

EUGENE 5160 CLUB ~ SEPTEMBER 2015

<https://www.facebook.com/5160Club>

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SEPTEMBER MEETING

September 3rd – 6:00pm at David Thompson's shop. If you didn't get the directions in the meeting notice, email me for them: michael@elementalforge.com.

Bring your latest project or show-and-tell!



AUGUST MEETING NOTES

I (**MICHAEL KEMP**) gavelled the meeting to order with a give-away. I had purchased two drill-press clamps from Harbor Freight – which was one more than I need. After having the drill-press pull a couple of pieces out of the vice and helicopter them in my face – I've decided that a drill-press clamp is “safety equipment.” So yes, I use a drill-press vice – but I don't want to crank it down too tightly on handle material... so by using both the vice and the clamp – presto: the piece is truly secured for drilling. Just to allay any confusion – here's what I mean by drill-press vice...



and here's what I mean by drill-press clamp. It's like a vice grip except that you drill a hole (or holes) in the drill-press table to bolt it in place.



I had the extra clamp, and Frank Bobbio had an extra multi-meter that he was giving away. I had a roll of raffle tickets which we passed out and the 1st pick went to Ken, who chose the clamp. 2nd pick went to Blair, for the multi-meter.

I had a couple of show-and-tell pieces. I've been working on a set of kitchen knife designs over the last couple of years (yes, I work that slowly). I've made a set of prototypes from random pattern Damascus, which we use in our kitchen. I've tweaked the designs based on our usage – and want to see how they would work out in stainless steel with a dishwasher-tolerant handle. I have a full set in process. Here's the chef knife – before heat treat, with the ResinWood scales temporarily held in with wooden pegs:



The ResinWood was my choice from my dishwasher torture testing – it doesn't feel like plastic and it held up perfectly. Unfortunately, the only place I know to get it (<http://www.usaknifemaker.com/>) now seems to be permanently out of stock of the “ebony” color that I like. Sigh. Well, I'll get this set finished and worry about more ResinWood if I do another stainless set.

This is my first experience with AEB-L stainless. Stock removal only. Full tang. One learning experience with this steel is that it is more malleable than carbon steel. This stuff bends while I'm working with it on the belt grinder... so I have to keep re-straightening it to ensure a true grind.

The other share-n-tell I had was more of a shop tip. I do a lot of flat grinds, and have found that hand sanding them on a flat surfaced chunk of wood held in a ball joint vice works really well for me. I cut a sheet of sandpaper into four long strips, secure a strip

onto the chunk of wood, and sand by moving the blade against the stationary block:

Where it gets troublesome is securing the paper to the wood.

Clamping the ends work, but the clamps are in the way. Gluing with low-tack adhesive works – but if you let it sit too long the adhesive becomes permanent and you have to scrape the sandpaper off the wood with a knife... unless you use this stuff: Krylon Easy-Tack 7020. It's like post-it note goo in a spray can. It keeps the paper firmly on the block – but you can peel it right off even if you've let it sit for days. This works great for sanding disks too. I got my 1st can from Amazon. I've tried to find this stuff in Eugene (Jerry's, Home Depot, Lowes, Woodcraft, Sherwin-Williams, art supply stores, yadda yadda yadda) – no joy. Except that I can special order it from The Artist's Palette Studio on 17th between Willamette and Oak – same price as from Amazon if memory serves (\$12 and change). <http://www.artistspalette.com/studio/> Frank Bobbio mentioned that there is also a 3M repositionable spray.



bottle-openers... and made one with a mini-sword...” he liked it, sold one, and here's the 3rd in the series:



In response to questions, Frank noted he's asking \$250 for it since “I've got 10 hours just in the sword.” And he noted that the brass handle is made with a method he saw on a blacksmith forum some years ago. “If you heat steel around 700-800°F and take a brass brush and start rubbing it will actually deposit the brass on there. If you get over 1000°F it takes it back off.” Frank gauged the heat on this small piece by the color – through straw-light blue-dark blue-purple to where it goes back to gray – that's about 650°F – so a little bit more and start with the brass brush. He's tried different brass brushes and some work better than others.

