

How to Build a Spangen Helm.

By armourkris in Workshop > Metalworking  91,371  524  85 ★ Featured

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In the past People have asked me to put up an Instructable on how to build a helmet. So, for all you people, Here goes.

As the title says, this Instructable will deal with building a Spangen Helm. Since I wanted something a little more unique I went with a 5 panel instead of the standard 4, and used shaped bands rather than straight ones.

Although the finished helm has a bar grill I neglected to add a bar grill step to

this Instructable. The reason for this is that it was my first bar grill and I had a surprisingly difficult time making it. Until I've gotten a little better at them I don't want to try and teach someone else how to make one.

Step 1: Tools and Supplies I Used

Here's a list of what I used for this project. Not everything here is mandatory, a lot of these tools could be dropped entirely or else have other tools substituted for them.

Patterning supplies

- A Sharpie
- A Meter Stick or Straight Edge.
- A Fabric Tape Measure
- Scissors
- Empty Cereal Boxes, Bristol Board, or something of that nature.

Steel

- 14 and 13 gauge sheet metal.
- About a foot of 1" flat stock
- About a foot of 1/2" flat stock
- About 3 feet of 1/4" round stock

Cutting tools.

- A Jigsaw
- Aviation Shears
- A Chisel
- A Drill and 1/8" Drill Bit

Shaping Tools

- A Deep Dish
- A Shallow Dish
- A Dishing Hammer

- A Cross Peen/Machinists Hammer
- A T Stake
- A Ball Stake
- An Anvil Shaped Object*

Riveting Supplies

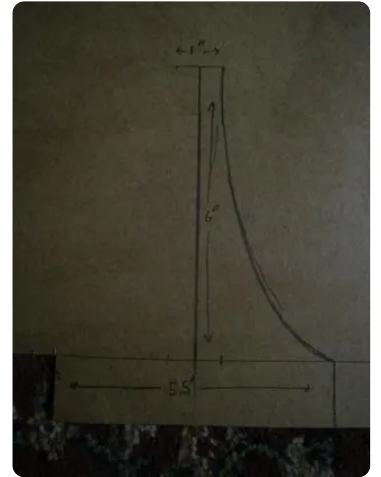
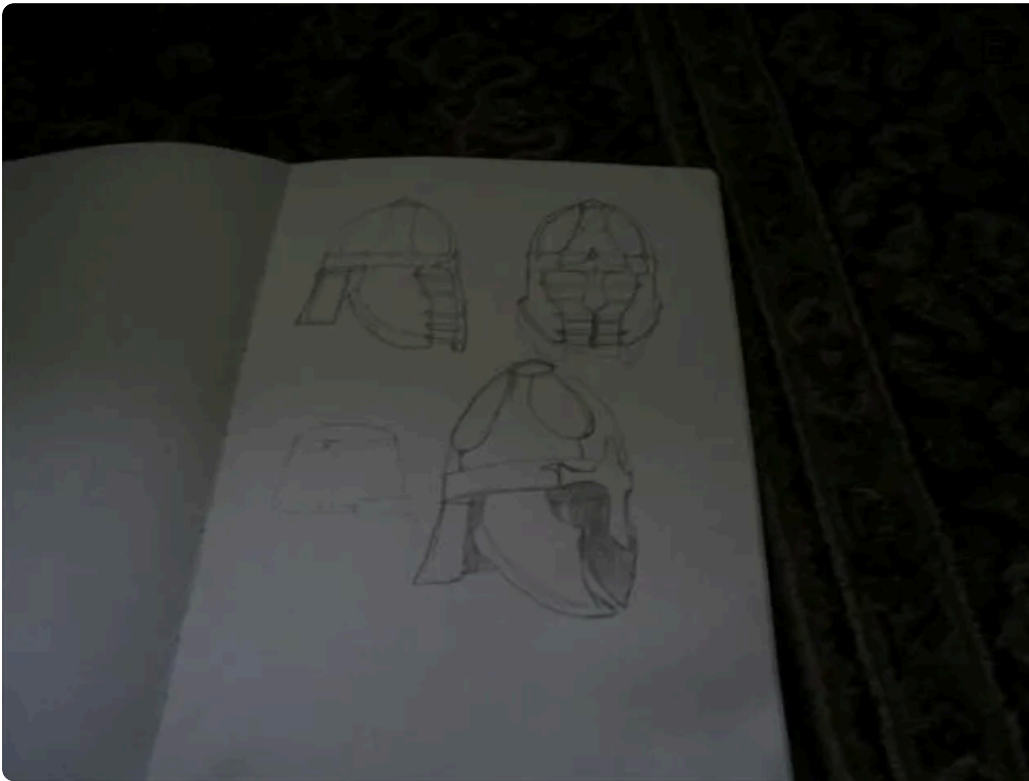
- A small Ball Peen Hammer
- Nails
- Side Cutters
- Cleco temporary rivets and pliers
- OR Small Nuts and Bolts.

