Custom making special handsaw blades

If you use hand saws, you will need to sharpen them eventually. So saw sharpening is a useful skill to add to your skill-set. There is much information on internet on saw sharpening, with Paul Seller's videos being particularly easy to follow. It is illuminating to watch him sharpen a handsaw in five minutes for a touch-up and perhaps 20 minutes for a complete resharpen where he reshapes the teeth. (See www.paulsellers.com and on youtube)

Some tools such as **frame saws** use removeable blades. It is not difficult to make a frame saw, like the one shown, from scratch, once you have a blade. In the past many artisans and apprentices will have made their own.

The example shown on the right is also called a turning saw because the blade holders can be rotated to cut in different directions.
It is important have a blade in hand before you start making the frame, as the blade length is a key measurement. I have two old examples with different blade lengths – one is 295mm hole-to-hole and the other is 345mm hole-to-hole.

These old blades are resharpenable with a small triangular saw file. The blades were quite narrow to start with. With each sharpening, the blade will become narrower, as one would expect. You can see that the upper blade in the picture on the right is somewhat narrower. It has been resharpened by hand as some of the teeth are uneven. For replacements, the required lengths were probably freely available when it was made, but no longer. There are only a limited number of lengths available nowadays, so good luck finding one in the length you need, off the shelf. You can make one as I describe below.

A **pad saw**, also known as a key-hole saw, is useful for awkwardly shaped holes. These blades are push blades, so they require a delicate touch to avoid bending them. I found a Marples example second-hand with a wavey, blunt blade. Because it is a push blade, it was probably inclined to bend and kink if the user was ham-handed. With some careful hammering, resetting and sharpening, I was able to restore this blade to working order. But it is not as good as new – you can see it fitted into the handle in the picture above. Slight kinks are still visible. These blades are 1.4mm (about 1/16") thick which is quite thick, but this is needed to avoid them being too fragile. These blades are still available by mail order from overseas suppliers, which is good news.

You may be aware of Japanese pull-saws and their virtues of being easy to use and having a narrow kerf because the blade is so thin. This is possible due to being pull-saws – if the blade needed to be pushed, it would kink in no time. To solve the blade kinking problem for my pad saw, I resolved to make a pull version of the blade. The first attempt at the bottom of the picture is rather snaggle toothed, but it does cut, albeit a bit unevenly. The second attempt in the middle, has more even teeth and cuts quite cleanly.

Band-saw blade stock is a good starting point for making frame saw blades and pad saw blades. If you have a band saw, you may have a collection of broken and blunt blades that you may be wondering what to do with. If not, they are probably available for the asking. The used blade shown below is a 19mm wide, 3 tpi blade that broke at the weld after some use. The stock is 1mm thick.

There are a few practical issues with using bandsaw blades as stock for making your custom blade.

1. The teeth are very hard, which is a virtue, but it does mean that they can't be resharpened with a saw file as one might expect for hand saws.
2. The teeth are usually a hook shape, which is too aggressive for a hand saw.

3. The blade needs to be cut to length and holes drilled.
4. They may be full of fatigue cracks because they are worn out – this happens eventually to all blades, particularly if they have been resharpened and rewelded more than once.

I will address each of these issues in turn below.

1. **Hard teeth.** Sometimes only the teeth are hard and the backing stock is soft enough to be file-able. Then you can just grind off the teeth and work with the backing stock, which will still be quite hard enough. To cut off a length of the blade, just grind a notch in it and bend it back and forth a couple of times. New teeth can be marked out on the blade and refiled as required. This can be rather tedious, so there are a couple of alternatives – you could send the blade out to have new teeth cut by a commercial saw-sharpener. You will need to specify the TPI (Teeth per Inch) and the shape of the tooth form if you can, such as 10 TPI, cross-cut. Depending on their tooling, they may find the bandsaw blade stock too hard, so check with them first. They may be able to make up a blade to your spec as an alternative.