Frank also made some cable knives this month. He got interested in this style after seeing the work of a bladesmith in Argentina. Frank mentioned the how-to tutorial: <http://www.aescustomknives.com/docs/tutorial10.htm> in which Ariel Elias Salaverria describes how to forge weld the cable while leaving some of the knife with the original cable look. “I think he's the only other guy to make these” Frank noted “I made a couple of these a few years ago and just got back around to it.”

The cable is “EIPS” which Frank noted is about the same as 1080. Frank enlightened us (me anyway) on grades of wire rope. The basic grades are named after Plow Steel “about 1050” - Improved Plow Steel – Extra Improved Plow Steel (EIPS) – and Extra Extra Improved Plow Steel “that is *maybe* 1095.” Frank cautioned “When you go to a place that sells cable they have hundreds of types of cable... but the only ones that are designated with a carbon rating are the Plow Steels.” Frank purchased his first batch from High Temp Tools (*see the link at the end of the newsletter*) but when he went to get some locally “nobody knew the Plow Steel label” - they only knew it as PS, IPS, EIPS, EEIPS “but they didn't know what that stood for!”



FRANK BOBBIO brought in a number of things to share. “Shop is back up to speed, more or less”, he said, as he spread out a knife roll. “I started making

Here's one of the cable knives Frank brought in – wenge wood and water buffalo horn:



“The only way to keep the wire on the back of the knife from breaking apart is to do it in a stainless steel tube because otherwise the wire oxidizes and each time you are heating and cooling you're losing maybe ten thousandths in scaling that just breaks off. If you break just one of those wires... you're screwed... so it's a risky proposition.”

“For wire knife #3 I went with a 7/8" cable which I forged inside the tube – and then I re-forged it inside to tube to see if I could get the spine to come down [to be even with the top of the bolster]. So I built a jig so that I could do that... it worked but it forge welded most of the wires on the top...” And here it is – with bocote and turquoise handle – very handsome!



In response to a question Frank elaborated on the process of joining the knife to the handle. He uses a stick pin tang. The cable is low temp silver soldered to the brass fitting – and on his first couple of these cable knives “even after 2300°F forging, 1500°F heat treat, at 430°F silver soldering it was oozing [grease/tar] and messing up the silver solder joint”.

After several knives experimenting with how to integrate the stick pin in the blade Frank went with:

- Using a rod long enough to serve as a handle and the size of the cable core
- Drive the pin rod into the cable 1-1/2" – driving some of the core out the other end
- TIG weld both ends of the cable, securing the pin
- After forging, do another TIG weld on the pin for good measure
- The joint to be silver soldered has to be ground

square plumb and true for a secure joint

- Cut and straighten the stick tang
- Chuck the tang in a lathe – Frank said “I was about 10 minutes indicating it so it was 80-90% true, then I slowly took a cutting bit...” to true up the TIG weld.

He had to finish up with an hour of hand filing.

Next time Frank is planning on encapsulating the knife in a pipe filled with Wood's Metal (aka Cerrobend) to get a better purchase with the lathe chuck. Wood's Metal will melt in boiling water, so it can be used and removed at low heat, well below tempering temp. It contains lead and cadmium so toxicity is an issue.

Frank's next pass-around was a railroad spike fork and knife set – fun!



... followed by a kitchen knife forged from 1084 with a mustard finish and stainless bolster. “This has been in use for a month in the kitchen.”



Then a knife in CruForge V done with a scandi type grind – in a Viking belt knife style:



Frank used both of the above knives in an edge-holding test where he whittled away at a 2x6. The kitchen knife is slightly narrower with a more acute angle on primary grind. Both whittled wood about the same at the start. After substantial whittling, both still slice-cut paper but have “noticeably different”

ability to whittle wood. Frank is convinced that it has more to do with blade geometry than the steel itself.

Frank's next test was to challenge his skepticism about using a stick tang for larger, rough usage, knives. He made a mild steel blade with a very small stick tang – glued on the handle/bolster with JB KwikWeld. He case-hardened the edge – cut through a 2x4 – and the stick-tang is holding up fine.



Frank has compared 5-minute epoxy, JB KwikWeld, JB Weld, and golf shaft epoxy. “The 5-minute and JB Kwik are not even close to the standard JB Weld...” he feels that the golf shaft epoxy is comparable to JB Weld except that it will release at a lower temp.

