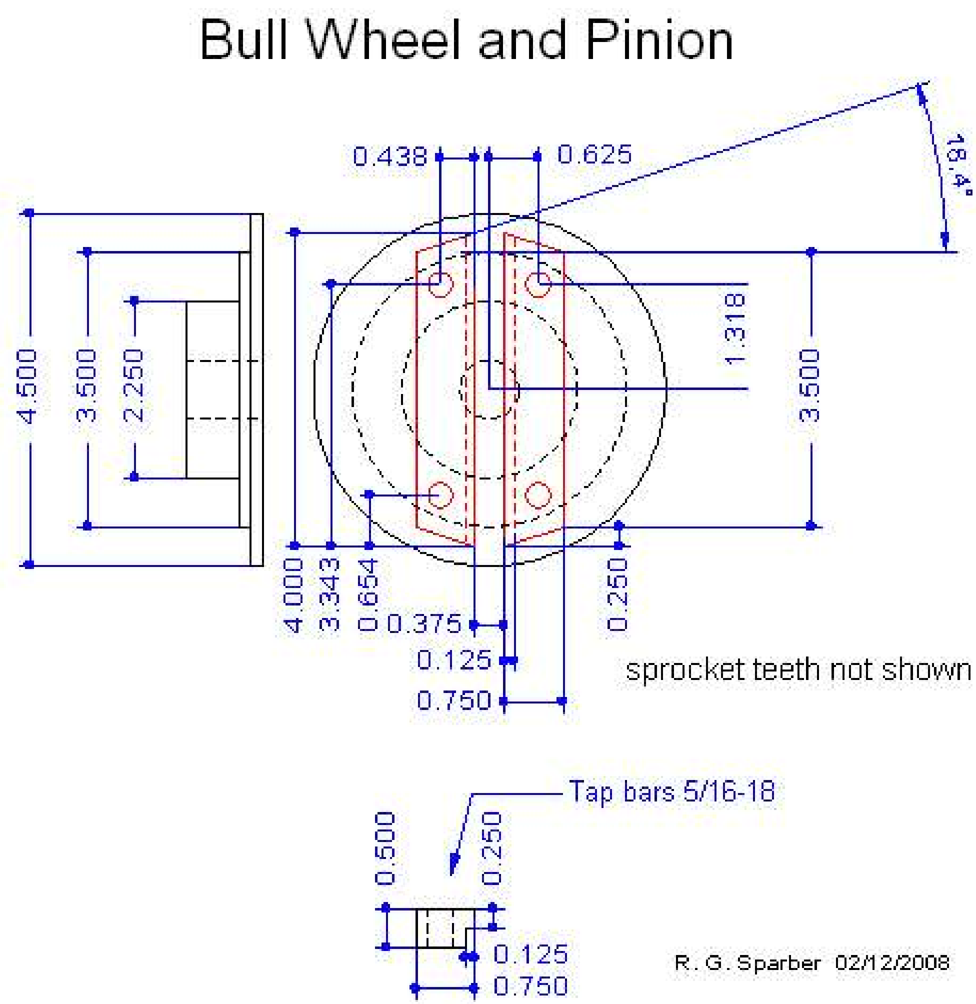
The Crank Plate

by R. G. Sparber

02/14/2008

In Gingery's original design, four lengths of 1/4” x 1” x 4” CRS are assembled to form the crank plate. This is a good approach unless you have access to a milling machine. Then it is easier to start with a pair of 1/2” thick bars. I didn't have any 1/2” x 1” bars but figured that 1/2” x 3/4” would work fine.

Although I really have not redesigned this assembly, it is still beneficial to draw it. In this way I become familiar with the pieces and can think about the best way to machine them.



My first step was to cut the bars. Their overall length does not have to be precise so I just scribed lines and cut close. Clean up was done on my belt sander.

