BANDSAW BASICS

By
Ian Cameron

Disclaimer

This article is offered from Ian Cameron, a member of the West Suffolk Woodturning Club.

It is intended as a comprehensive workshop guide for the selection, use and tuning of a Bandsaw.

The author and The West Suffolk Woodturning Club are not responsible for your actions. Bandsaws are dangerous. Any use, advice or guidance followed or interpreted from this guide is implemented at your own risk and responsibility.

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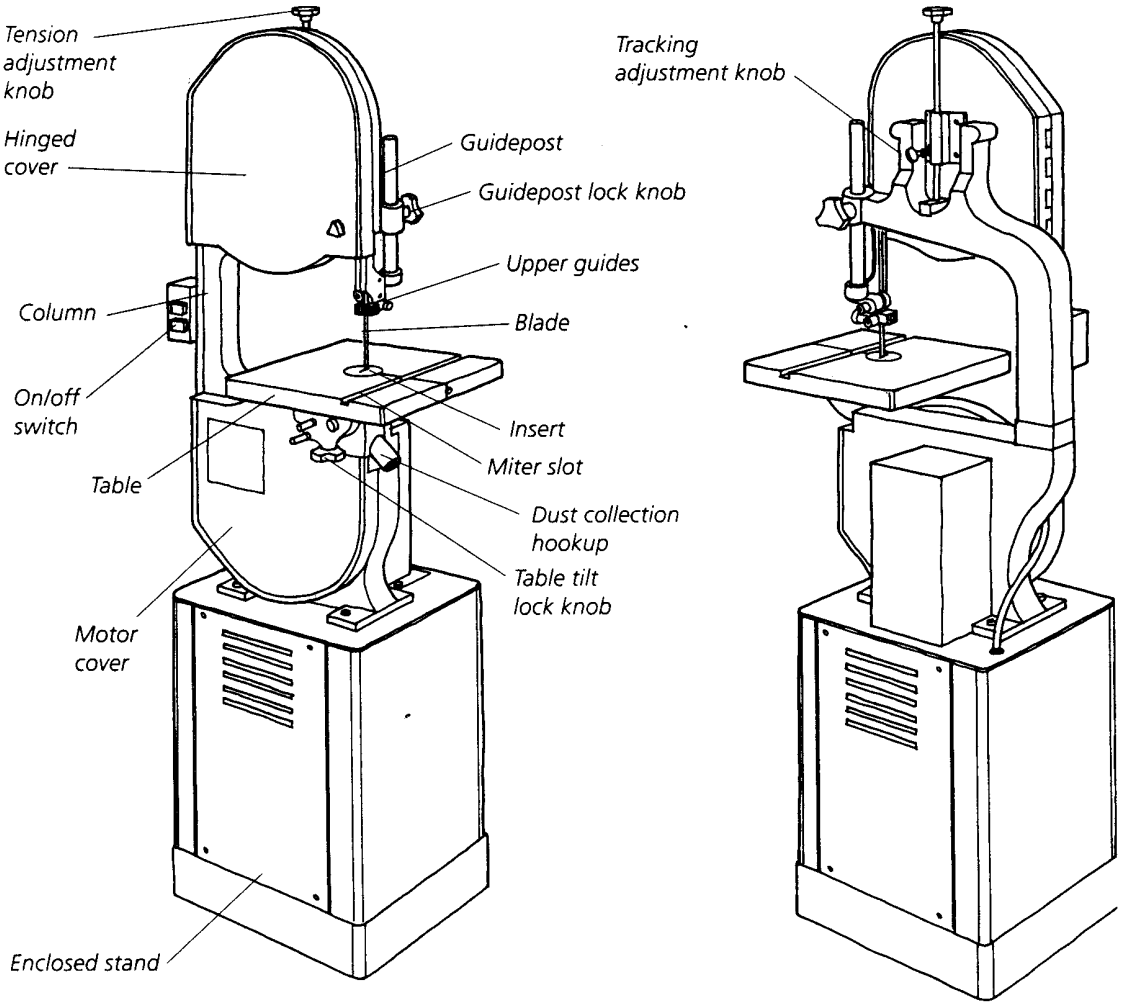
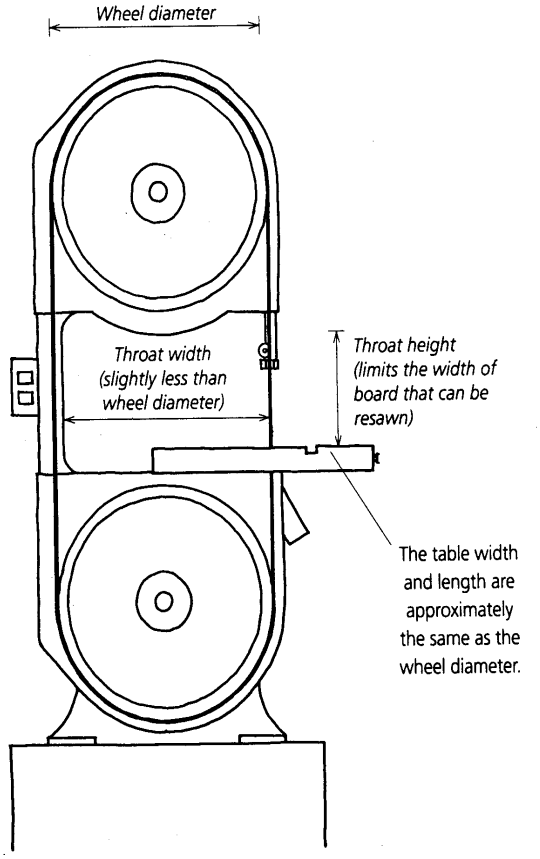
1. This handout contains some of the basics of bandsaw work, from understanding the type of machine you need to blade selection for a specific need. This is not an exhaustive collection of information, but is designed to give a flavour of the versatility of the machine. In conjunction with a hands-on class that will produce an attractive piece it is hoped that we will kindle your interest in the almost unlimited potential of bandsaw work, and perhaps awaken the artistic being that (mostly) lies dormant in all of us.