Frank's then shared a rust prevention test. His main concern was “what can I put on a satin finish knife – if I sell a customer a railroad spike knife – what can I put on it so it won't rust” if put on the shelf for two or three years “and I don't want it to look oily.”

His test included bare metal, Renaissance Wax (Frank's favorite for mirror polished blades), WD-40, Ballistol, HDCi, a Rustoleum spray, and EEZOX. Here's Frank's test – the bar in front was given more severe treatment – and HDCi beat out EEZOX in this test with more frequent water sprays:

On a previous test with salt water, with 2 or 3 days every piece was rusting except the EEZOX – which held out about 10 days (*I don't think Frank included HDCi in that test*). The samples above were sprayed daily with well water for 25 days. After 2 days the Renaissance Wax started rusting. HDCi did best, then EEZOX, followed by Ballistol, WD-40, Rustoleum, with Renaissance Wax being almost useless IMHO.

The drawback with EEZOX is that it has chlorinated solvents, so there are toxicity issues. At the other end of the spectrum, Ballistol <http://www.ballistol.com/> is food safe. As for HDCi, on the Aegis Solutions web site <http://aegissolutionsknifecare.com/> they state that their EDCi product is food safe, but don't specifically make the same claim for HDCi.

Frank's also shared a short stack of vintage American Blade magazines.

Ken noted that Bondo epoxy was tested for sheer strength and the metal failed before the epoxy. He also noted that it has microscopic glass beads in it so that when you clamp pieces together you won't squeeze out all the epoxy.

There was discussion about surface preparation for gluing. The old “Glue Wars” postings on Blade Forums <http://www.bladeforums.com/> championed bead blasting (or sand blasting) over sanded surfaces.

Frank noted that in his testing, even a rusted surface (after being brushed) is better than sanded. He also noted that JB Weld has a tensile strength of 3960psi and K&G golf shaft epoxy is 4400psi (*I don't find this epoxy on the K&G site – and the psi that I can find for other golf shaft epoxies are lower than JB Weld – so check before you buy*).



Frank's final pass-around was a fun cable-Damascus bottle opener:



CRAIG MORGAN brought in a knife that he got at the Usual Suspects Network (*see the Forums links at the end of the newsletter*) annual camp-out in Three Sisters Wilderness. He'd won "a beautiful bullwhip made of paracord. Beautiful. Ten footer. But I already had a twelve foot leather one so I didn't really need it. So I traded with my friend Bill Siegle (<http://www.siegleknives.com/>) who makes really great knives... you can beat it up – don't have to worry about scratching it..."

So here's Craig's swag – 5160 blade, Kydex sheath:



JOVE LACHMAN-CURL was up next to show-and-tell about his atmospheric (venturi) forge burner. He'd built a burner that worked fine for his two brick forge, but he wanted to be able to use it in open air for pre-heating

weld joints etc. "the moment you took it out of the forge it would either – if you turned it down low the flame would go back inside the tube and go out – if you turned it up too much the flame would stand off the front and flash out... so I started taking apart my blowtorches and finding mesh and little cups and

sheet metal things. What I found worked was to take a little steel wool, tease it out so you can see through it, make a little cup in your finger out of it and shove it down the end of the burner – works really well – the cooling flow of the air keeps it from burning. But I didn't think it would be very durable so I started cutting up tea strainers and things... what I have in here now is a piece of tea strainer about 1/2" down and a piece of the Bodum thing (*French press coffee strainer replacement filter – a very fine wire mesh*) another 1/2" down. And I've tried them independently and it doesn't work as well as having them both after each other." Jove demonstrated how this kept the flame in good shape from low-low to as high as he wanted.

This is a much more elegant solution to keep the flame from climbing back up the burner at low pressure than I came up with – Thanks Jove!!

JIM JORDAN brought in a ball vice that he made from a St. Vincent's bowling ball and a doweling jig from Harbor Freight. "It's basically a self centering vice with a left hand screw and a right hand screw – you put your knife handle in here" and can work with it at any angle (using a ring of some sort as a base – e.g. an old lawn mower tire). Jim used a chisel to cut the outer plastic on the bowling ball "so I didn't have to use a chain saw or something" and trued it up with a disk grinder. Then he bolted the doweling jig to the flattened surface.