Finishing Tools

- A Belt Sander
- A Bench Grinder
- Files
- A Planishing Hammer

*most any large hunk of steel will work for this.

Step 2: Step #1: Patterning Your Helmet.



Ok, So the first thing you need to do is Draw your helmet. Get a good idea of what you want the finished project to look like. If you cant put it down on paper you'll probably have a hard time making it with steel.

Got a few pictures of what you want? Good. Now it's time to start actually making patterns for this.

First thing you need to do is get the brow band. A good rule of thumb for this is to take the circumference of your head and add 3" for 1/2" of padding, or 5.5" for 3/4" of padding. Alternately you could add whatever padding you want to your head then measure the circumference.

In any case, The brow band for this helm is 1 1/4" wide and about 28" long.

Next come the bands. For a basic spangen helm you can just cut a pair of rectangle bands, 1-2" wide by however long you need and make them cross

over the top, dividing your helmet bowl into 4 quarters. it's pretty simple. But, since I wanted something a little fancier here is how I did it.

I took the length of my brow band, divided it by the number of bands i wanted to use (5) then rounded that to the nearest half inch to keep things simple. That gave me 5.5" as a base line. Next I chose 6" as a length for my bands. I just pulled 6" out of the air and got lucky. often times patterning takes a few tries to get it right. From there I added another 1 1/2" to the base and drew in one half of the profile I wanted. Next i cut out that half, folded it over, traced it and cut out the other half. Now trace that out 4 more times and cut them all out.

For the disc that holds them together on the top I just traced the lid off a jam jar that looked to be the right size. It was very complicated scientific process

Now tape them all into place on your brow band to get an idea how they fit. they will likely need to be tweaked, you may even have to go through a few sets before you get it right.

Congratulations, that's the top of you helm. Once your happy with it it's time to move onto the cheek plates and the nasal. I'm afraid that there really isn't much in the way of measurements for these. Look at pictures online, look at your drawings and just start cutting out pieces until get something you're happy with. Don't be afraid to look like an idiot in a cardboard hat and try it on to make sure you can move your head, and that nothing is in the way of your eyes.

I opted to put a slat back on this helmet instead of the skirt plate that I had in my drawings, again, just like the cheek plates and nasal they are something you just have to eyeball. It seems i didn't take any pics of them getting patterned, but they're pretty simple. make a rectangle about 1"x5" and your pretty much there. if it wont be hidden maybe ad a bit of pizazz to make them look nice, and just

make sure they aren't so long that you cant move your head properly.

Step 3: Layout, Cut and Clean Your Plates.



Now that you've got everything patterned out it's time to cut it all out. Start out by tracing it all out onto your steel, make sure to place your pieces to minimize the amount of waste. This was especially important for me since I had just BARELY enough steel to finish this helmet.