Parts of a Bandsaw



The details of the bandsaw above are based upon a cast, consumer grade 14" model, which is very typical of the mid range workhorse manufactured by the majority of power tool companies. Newer designs, however, are constructed from steel plate.

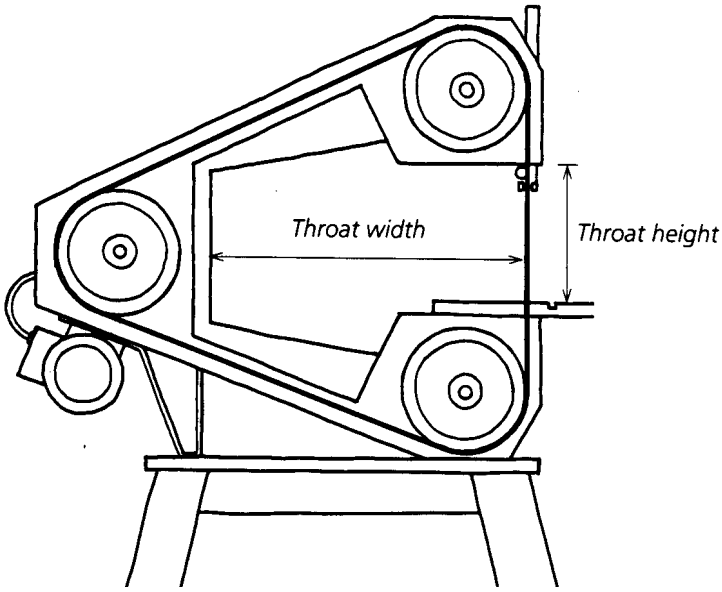
2. There are a huge variety of bandsaw machines that can be divided by size and configuration. The manufacturers machine size reflects the dimension of timber you are able to cut in terms of width and thickness.



What Size Means

When talking about the size of this 2-wheel bandsaw, it's usual to refer to the wheel diameter. As shown in the drawing the throat width limits the width of stock you can run trough the saw. However it should be remembered that if you intend to cut curves the movement of the stock can reduce that maximum size, and generally you need to keep the waste to the inside of the cut. In the case of the 2-wheel bandsaw the throat width is almost the same as the wheel diameter; typically a little less since most saws use the frame to shield the blade on its upward travel. In most cases the length and width of the table are similar to the wheel diameter. Thus a 14" 2 wheel bandsaw can handle stock less than 14" wide.

The configuration of the machine is also worth reviewing as the sales drive by some retail outlets can be confusing to someone just exploring the world of bandsaws. The second configuration is the 3-wheel bandsaw, which was designed to increase the cutting size capability of the hobby (mainly bench type rather than floor standing) size saws.