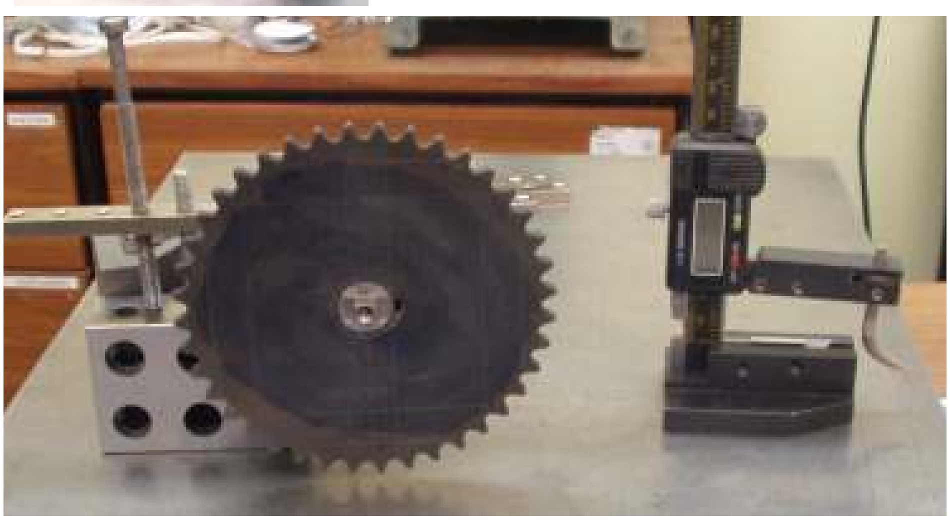
One thing of note here is the block of paraffin wax on the left side of the picture circled in red. My bandsaw blade teeth first cut across this wax and then cut the CRS. In this way cutting lubricant is freshly carried into the cut. The cut end of the bar had an even coat of wax on it indicating that there was plenty of wax present.

After deburing, the bars were clamped in my mill vise and 1/8” x 1/4” lips cut. I hope you weren't excited about seeing this machining step because it was so routine that I didn't take any pictures. Not much too it, really. My rough cut was 0.01” from the finished dimensions. I used a 5/8” end mill running at 770 RPM with a feed rate of 1 inch per minute.

A liquid cutting fluid kept things cool. Tap holes were drilled with an “F” drill in each bar and deburred with a countersink mounted in a brace and bit.

Next the sprocket was laid out. This was done by fitting it to a piece of scrap 3/4” round stock. The round stock was then clamped to a V-block.

A fixture was rigged with a 1-2-3 block so the sprocket was suspended above the surface plate. I then used my surface gage to scribe the lines that would later define the location of the crank plate.



The placement of the crank plate is not critical cut the spacing between the two halves should be precise. More on this later.

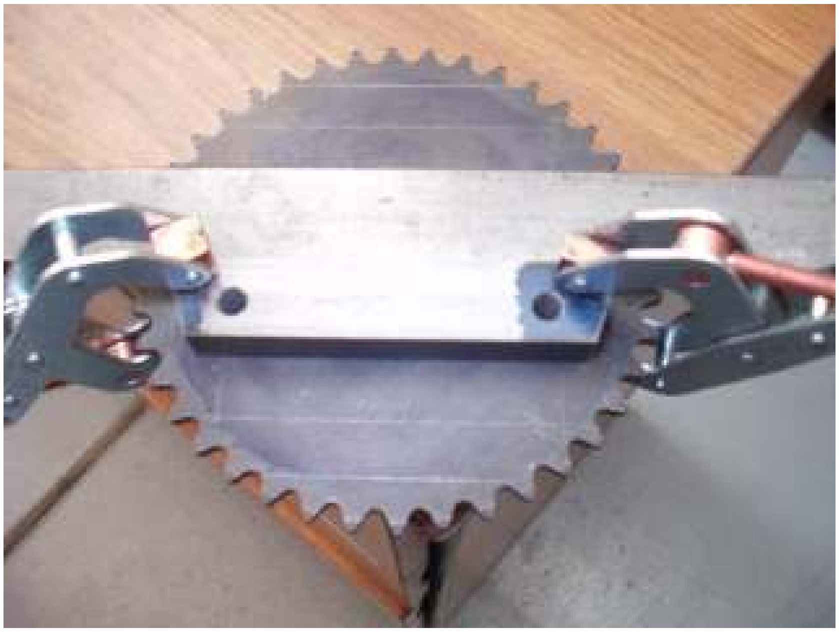
In order to scribe the lines, I first moved the surface gage so it touched the bottom of the bore.

I then zeroed the display. Moving up by the radius of the bar, 0.375”, I arrive at the horizontal center line. The gage is again zeroed. It is then a simple matter to scribe at 0.1875” and -0.1875”. These lines are parallel and 0.375” apart as shown in the drawing. Another set of lines were scribed 0.125” higher and lower to show me the location of the recess. In hindsight, these lines weren't helpful. Oh well...

The V block is unclamped from the 1-2-3 block and turned 90 degrees. It is again secured. The sprocket has now been rotated exactly 90 degrees. I again pick up the center as described above. Then scribe lines at ± 2.000" and ± 1.500".