   Or you can grind your own teeth. This is a bit fiddly, but it can be done with some care – a steady hand and a good pair of eyes are essential. Using a small triangular grind-stone in a high-speed die grinder or a small router, the required tooth form can be shaped using a profiled stone. The picture below shows a worn stone (top) and a reshaped stone (below). On the right is a diamond dressing tool which was used to shape the point. Only a very light touch is needed as the diamond very efficiently cuts away the aluminium oxide stone.

   Using a black marking pen, lay down a back-ground on the blade stock, against which you can mark out the tooth profile you want using a sharp point. I used the existing saw blade as a template. Then you can use the triangular grind-stone to cut the teeth. I proceed slowly, grinding each tooth a little at a time, moving along the blade, before returning to deepen each gullet until the desired shape is reached.
   The key with small stones is to run them as fast as possible, to get enough surface speed for efficient grinding. An electric drill is just not fast enough – 24,000 rpm is the sort of speed needed. Even at high speed, the stone will wear quite quickly, so it may need to be reshaped a few times. This is why you need to grind each tooth a little at a time, otherwise the teeth at one end may have different shapes to the other end. This is how the pad saw blades shown above were made.
   You may notice the teeth becoming blue with the grinding heat, even with a light touch. On a working band-saw blade this would be a problem as the teeth will have lost some of their hardness and will then become blunt very quickly with the heavy use expected of a band-saw blade. However, for a hand-saw blade this is not going to be a problem, as the steel will still be quite hard enough, and may still be too hard to file!

2. **Tooth form.** If you look at the blades I made for the pad saw, you can see the pull teeth, sloping in the opposite direction to the push teeth of the original blade at the top. These pull-tooth blades are made from 1mm thick band-saw blade stock as shown in the picture above. The bottom blade is the first one I made and you can see the teeth are rather irregular – they still cut, but not well. The middle blade is the second one I made, and you can see that teeth are much more regular. The tooth form is a combination rip/cross-cut with a slight backwards slope so that the saw doesn't cut too aggressively. The tpi is the same as the original pad-saw blade at 9 tpi. Before the final grinding pass the teeth were set using an Eclipse saw-set at the #11 tpi setting. When resharpening, try to keep the same tooth form, unless you have some insight on what you want, based on another blade that you like. If you are unsure what tooth form to use, copy an existing saw that you are happy with, using it as a template to mark out the teeth.

3. **Cutting to length and making holes.** The blade can be cut off using a bench grinder or a fibre disc wheel in Dremel type high-speed grinder or an angle grinder with a fine metal cutting disc. The holes for

pins at the ends of the blade for a frame saw are best drilled using a carbide drill, but a sharp HSS drill bit, preferably a high cobalt one, may also do the job.

4. **Fatigue cracks.** If you find these, scrap the blade stock, as it may fail later on – it is not worth investing any further time. Careful inspection should reveal these cracks – they often start at the gullets of teeth as this is the narrowest part of the blade. They can often be seen along the back of the blade too, under a magnifying glass.

This whole blade making process may seem rather fiddly, but if a replacement blade is not available, there may be no alternative to making your own. As a guide, the second pad-saw blade took about 2 hours to make, starting with 19mm wide x 1mm thick band-saw blade stock, which had to be reduced in width, before the teeth were cut. It can be done. At 1mm, the blade is thinner than the 1.4mm thick push blade, but it is intended to be pulled.

Another advantage with making your own is you get to choose the tooth form you need – crosscut, rip or combination, as well as the number of teeth per inch.

I have also made a blade for the larger frame saw shown, from narrower band-saw blade stock. The blade stock I used had a fine-tooth form, probably from a metal cutting blade. These finer teeth suited the application I had in mind, so I could use it as made. I just cut it to length and the pin holes were drilled with an HSS drill bit. I have tried a coarser tooth form as provided with a wood cutting bandsaw blade, but the hook tooth form was too aggressive and the blade required too much force to cut with. Regrinding the coarser blade with a less aggressive hook, perhaps even a slight backwards slope may make it usable.