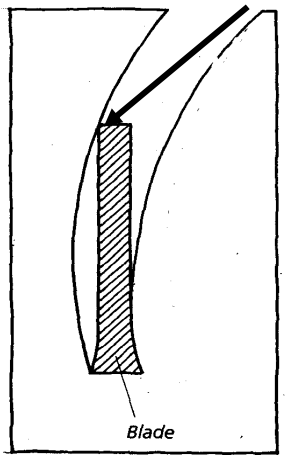


Three Wheel Bandsaws.

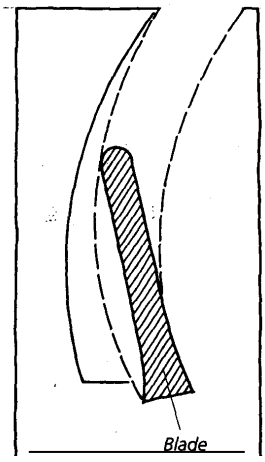
Three wheel bandsaws have a much larger throat width, giving the capacity to cut wider boards. In the case of 3 wheel saws the size is not related to the wheel diameter but to the throat capacity

3. The 3-wheel saw appears to be the answer to space saving when judged against achieving the maximum width of stock. There are some benefits to this type of machine particularly in the hobby arena where small pieces are the order of the day. The down side of the 3-wheel machine is that, of necessity the diameter of the wheels is small, and thereby hangs the problem. If you wish to indulge in any resawing or heavier work that requires wider blades, the continual flexing of the saw blade around small diameter wheels weakens the blade structure and the user needs to be aware that the blade is much more likely to fail. A recommendation from blade manufacturers gives a broad understanding of the limitation; a 0.5 in wide 0.025" thick blade should not be used on a machine with wheels of less than 10" in diameter.

4. The reason for using a bandsaw is to be able to either resaw stock or cut curves. It follows that we need to have an idea of the severity of curve that can be cut by any given blade. The defining dimension that dictated the smallest available diameter of curve is the width of the blade.



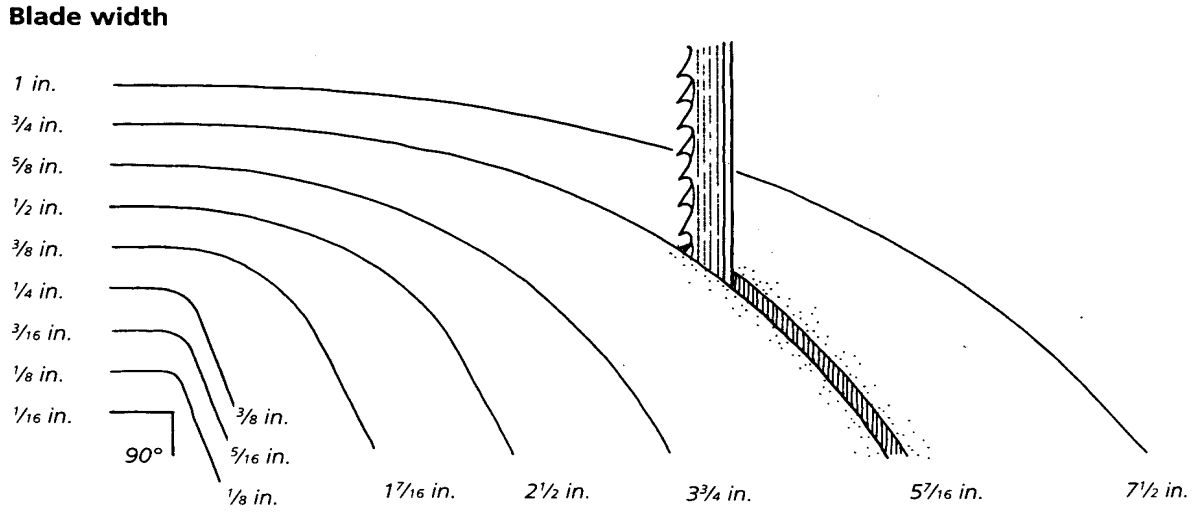
As can be seen from the diagram on the next page, the width of the blade dictates the minimum curve that it is physically possible to cut. Additionally, if we push the blade to its limit, it should be apparent that the back corner (arrowed) would drag on the stock and hinder our ability to be accurate and smooth. This effect can be minimized by a very effective and quick fix. Each and every time we replace a saw blade we should apply a file, stone or abrasive paper to the back edge and round the corners as shown on the right.



