Defects but No Failures

By R. G. Sparber

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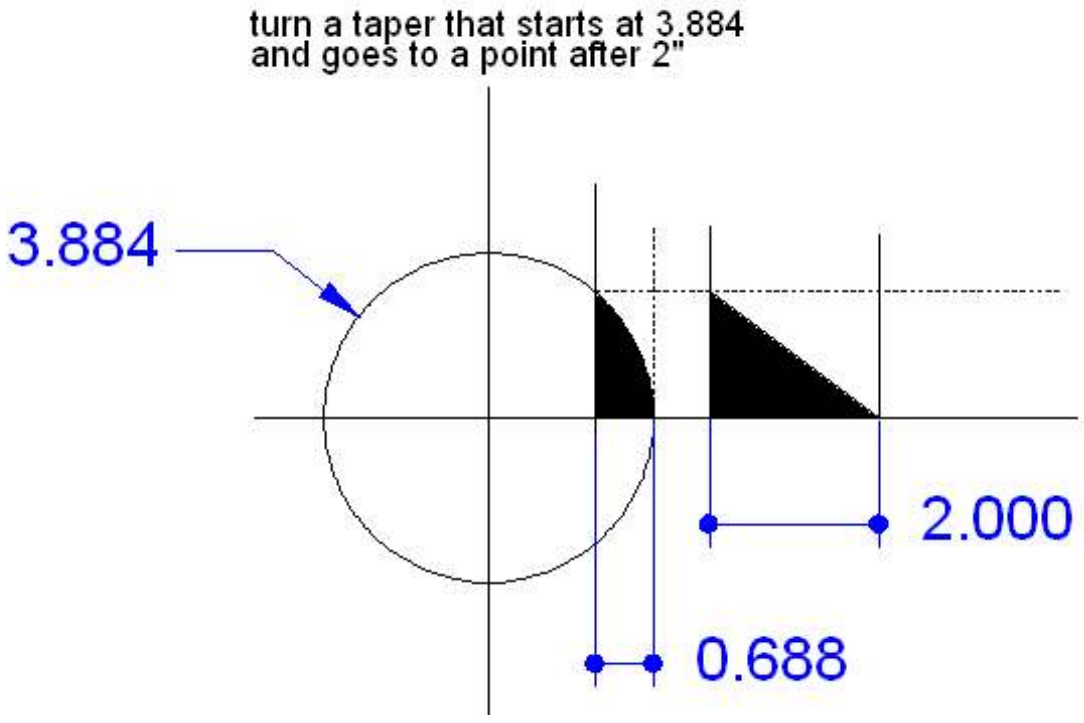
A defect is when something does not turn out the way you wanted. A failure is when you don't learn from the experience.

This last week I had lots of defects. Hopefully there were no failures.

Ram Pattern

The ram provides an opportunity to make the Gingery shaper look great or at least a bit less boxy. Those side lobes are the key. Gingery suggests using lots of Bondo® to form these lobes. I'm just not that talented. It occurred to me that I could cut a cone and then cut the right sector from it and I would have a nice set of parts that would be the lobes.



I started with a stack of glued up pine and mounted it on a faceplate.

It made a mess of my lathe and shop, but I turned a very nice looking cone. The hole in the side of the cone is from pilot holes for wood screws that hold the wood to the faceplate.

I then used a handsaw to cut the cone in half. This was followed by cutting out the sectors shown in the drawing. In the end my gluing job was poor and bit of wood fell off. That was easy to fix but the resulting sectors just did not look so good. Not much learned on this one but glad I did not use these side lobes.

I then decided to take a much simpler approach. Two squares of 3/4" MDF were cut to fit the sides of the ram. I then used a straight edge and compass to draw the two transitions. Rough cutting was done on the bandsaw. I then sanded to the line on a belt sander. The sides were beveled by eye.

After gluing up, wood putty was used for fillets.

The spine of the ram is taller than specified by Gingery as are the transition pieces. This was done to better support the top cap.

The Front Column Pattern

Except for making it longer by 3", this is the same as Gingery's design. At first I used his trick with waxed paper to form the fillets but they came out with a ragged edge. I then read in my U.S. Navy Foundry Book that a fillet with a right triangle cross section was better than a curved fillet. So I cut a few sticks of MDF to form the fillets. They worked very well. I still used wood putty to blend the transition between MDF fillet and vertical surfaces.

The problems started when it came to ramming up this pattern. I used the same flask as used for the side column plates. Two bars were placed across the cope to hold gaggers and I rammed the cope very hard. No joy. The cope dropped out soon after I cut the sprue. Fortunately the drag was spared. Lessons learned:

1. once the cope is lifted from the drag, keep the two parts far away from each other so a failure of the cope does not damage the drag
2. do not pull the drag pattern parts until you are sure the cope is solid since you may have to re-ram the cope
3. if you are ramming the pattern at the same time you are melting the aluminum, be sure to have a "plan B" so you can dump the melt when it is ready.