Jim has an engraver's vice – and really likes how it works, but wanted something bigger for bigger projects.

Jim also shared a couple of beautiful inlay or planishing hammers. The handles are made from bamboo flooring scraps with other wood laminated to the sides. He turned the heads on his lathe.



One is made from 1055. He used his checkering file to checker both faces – then heat treated it.



Next up Jim shared a sheath he made for someone who spotted him at the OKCA April show. They had purchased a knife they liked but weren't happy with the sheath. Jim whipped up this sheath, incorporating some inlay banding from Woodcraft. The sides of the sheath are lacewood to match the knife handle. Here's the sheath on edge to show the banding:



CLIFF CHRISTIAN came to the front next with a homemade blown burner controller! “This goes back to Michael's deal last meeting about having issues with temperature control. I've got an old Menkel triple burner forge – works great for 2000°F and above – trying to get it down to 1500-1600°F was a little rough.”

“This is a hybrid setup that I made when I was at the ABS hammer-in in California last year...” Cliff based

his controller on one that someone there had for controlling the gas only – they had a venturi forge. Cliff uses blown burners so he needed to add control of the air as well. He also referenced Ed Caffrey's setup that he uses for his salt pots... “I figured if it's good enough for that it'll work for me!”



You set the controller for the desired temperature “It has an auto-tuning feature in it ... if you set it for 1600°F it'll bring it up and shut off and it will still monitor the temperature and if it notices that it goes to 1610°F then it'll say 'OK, next time I want to shut off around 1595°F' and it'll actually program itself so that it will hold your temperature to within 3-4°F.”

In response to a question about cost, Cliff referred to Caffrey's website:

http://www.caffreyknives.net/salt_tanks.html for the PID controller (from Lightobject) and the pyrometer thermocouple (from Omega) - “with shipping each of those was about \$35.” He got the valve from Paramount Supply (*which has a branch here in Eugene*) for about \$60. And the solid state relay from Grainger for \$30.

On another question he said that this setup will not do ramping up or down but that there are a number of programming options to watch for alarm situations.

Cliff noted that the programming was much simpler using the solid state relay.

At one point in the evening, Blair asked whether Emmerling's ribbon burner was atmospheric or blown. I relayed that what I saw in Emmerling's shop was a blown ribbon burner. Squirrel cage fan with a gate valve between it and the propane needle valve so that you can choke down on the air as desired.

Blair mused about using MIG welding tips instead of the lost-wax crayon holes in the castable refractory to make it easier to build the ribbon burner. Frank noted that the welding tips would melt in the forge heat.

There was some discussion of treatments for non-stabilized woods. Lynn Moore likes linseed oil. I'm using equal parts of bee's wax and carnauba wax – which I melt in a double boiler then add enough food grade mineral oil so that it's barely solid at room temperature (I got that from someone on the Bladesmiths Forum) – hand rub in multiple coats.

Craig Morgan highly recommends drying even commercially stabilized wood. He made a knife with stabilized birch burl and brass bolster “when it was finished you could close your eyes and run your finger over the knife and the only thing you could feel was temperature difference between the brass and the wood” but after a year in a drawer in the house you could catch your fingernail on the brass – the “stabilized” birch had shrunk.

In the same vein Craig said “I've seen Wayne Goddard weigh his handle material on a powder scale – put it under one of those shop clamp-on lights with a 100 watt bulb – weigh it every day until it stops losing moisture.”

Cliff returned to the subject of epoxies. He noted that standard epoxy that you buy at a hardware store has a bond life of about 5 years... but Acraglas has a bond life of 50 years and a long shelf life.

G-Flex came up for discussion – Cliff mentioned that Jose Diaz likes it for neoprene handles on cutting competition knives. I relayed that I've had tests where it didn't hold on to steel as well as others.

The best performers for me have been Acraglas, T-88, and E-120HP. I mentioned that I wasn't fond of Acraglas because it was rather thick. This started a discussion of how you can create “dry joint” by squeezing the parts being glued too tightly. Wood isn't as subject to this as metal and synthetic

materials... which led into discussions on how different makers rough up tangs and scales and drill extra holes in the tang for “epoxy rivets.”

