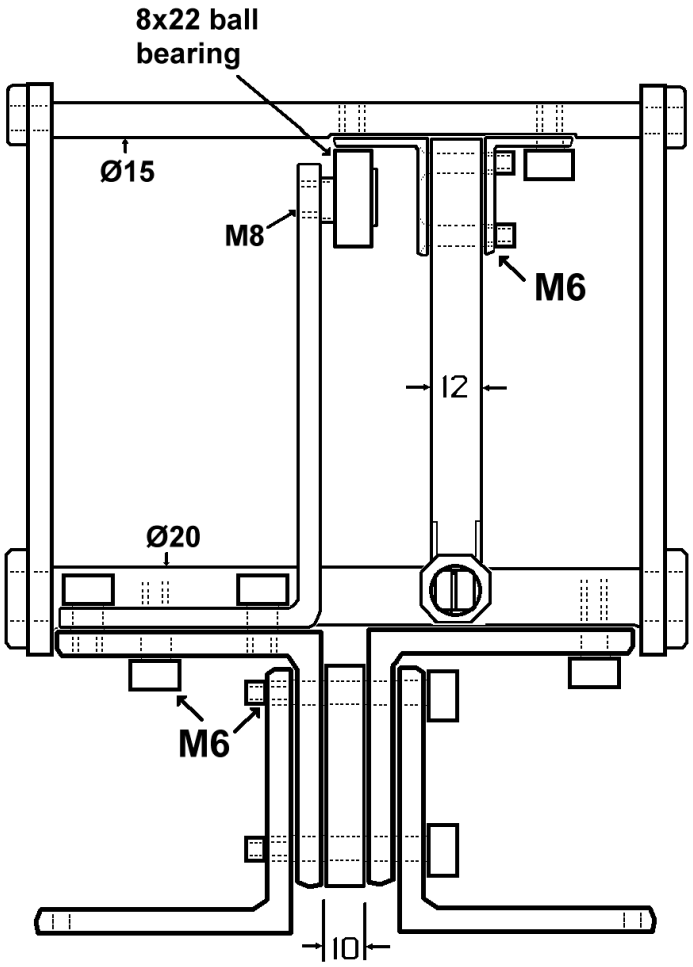
Building the Popular Science Hacksaw

Hacksawing has always been a chore and I have spent a lot of time hacksawing small pieces from larger pieces. Today you can buy bandsaws that will cut metal, but they cost quite a bit. When I found an article in *Popular Science* February 1964 about building a power hacksaw from angle iron and a few pieces from the scrap box I saw a cheap way to escape a lot of hard work. I managed to find some cheap 50mm x 50mm (2 in. x 2in.) angle iron where I live, and I used that for the base as suggested by the P.S. article. But I could not find 25mm x 25mm, however, I did find some 30mm x 40mm L shaped angle iron and used that instead for the overarm. I had a piece of 12mm thick steel in my scrap box and used that for the blade arms. The blade arms are clamped between the angle irons of the overarm, this differs from the P.S. version, I also clamped 10mm thick spacers between the 50mm x 50mm angle irons that makes up the base. This way the base and the overarm become wider than the P.S. version, but I guess this would make the frame stiffer. It will also allow me to insert a M10 bolt so a vice can be clamped to the base. So my version differs in some details from the PS version.



The sketch at the right shows the hacksaw as seen from the front.

A friend gave me a 250mm dia. PolyV pulley that I used on a countershaft to reduce the speed of the 1500rpm motor

Base

The P.S. article used 3/8in. bolts to clamp the "feet" to the angle iron base. I had some M6 screws of suitable length so I used 4 of them instead of one 3/8. I marked the first hole, clamped the pieces together and drilled through with a 5mm diameter twist drill. The holes were then opened up to 6mm except for the one in the leftmost piece on the sketch. This was tapped M6, I could now use one M6 screw to clamp the pieces together and drill and tap the next hole the same way. This way all holes in all pieces line up.

At one end of the base I drilled two 6mm diameter holes so the 20mm diameter mild steel rod used as a lower pivot could be clamped to the base. A 6mm wide flat was milled on the underside of the rod, the rod clamped to the base. I used a square to check that the rod was

clamped square to the base. Then I used a 6mm drill to spot the holes in the rod. Two 5mm holes were drilled almost through, and tapped M6.

Overarm

I found some 30mm x 40mm L shaped angle iron and used that to make the overarm. One arm was heated with a Propane torch not far from the upper pivot end and slightly bent. Flats were milled on the pivot and I tapped and drilled as for the lower pivot. This way the overarm becomes less likely to move sideways.

