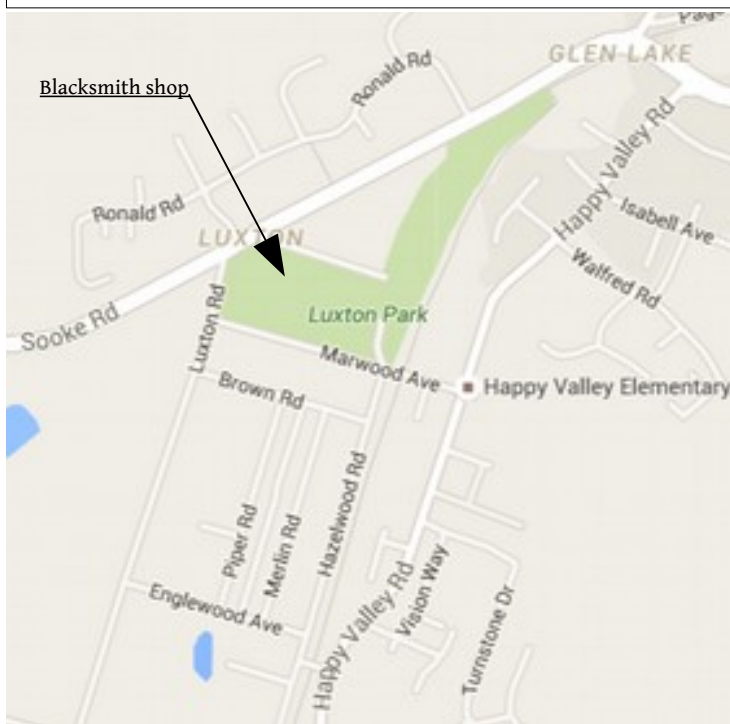
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