There was discussion of normalizing, grain size, hardening, and destruction testing various steels. Frank warned that on one bend-to-destruction test a fragment flew into his arm even though he was bending it toward himself and expected any fragments to go away from him – so suit up before doing a bend test!

Julius talked about the multiple thermal cycling that Bill Burke does for optimum grain size and toughness for a given hardness. Burke does flash quenches (heating above critical and quick quench just to black) for thermal cycling. Julius relayed that Burke does each heat treatment three times – thermal cycling, normalizing, quenching, tempering.

As I've seen on the knifemaking forums when triple quench was mentioned, this inspired lively discussion about the gap between this method and industrial heat treating practices.

Food For Thought Department: there was discussion that having a propane tank indoors will void homeowner's insurance if it is implicated in a fire.



And there's the meeting notes!

I promised myself a scotch and cigar on the porch once I got this out the door – so Keep Well everyone – I'm going to go enjoy the evening!

~ ~ ~ Michael Kemp



FREE DE-CLASSIFIEDS (IN NO PARTICULAR ORDER)

Email me a brief description of what you are selling/buying/looking for with your preferred contact (phone/email/...). Unless you let me know you want a shorter run, I'll run the note for 3 months and then send you an email to see if it's still valid. It's free – email me at Michael@ElementalForge.com

Nothing to report this month – have a good one!



NOTES AND REMINDERS

Julious Griffith – one of our regulars – has a number of Facebook groups designed to help knifemakers and collectors – I'll add them to the links section:

- Custom Knives For Sale by Maker - Available now
- Knifemaking - Works in Progress (w.i.p.'s)
- Knifemaking Equipment Buy, Sell, or Trade (used only)
- Knifemaking - Masters to paying Students connection
- Knife shop photos
- Knife Calendar - Events, shows, hammer-ins, schools, misc.

These are all closed groups – to keep them focused – so if you want to join one of the groups, click the “+ Join Group” button and also message Julious and give him some info on yourself so he knows you have real interest in the group.

The **Northwest Knife Collectors Kelso Show** will be September 26-27 at the Red Lion conference center in Kelso. Watch here for more details: <http://www.nwkc.org/home.html>

I finally ran down the original article on making a ribbon burners that John Emmerling wrote back in 2005 for the NWBA Newsletter: <http://blacksmith.org/2005-1-hot-iron-news/>

You can download the PDF from that site. John's article starts on page 11.

There's a new set of epoxies made specifically for bladesmiths, created by a man with a decade of experience in making fishing rod adhesives. <http://www.bladebond.com/Products.html>
If you try some of this stuff, I'd love to know which product you tried and how you liked it!

Also, the “Technical Data” page on the BladeBond site has informative notes on surface prep for various materials and other epoxy issues.

Valley Stainless (that does water-jet cutting) is one of Craig Morgan's customers. They told Craig “bring in a pattern” and they'd work with you on small batch cutting. They don't have a website yet. 29884 E Enid Rd Eugene, Oregon 97402 (541) 686-4600



WEBSITE LINKS

5160 CLUB

5160 Club Newsletters are archived at: <http://www.elementalforge.com/5160Club/>

Hint: to Google the archive for a specific knife style or presenter name, use a search like this:

sami site:<http://www.elementalforge.com/5160Club>

or this:

ron lake site:<http://www.elementalforge.com/5160Club>

OREGON KNIFE COLLECTORS ASSOCIATION (OKCA)

The OKCA hosts monthly dinner meetings where you are guaranteed to see treasures from the wide world of “things that go cut!” OKCA also puts on the big knife show in April – if you haven't seen it you've been missing something special!

<http://www.oregonknifeclub.org/index.html>

Go to the “Knewsletter” link and scan a recent newsletter for a membership form and contact info.

FORUMS

Knifedogs Forum

<http://knifedogs.com/forum.php>

Bladesmith's Forum aka Don Fogg Forum

<http://www.bladesmithsforum.com/>

American Bladesmith Society

<http://www.americanbladesmith.com/ipboard/>

Usual Suspects Network

<http://www.usualsuspect.net/forums/forum.php>

Blade Forums

<http://www.bladeforums.com/forums/forum.php>

Julious Griffith – one of our regulars – has a number of Facebook groups designed to help knifemakers and collectors – search Facebook for:

- Custom Knives For Sale by Maker - Available now
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REFERENCES

Many of the sites linked under “Knife Maker General” have book & video sections.