The blade arms were hacksawed from some 12mm thick mild steel. In the lower part of the blade arm closest to the crankshaft, a sawcut was made so an ordinary hacksaw blade could be inserted. To hold the blade a hole was drilled into the sawcut and through it, and tapped for a screw. In the other end a piece of 1.5mm thick steel was bent around a piece of square mild steel and attached to the front blade arm. The square piece was turned and threaded at one end for a nut, a sawcut was made in the other end and a hole drilled and tapped – see right photo. This way the hacksaw blade tension can be adjusted.

Rocker

In the PS version the rocker was made from an automobile connecting rod, I didn't have any so I made something similar from some pieces of mild steel from my scrap box, see the sketch on page 1. What the sketch doesn't show is the spacer between the two rocker arms, instead of using just a cross bolt as in the PS version, I made the spacer wider and used four M6 screws to hold the rocker arms to the spacer. I think this makes the rocker stiffer than just using one bolt.

I silver soldered some pieces of mild steel to the ends of each rocker arm, bolted them together and drilled and bored holes through both ends. Oilite bushes with 20mm and 15mm holes were pressed in, and are used as bearings for the 20mm and 15mm pivots. I used bushes with 20mm inner diameter for the lower pivot and 15mm for the upper. The bushes works well and if they wear (unlikely) they can be replaced.

Crank, crankshaft and connecting rod

I started with the connecting rod. I drilled a small hole near one end and used a hacksaw to make a cut from the end to the hole. That end was heated with a Propane torch and bent out, after cooling I milled the slot so the blade arm just fit inside.

At the opposite end I drilled a hole and pressed in a piece of brass tube, this will serve as a bearing for the crank pin.

I also milled groove on each long side of the connecting rod to make it lighter – right photo.

The crank was hacksawed from a piece of steel, a slightly undersize hole drilled and bored in the centre and a piece of 20mm bright steel rod (crankshaft) was pressed in. I also used a couple of so called "French keys" to make sure the rod would not move.

The crankpin was made from a piece of 10mm dia. mild steel rod, threaded at each end. One end is screwed into the crank and secured with some Loctite. The crank pin will fit into one end of the connecting rod and I used a "Nyloc" nut to make sure the connecting rod will stay in place.

Crankshaft bearing

For the crankshaft bearings I used Oilite bushes with an inner diameter of 20mm. The crankshaft will rotate with less than 100 rpm so I didn't think there was any need for ball bearings. To get the Oilite bushes up to centre height I used a short piece of 80mm square

steel tube bolted to the base. To get enough "meat" for the Oilite bushes I bolted two pieces of mild steel on the inside of the tube before drilling and boring the holes for the bushes – right photo.

Below is a photo of the finished bearing.

The photo to the right shows the crankshaft and bearing mounted on the base. A couple of oil-holes are visible on the top.

The only thing missing is a large pulley.

Pulleys

I managed to find a suitable piece from an aluminium plate and decided to use that for the crankshaft pulley. Unfortunately the diameter was larger than what I could turn in my small lathe so I had to mount the work (with spacers between

the work and the table) on my rotary table and mill the outer part circular.

I made a single point cutter and used that to mill the V groove for the 5mm wide V belt.

The aluminium used for the crankshaft pulley was just 10mm thick and it would be difficult to get a satisfactory fit on the crankshaft, I decided a thicker hub was needed. I bored the centre of the aluminium pulley out to 30mm, and fabricated a hub from two pieces of mild steel – see right photo. I used a 32mm steel rod and a piece hacksawed from a 10mm thick steel plate. A friend TIG welded the two pieces together for me.

In fact I made two identical hubs since I needed a counter-shaft to get the speed reduction needed.

After welding the centre hole was bored to a sliding fit on the 20mm dia. crankshaft and mounted on a mandrel so the hub could be finish turned between centres. On one hub I turned a V groove for the 5mm wide V belt – right photo.

I did struggle to find a second large pulley for the countershaft, but after a while a friend got me a large PolyV pulley that I could mount on the second hub. For the countershaft I used another piece of the 80mm square steel tube, but instead of Oilite bushes I used two 20mm Pillow Block ball bearings. The countershaft will rotate at a higher speed than the crankshaft. I also turned a small diameter PolyV pulley for the motor. I must find some material to make some belt and pulley guards.

The power hacksaw has worked well so far.