Here we have the scribed sprocket. You may ask why I scribed lines at ±2" and ±1.5" parallel to the ones needed to set the bars. Simple – I screwed up.

The next step is to place the first bar. Since each bar has a step in it, lining up this bar by eye is difficult. Instead I placed a straight length of CRS on the scribed line as a fence.



The first bar is then clamped in place against the fence. This bar's placement should be as good as I can get to the scribed line but is really not that critical.

The assembly was then taken to my mill/drill and I match drilled through the bar using the same “F” tap drill. In this way I am guaranteed that the holes line up. With the bar removed, through holes were drilled in the sprocket.

The bar is then tapped 5/16”-18. I decided to hand tap the first hole but this got to be a chore. Time to risk a real part using my “new” tapping head.

I've had experience with this head tapping 1/4-20 in aluminum but was still a bit concerned about snapping a tap with this larger hole size and harder material.

At first I just clamped the bar with my Visegrip© style clamp. I knew there would b a lot of force so quickly decided to add more clamping force.

Ok, this is better. What you can't see is there there is a hole in the table directly under the tap. It will hold the chips from the tap.

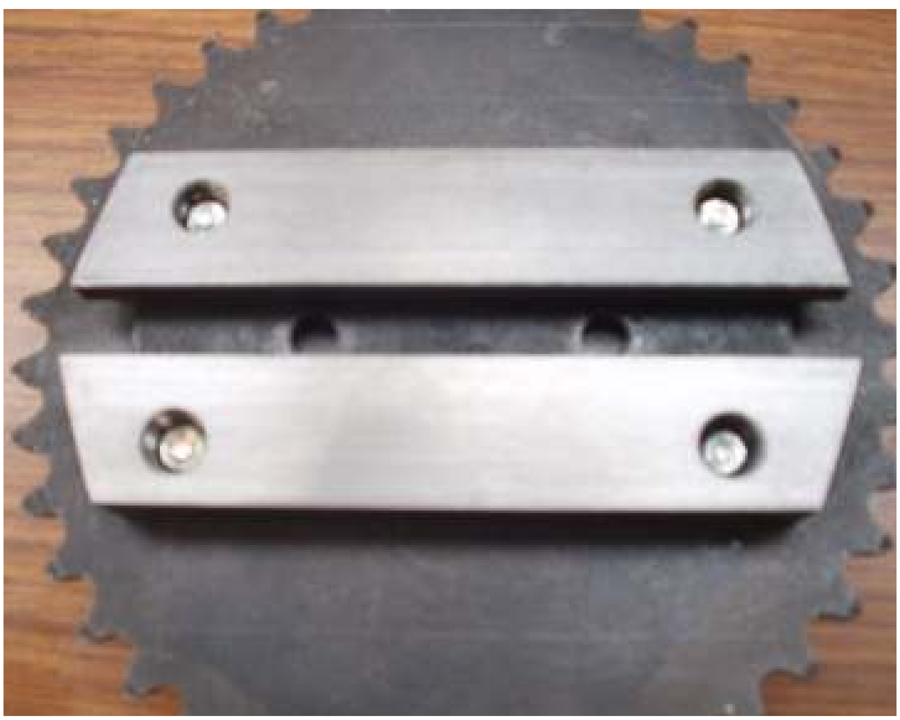
There was a lot more needed torque than my little drill press motor could handle. I stalled the motor twice before realizing that a pecking action worked better. The trick is to not let the tap fully leave the hole or upon reentering, there is a risk of tearing out some threads. The good news is that I did not break a tap.

Some people may have told you that you can't break a tap in a tapping head. I'm here to tell you that it can be done and is not pretty.

The bar is then secured to the sprocket using two grade 5 bolts and lock washers. The position of the second bar is more critical than this first bar. The gap between bars must be uniform. This is rather easy to do as long as it is not measured.

I want the distance between the bars to be 5/8” as measured against the sprocket. This is accomplished by just placing a 5/8” parallel down and pressing it against the first bar.

The the second bar is pushed against the parallel and clamped in place. You can see the holes of the parallel in the gap.



The attachment steps are repeated and the second bar screwed into place. As a final alignment step, all 4 screws are loosened and the parallel placed in the slot. Using my vise to apply gentle pressure on the bars and therefore on the parallel, I tightened all four bolts. My gap is now a precise 5/8” wide and parallel.

That's all for today. I'm now at page 45 in the book.

Rick Sparber
rgsparber@AOL.com