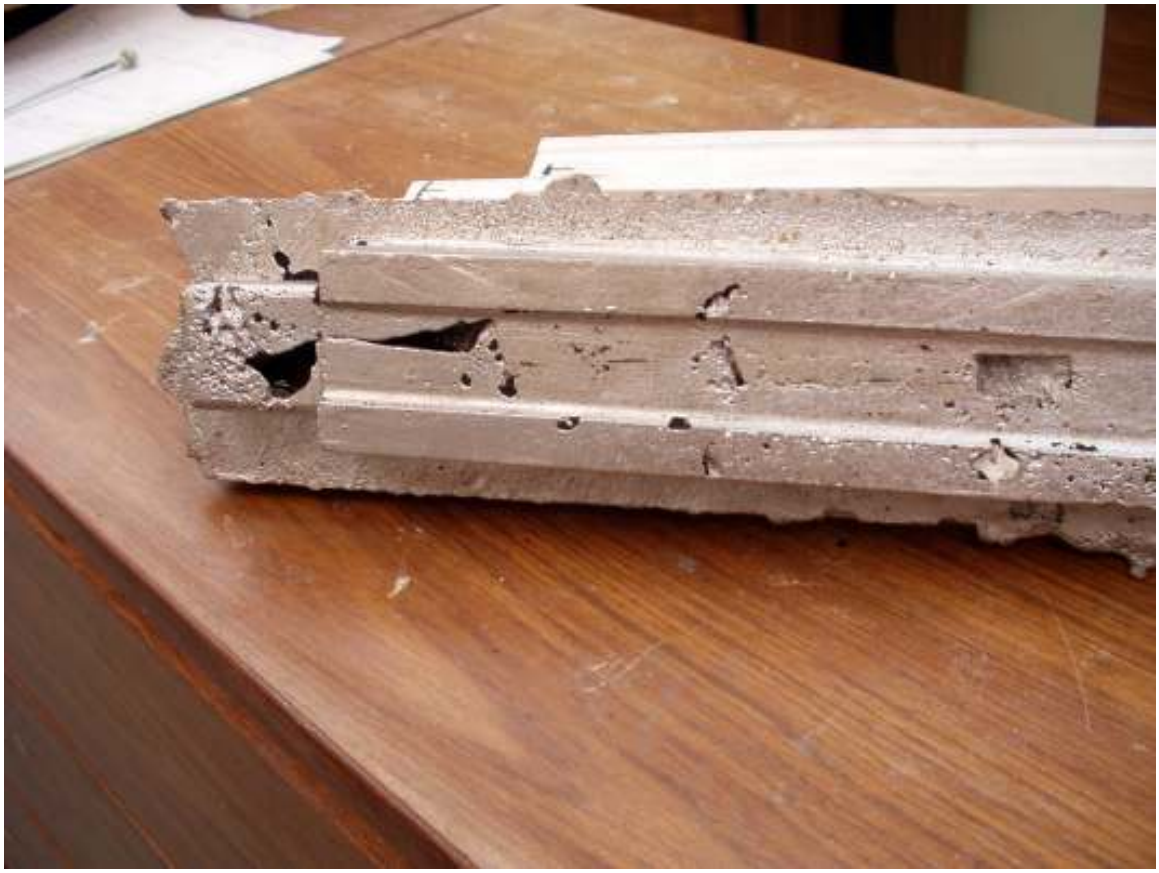
My second try at ramming the front column plate was not good. By the time I was ready for the pour, it was dark out and I was tired from a day of turning scrap aluminum into ingots. So I left the drag on its bottom board and put my molding board on the bottom of the cope. Then I rotated the cope so it was horizontal.

In the morning I fired up the furnace and carefully moved the drag to the pouring area. Then I moved the cope. As I lifted the cope from the molding board, thud. Major drop out. So it was back to the sandbox.

This time I placed the pattern in the drag at a diagonal. My hope was that the ends would be closer to the flask walls so be less likely to fail. I then rammed the sand much harder and used a 1/4" x 1" x 5" steel bar to ram around the pattern. My riser was placed near the end of the pattern that would become the top end of the part.

I carefully moved the drag to the pouring area and then the cope. All went well. Then I lowered the cope onto the drag and discovered that one of the guide pins was slightly out of alignment. The little bump caused by this misalignment was enough to cause my third drop out. It was not as massive as the first two and I figured I had nothing to loose so went ahead with the pour.

I was fairly sure the casting would be spoiled but figured I might learn something from the experience.



All of these voids had sand in them. I did not see any porosity. Note the areas that were not spoiled. They are nice and square. The on the left end is part of my riser system. I think it was part of my problem in that it unduly weakened the cope.

Here you see the sprue and gate next to their pattern. They seemed to work well. My goal was to have a nice even flow into the casting. The downward force of the aluminum falling down the sprue was absorbed by the void below the sprue. The extra wide gate slows the flow while distributing it across the casting impression.

Note that I put lots of labels on my patterns. They help me to not make the really stupid mistakes.

Here you see the fault line in the cope. Lots of sand fell down to provide more room for aluminum. If this was the extent of the damage, I could have milled it out.

Lessons learned:

1. Don't give up! Well, I actually knew this lesson but it is good to know when to take a break…
2. the riser was too close to the pattern which left pieces of cope that were too narrow to support themselves; I will try pencil risers resting on top of the cope pattern next time
3. It was worth doing the pour because I can see that if there had not been drop out, it would have been a good part.

Furnace Wear and Tear

Each time I did a pour today, a few more bits of refractory fell off of my lid. I am using a commercial refractory that is 5 to 20% perlite. It is an excellent insulator but very fragile. I have already faced the top of the body with black

fireplace cement and it has turned out to be very rugged. So now it was time to give the same treatment to the lid.

After waiting overnight to cool, I brushed out all loose material and wetted the surface with a paintbrush. Then I slathered on the cement, which tools very nicely when wet. A single layer of cardboard was placed on top of the furnace body and the newly repaired lit carefully placed down on it. The temperature of the furnace will then be slowly increased until the cardboard starts to smoke. The last time I did this it smoked for hours.

My furnace controller permits me to start heating at 3% of maximum and go up to 100%. Details are provided else ware on my web site.

My hope is to go for try #4 tomorrow and hopefully get a decent front column casting. My ram pattern is ready to go, as is the cap. I also have a pattern for an angle plate that I want to do. No lack of fun waiting to happen.

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