Handy tips: when bandsawing, slower cuts are usually best, whether you're resawing or cutting contours. You'll get a cleaner cut, and you should be able to saw more accurately. Too slow and the wood will burn and the blade will stall, Too quickly, and the blade will choke and also stall. The ideal speed depends upon the design of the blade and practice will produce your own comfort level. Probably the most important variable is the pressure you put on the blade by feeding the stock. After a little use you can almost feel the blades comfort level.

5. Having given the blade every chance to do its job well the following table gives a guide to the radius of cut that is possible with each width of blade. I should stress that this is an approximation based upon the average thickness of metal used to make the blade and the number and type of teeth. The best way of finding out the curve capability of the blade is to try a practice cut.

How Bandsaw Blade Width Affects Cutting Radius

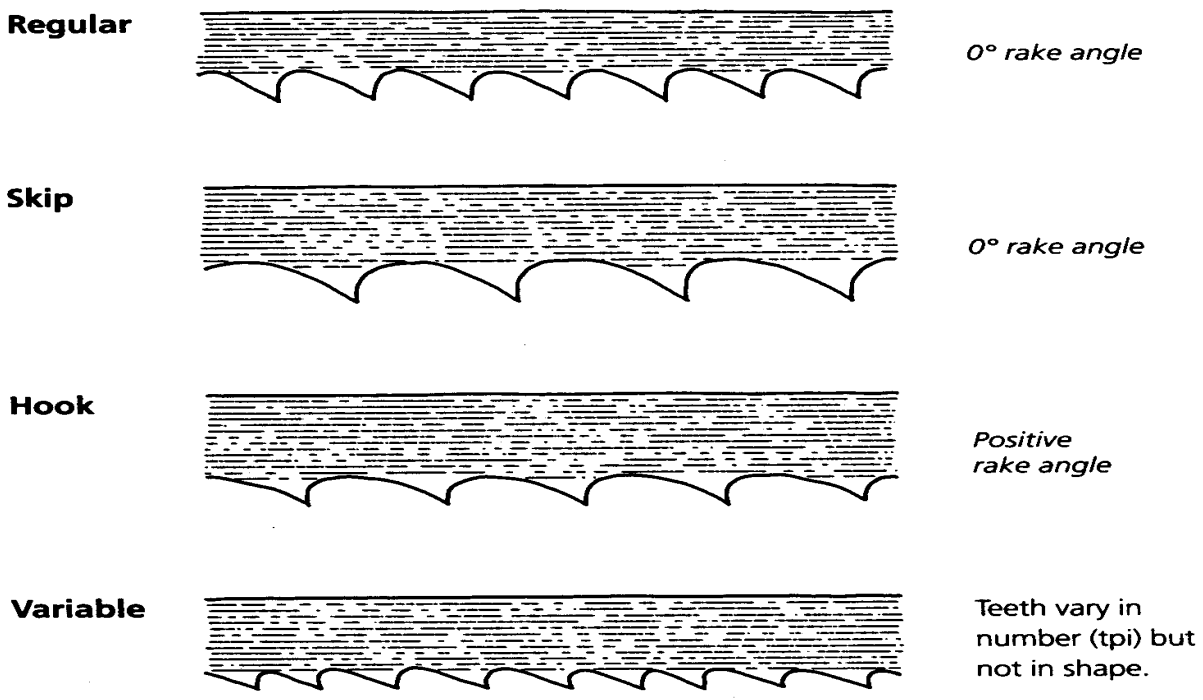


Minimum radius the blade can cut without difficulty

6. Tooth form is vital. At the top of the importance table when it comes to efficient cutting is the tooth form. The tooth form will determine how well the blade will cut in a given situation.

Tooth Forms

The form of the tooth is the most important factor in how a blade cuts.



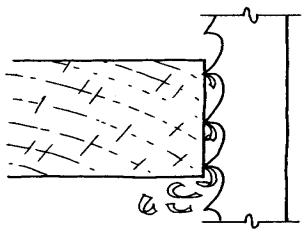
In fact one of the best blades I have used is a combination blade, which is produced for the frozen meat trade and is called either a Hook and Skip blade or Meat and Fish. The theory behind the fact is that the most critical design of a blade from an efficient cutting perspective is the "space between the teeth". That is because you need to remove the cut waste or swarf efficiently. If the space is too small the waste wood will clog the blade and cause it to stall. That also leads us to selecting the best pitch of blade (No of teeth per inch). The diagram below illustrates the effect of the number of teeth in the stock to be cut, and the table below gives an outline of the use of tooth forms.