Our own Wayne Goddard's books are available at Amazon:

<http://www.amazon.com/Wayne-Goddard/e/B001JS9M10>

And you can email Wayne directly for his DVD at

wgoddard44@comcast.net

Verhoeven's Metallurgy For Bladesmiths PDF

<http://www.feine-klingen.de/PDFs/verhoeven.pdf>

Verhoeven's updated book:

<http://www.amazon.com/Steel-Metallurgy-Non-Metallurgist-J-Verhoeven/dp/0871708582>

ZKnives – Knife steel composition/comparison/etc.

<http://zknives.com/knives/steels>

Kevin Cashen's Bladesmithing Info

<http://www.cashenblades.com/info.html>

Tempil Basic Guide to Ferrous Metallurgy

http://www.tempil.com/wp-content/plugins/download-monitor/download.php?id=Basic_Guide_to_Ferrous_2010.pdf

My “Knife Info” has some knife musings and cheat sheet charts – plus Oregon and Eugene knife laws:

http://elementalforge.com/tips_notes/

PACIFIC NORTHWEST KNIFE MAKING CLASSES

Gene Martin offers personal instruction at his shop south of Grants Pass for a daily rate.

<http://www.customknife.com/>

Michael and Gabriel Bell offer a constant series of small group classes in Japanese style sword forging and fittings. Located on the southern Oregon Coast.

<http://dragonflyforge.com/>

Murray Carter offers small group classes in a variety of subjects, primarily focused on traditional Japanese cutlery. Located in Hillsboro.

<http://www.cartercutlery.com/bladesmithing-courses/>

David Lisch is a ABS Master Smith who teaches classes in Seattle. I've heard rave reviews from his students. Lisch is very skilled at blacksmithing in general and bladesmithing in particular.
<http://www.davidlisch.com/Learn.html>

And speaking of the ABS (American Bladesmith Society) – if you are up for traveling a good distance to take classes, check out their “Schools” link:
<http://www.americanbladesmith.com/>

GENERAL TOOLS & SUPPLIES

Woodcraft of Eugene – thanks to Joe & the crew for six years of hosting 5160 Club meetings – we've had to move on, but the hospitality was appreciated.
<http://www.woodcraft.com/stores/store.aspx?id=515>

MSC Direct
<http://www.mscdirect.com/>

McMaster-Carr
<http://www.mcmaster.com>

Grainger
<http://www.grainger.com>

Surplus Center
<http://www.surpluscenter.com/>

Victor Machinery Exchange
<http://www.victornet.com/>

KNIFE MAKER GENERAL

Knife kits, steel, tools, machines, supplies such as handle material, fasteners, belts, glues, finishes, etc.

Jantz Supply
<http://www.knifemaking.com>

Texas Knifemaker's Supply
<http://www.texasknife.com>

USA Knife Maker's Supply
<http://www.usaknifemaker.com/>

Knife and Gun (K&G)
<http://www.knifeandgun.com/>

Alpha Knife Supply
<http://www.alphaknifesupply.com/>

True Grit
<http://www.trugrit.com>

KNIFE STEEL SOURCES

New Jersey Steel Baron
<http://newjerseysteelbaron.com/>

Kelly Cupples (High Temp Tools) – Alabama
<http://www.hightemptools.com/steel.html>

Niagara Specialty Metals – New York
<http://www.nsm-ny.com> (click Products/Knife Steels)

SB Specialty Metals – New York & Texas
<http://sb-specialty-metals.com/products/knifesteels>

Bohler Uddeholm – numerous U.S. locations
<http://www.bucorp.com/knives.htm>

Sandvic – stainless steels – Texas & Pennsylvania
<http://www.smt.sandvik.com/en/products/strip-steel/strip-products/knife-steel/sandvik-knife-steels/>

Pacific Machinery & Tool Steel – Portland, Oregon
<http://www.pmtsco.com/tool-die-steel.php>

EQUIPMENT

Beaumont (KMG) [Ohio] – the industry's benchmark 2x72 belt grinder
<http://www.beaumontmetalworks.com/shop/>