Once your happy with the layout fire up your jigsaw and start cutting out the brow band, bands and top. Do not cut out the cheek plates, nasal or slats until you have the dome of the helmet assembled.

Once you have all your top plates cut out clean up the edges and put a nice bevel on them. You don't want to have any burrs or sharp bits anywhere on them. Any point that may come in contact with you should be rounded out.

Step 4: Building the Frame. Pt 1: the Bands



Now that you have the brow band, spangen bands and top piece all cut out and cleaned up it's time to shape them.

First off you can make life easier by drawing a guide on some scrap paper. Draw a line that is as long as you want your helmet to be front to back, then bisect it with one for the width. Next eyeball in an oval around it to give you a rough idea of how your brow band should be shaped.

Next take your brow bands and giving them a quick once over into the shallow dish. This should give you most of your curve from end to end and just a tiny tiny bit of curve top to bottom. Now take your brow bands and lay them over the guide. Tweak whichever one of them is the closest match until your happy with it's shape, then clamp the other band to it and work your way down from the clamp adjusting the curve until they are symmetrical. You should be able to just bend them by hand or over your thigh.

Once they are looking nice and even you can set them aside and start on the bands.

To shape the bands just give them 2 or 3 passes in the shallow dish. Start at the outside, work your way into the middle and they should all come out close to the same shape.

Now it's time to temporarily assemble it. here is where Clecos become the greatest thing since hot and cold running water. if you don't have Clecos then you'll be wanting a whole bunch of nuts and bolts in whatever size rivet you'll be using.

So, start by laying your brow band out on the workbench then take the one of the band sections and place it on top front and center to check the fit. Mark where it needs to be tweaked then use a rubber or dead blow mallet to adjust the curve over a T stake as needed. do it a little bit at a time and keep coming back to check the curve.

Once you have the fit right clamp everything in place and mark where you're rivets will go. Then center punch and drill the rivet holes in the brow band. Once your holes are drilled give them a quick once over with a half round file and use them to mark their matches on the spangen band. Center punch and drill those holes, then use either Clecos or nuts and bolts to hold it all together.

Now just work your way around to the back repeating the process with each band. At that point you will most likely have 1/4" or so of extra poking out from the brow band. I used a combination of tin snips, the grinder and a file to take off that last little bit and leave it sitting flush.

Step 5: Building the Frame Pt. 2 the Top Plate



The top plate has a couple of steps that the bands don't. First, give it a quick once over in the shallow dish, that gets the steel to start moving and makes the next steps easier. Once it's been shallow dished move it over to the deep dish and give it a few more passes. You can stop here, but I figured I'd give mine a little something extra and add a little boss to the center. To do that I cleaned up the edges of an appropriately sized hole in a hunk of steel (actually the base of my T stake) then centered the top plate over it. Next I placed the ball end of my riveting hammer in the center of the top plate and gave it a few good smacks with the shallow side of my dishing hammer. You should be left with something that looks like a tiny UFO.

Now place it on top of your bands and check how it fits. Odds are it won't. Thankfully you should still be able to bend and twist your bands as needed to make it fit. Something else that will really help is to bend the tips of the bands up with a pair of pliers so they fit into the top plate rather than under. Once your happy with your fit mark punch and drill your holes, then bolt it all together.

Step 6: Finishing the Frame



Now it's time for some planishing, maybe a little riveting, and some more patterning.

First off, planishing. I could have planished the plates separately in step 4, but I prefer to have everything roughed into place first. It's really a matter of preference though.

To planish your frame you'll need a planishing hammer. Mine is a plain old storebought autobody planishing hammer, but it's the heaviest one I could find. What you want for a planishing hammer is a light to medium weight hammer with a broad flat face and as close to a mirror polish on it as you can get. Any imperfections in the face of this hammer will be stamped into your work piece a few hundred times over.

The actual mechanics of planishing are pretty simple. You place your workpiece over a ball stake (usually) and start using light taps with the hammer to pinch the metal between it and the stake. I swing about 90% from the wrist and 10% from

the elbow. you should have a light grip just enough to control where the hammer falls and not have it fall out of your hand. You'll figure out where the right place to hit is pretty fast, it should make a kind of a "ting" sound and you should be able to use the bounce to reset the hammer for the next stroke. If your not hitting right the sound will be a little more flat sounding and the hammer will either not bounce well at all or bounce off to one side or the other.

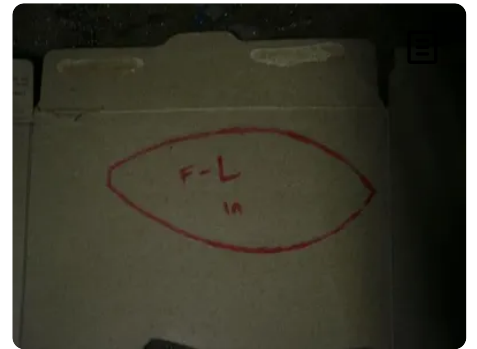
Once you've established where to swing the hammer you just keep swinging the hammer at that spot and move the workpiece under it. The object is to hit pretty much every bit of exposed surface area, this should change the little lumps left over from dishing to an even texture of tiny facets. usually it takes a few passes of this to get everything looking nice. From there you can either leave it as is, which is what i like to do, or you can sand and grind the corners off those facets leaving behind a smooth surface ready to polish.

Once your frame is planished you have a choice to make, you can just reverse your bolts/clecos an go straight to patterning out the panels, or you can do your finishing work on it and assemble it.

I chose to burnish it all and rivet it together before patterning the panels.

In preparation for riveting I re-assembled the whole thing with clecos, but I used the bare minimum to hold it all together. From there i worked my way around all the open holes in the brow band, then I went riveted on the top plate. Next I removed most of the clecos and riveted those spots. I did however leave a few places on the brow band un-riveted. There are 4 rivets on the front that will be shared with the nasal, so I left them open, and 2 on the back where the clecos and a bit of scrap are holding the back shut untill I have the pannels riveted in.

Step 7: The Panels



Now that the frame is together it's time to pattern out the panels. Patterning out the panels is dead simple, just lay the frame on some patterning material (in this case old cereal boxes) and trace out each of the openings. After you trace out each opening add 1/2" to 3/4" of rivet allowance. You also want to make sure to mark which panel is which, and that the marked side will be the side that faces inside the helmet. This is because odds are the panels won't be perfectly symmetrical, and they may not fit properly in any of the other spaces.

Once you have your patterns transfer them onto your steel, cut them out, finish the edges then give them a couple passes in the shallow dish.

After I had them dished I marked, punched and drilled my rivet holes in the band. 14 for each panel. It's a little overkill, but it looks sweet.

After you've put the holes in your bands it's time to fit the panels. If your lucky they'll just slip right in. I was lucky for a few, but a couple of them needed some

serious man handling.

I started with the back panel. Lucky for me it fit right in place without any tweaking, so I held it in place, marked a few of the rivet holes then punched and drilled them. Once they were drilled I used clecos to hold it in place and used the remaining holes in the bands as my guides to drill the rest of the holes.

The second panel didn't fit so well. It needed some more curvature added to it. To add that extra curve i just used the jaws of the vice and a little muscle to tweak the curve into place. Bending it with the vise let me get it pretty close to fitting right, but the top corner was still out of whack. So i drilled the holes for the side that fit right, then put clecos in each hole to hold it in place. Next I put it over the ball stake and used a rubber mallet to try and knock it into alignment. That got me about half way to where I needed it to be, so I finished it by reaching through with my dishing hammer and bashing the panel the rest of the way into place from the inside. once I was happy with the fit I drilled the rest of the holes and moved on.