Travis Wuertz [Arizona] – premium versatile grinder
http://www.twuertz.com/Home_Page.php

Pheer [Gresham, Oregon] – affordable grinder made in Oregon

<http://www.2x72beltgrinder.com>

AMK [Ohio] – affordable grinder, quick-change between platen & contact wheel

<http://amktactical.com/>

Coote [Port Ludlow, Washington] – affordable, simple grinder – you supply the motor

<http://www.cootebeltgrinder.com>

Marinus Kuyl [Hillsboro, Oregon] – another affordable grinder made in Oregon – and parts – you provide the motor.

<http://oregonblademaker.com>

Grinder-In-A-Box – grinder kit, assembly required

http://www.polarbearforge.com/grinder_kit.html

Wayne Coe [Tennessee] – grinders, motors, VFDs...

<http://www.waynecoeartistblacksmith.com>

Contact Rubber Corp – wheels etc.

<http://contactrubber.com/contact-wheels.asp>

Sunray – drive wheels

<http://www.sunray-inc.com/drive-wheels/>

Quick and Dirty Tool Co. [Auburn, Washington] - will build Spencer/Clontz style tire hammers

<https://www.facebook.com/QDTool>

Renaissance Metal Art [Mulino, Oregon] – 80# ram air hammer

<http://www.rmetalart.com/tools.htm>

Anyang [Texas] – air hammers from 20# to 165#

<http://www.anyangusa.net/>

Meyer Machine Tool [Ohio] – treadle hammer

<http://www.meyermachinetool.com/Blacksmith-div-.html>

Spencer/Clontz tire hammer plans/workshops

http://www.alaforge.org/Trading_Post.html

Appalachian Power Hammer plans

<http://www.appaltnet.net/rusty/index.htm>

FORGE & REFRACTORY

Chile Forge

<http://www.chileforge.com/>

Mankel Forge

<http://mankelforge.com/forges.html>

High Temp Tools (scroll down the page for the category buttons)

<http://www.hightemptools.com/supplies-mainpage.html>

Omega – thermocouples & measuring equipment

<http://www.omega.com/>

Auber – more thermocouples and controllers, etc.

<http://www.auberins.com>

Hybridburners – home of the venturi T-Rex

<http://www.hybridburners.com/>

Pine Ridge Burners – for ribbon burners and all associated fittings, blowers, valves, etc.

<http://www.pineridgeburner.com>

Zoeller Forge – low cost venturi & parts: Z Burners

<http://zoellerforge.com/>

BLACKSMITH

Blacksmith Depot

<http://www.blacksmithsdepot.com>

Pieh Tool

<http://www.piehtoolco.com>

Centaur Forge

<http://www.centaurforge.com>

Quick and Dirty Tool Co.

<https://www.facebook.com/QDTool>

LOGO/ETCHING

Ernie Gropitch – Blue Lightning Stencil

<http://www.erniesknives.com/>

IMG International Marking Group

<http://img-electromark.com/>

Electro-Chem Etch

<http://www.ecemmi.com/products.html>

OTHER GOODIES

Sally Martin Mosaic Pins – So. Oregon

<http://customknife.com/index.php?cPath=13>

Burl Source – handle blocks/scales – So. Oregon

<http://www.burlsales.com/>

Shelton Pacific – stabilized wood – Shelton, WA

<http://stores.sheltonpacific.com/>

Gilmer Wood – N.W. Portland

<https://www.gilmerwood.com/>

Oregon Leather – 810 Conger Eugene and 110 N.W.
2ND Portland

<http://www.oregonleatherco.com/>

Coyote Steel – misc., scrap, copper, brass, bronze –
Garfield & Cross St. Eugene

<http://www.coyotesteel.com>

Cherry City Metals – Salem, Oregon – metal
recycling and useful objects

<http://www.cherrycitymetals.com/>

Amtek – tool steel & cutting tools

<http://websales.amtektool.com>

Rio Grande – jewelry tools/supplies

<http://www.riogrande.com>

Otto Frei – jewelry tools/supplies

<http://www.ottofrei.com>

M3 Composite – space age mokume & other

<http://www.m3composite.com/>