The last 3 panels all went in pretty easily. 2 of them needed some light tweaking with the hammer, but nothing major.

Once they were all fit I planished them and then it was time to move onto the cheek plates and the slat back.

Step 8: The Lower Half



Now that your top is all worked out it's time for the bottom.

Start out by checking your patterns for the nasal and cheek plates to make sure they work with the metal helm top. I needed to go back and re-pattern my nasal.

Once your happy with how your patterns look with the top cut them all out.

Now, take your cheek plates and give them a pass or 2 in the shallow dish. Look at the pictures to see about how much curvature you're looking for. Once you've dished the cheek plates you'll need to put a flare along the back edge. Well, you don't need to, but it looks good, is easy, strengthens the plates and will help deflect weapons away from the opening at the back of the cheek plate. So really there isn't any reason not to.

To flare the edge start by marking the line you want to flare it on. Next place the line on a soft edge (in this case the edge of the dish, the edge of a stump or even a 2x4 clamped in a vice will work too.) and start to hammer the edge down.

Just do it a little bit at a time, I used 2 passes to set the flare on these plates.

Once your cheek plates are all formed mark and punch the holes where they'll attach to the top and bolt or cleco them in place.

Next we'll do the slat back. Start by giving them a quick pass in the shallow dish, that will add a bit of compound curve to them and make them a little stronger, plus it looks better IMHO. For a bit of extra flare I embossed little bosses into them the same way I did for the top plate. next drill a pair of holes in the top corners of each slat and mark and drill matching holes in your helmet top. I just spaced the slats evenly around the back between the cheek plates, it worked out to be a little less than an inch between each slat.

The slats by themselves are still fairly easily bent, so to beef them up I put a reinforcing bar across them. To make it I eyeballed out a length of 3/4" bar stock and used a modified machinists hammer to stretch one side, causing it to curve into more of a cone shape. the pictures explain it better than i can.

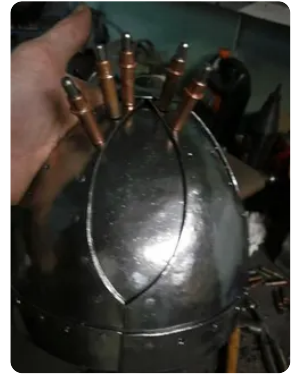
Once you have the right amount of curvature in it mark and drill your holes, then bolt or cleco it in place.

I ended up having to add as second bar underneath the first, just above the bosses to make it SCA legal. i don't have any pics, but it was done exactly the same as the first.

Lastly We'll do the nasal. I started by creasing the nasal. To do that I marked my center line as far up as i wanted the crease to go, then clamped it into the vice and hammed it over a little. It's that simple. Next I dished top portion of the nasal a little in the shallow dish, that makes it sit nicely against the top of the helm. Once i was happy with the fit I marked the existing holes in the brow band on it, drilled them, then while the nasal was held in place with clecos I marked and drilled the other rivet holes.

That's it, all that's left to do at this point is your finishing and assembly.

Step 9: Finishing and Final Assembly



Now that your helmet is all shaped and has all the rivet holes all that's left to do is your finishing. Whether you paint, powder coat, blacken, blue, russet, polish or whatever else is up to you. Myself, I take advantage of an industrial tumbler to burnish my plates.

Once you've done whatever finishing you choose it's time for the final assembly. Start with the dome and cleco or bolt in a panel, then go over it and one at a time remove each fastener and replace it with a rivet. Start with the back panel and work your way to the front just like you did to make all the holes in the first place.

Next put on the cheek plates, then the slats. Last comes the nasal. If your adding a bar grill or something similar then obviously that should go on before the nasal.

I was going to do a step on the bar grill, but I'm not happy with how I made mine, there was a lot of frustration and swearing involved. Understandably I don't want to make a tutorial on something that I'm not too sure about building myself in the first place. I'll see about a bar grill 'ible when I make my next helm.