Tooth Forms and their Uses

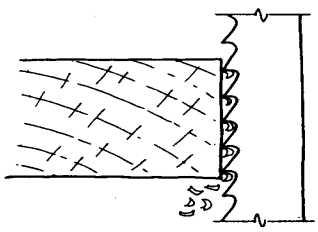
Tooth form	No of teeth	Rake Angle	Gullet	Best Use	Limitations
Regular	Many evenly spaced teeth	0° scraping action cuts cleanly	Small	Precise cutting of curves	Gullet fills quickly. Slow feed rate
Skip	Every other tooth missing	0° scraping action cuts cleanly	Large	Resawing, ripping thick stock	Cut not as smooth as regular tooth
Hook	Similar to Skip	Positive angle Aggressive cut	Large	Aggressive blade faster feed rate. Resawing and ripping especially hardwoods	Same as Skip
Variable	Vary in size and pitch but not shape	0° or positive	Same as tooth form	Much less vibration. Very smooth cut. Moderate feed rate	Expensive
Hook and Skip	Hooked tooth fewer teeth	Positive angle	Very large	Best resawing and ripping	Not easily available in US

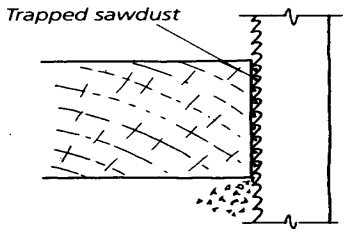
Selecting the Best Pitch

You'll get the best cuts when there are between 6 and 12 teeth in the stock (center).
The cut is smooth and because the sawdust is rapidly carried away, the feed rate can be faster.



Fewer than 6 teeth in the stock can cause vibration and a rough cut.





With more than 12 teeth in the stock, the small gullets fill with sawdust and the blade overheats.

7. It follows that after applying the rules above you should be using the widest (for stiffness) blade you can dependent upon the diameter of the curves you need. Wider blades wander less and produce smoother curves. One of the lesser known, limiting factors on blade width is the ability of the bandsaw to tension the blade. The majority of consumer grade saws (14 inch - 2 wheel) cannot tension a blade wider than 0.5" and there is therefore no advantage in fitting a 0.75" blade, which the wheel and tire combinations are capable of accepting. The pitch of blade should provide approximately 6-12 teeth to the thickness of the stock being cut. Last but not least is the material that the blades are made from. So to complete the picture the table below contrasts the currently available Bandsaw blade materials and their uses.

Bandsaw Blade Materials

Material	Cost	Advantages	Disadvantages	Best use
Spring Steel	Inexpensive	Very flexible for use on bandsaws with small diameter wheels	Stamped teeth dull very quickly	Light-duty cuts on small bandsaws
Carbon Steel	Inexpensive	Weld or braze your own Readily available	Dulls quickly, Cannot be sharpened	Cutting contours in relatively thin stock
Wood Slicer Spring Steel	Moderate	Flexible, thin kerf Ground polished and hardened teeth. Variable pitch reduces vibration		Resawing
Bimetal	Moderate	Cobalt-steel teeth don't overheat as readily as carbon steel teeth. High recommended tension means greater beam strength		Demanding, heat generating, uses such as resawing and cutting thick stock
Carbide	Moderately Expensive	Precisely ground carbide teeth give smooth cut. Recommended tension almost twice carbon steel. Outlasts carbon-steel blades 25 to 1	Cost. Carbide is brittle	Resawing and other demanding applications
Stellite	Very Expensive	Less brittle than carbide	Cost. Not as hard as carbide	Resawing

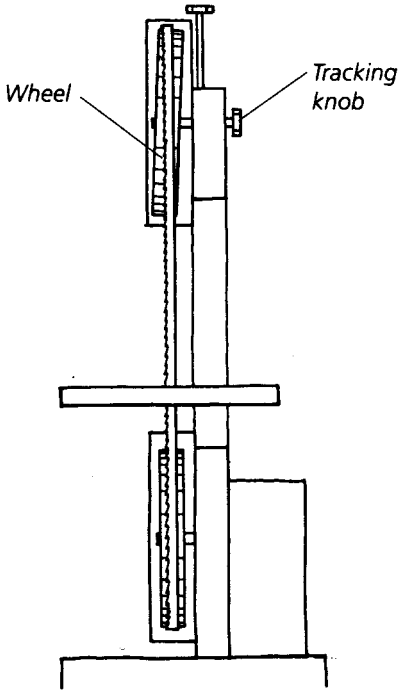
A few words on Blade tracking and tensioning:

Bimetal, carbide tipped, and spring steel blades can be tensioned significantly tighter than carbon blades. That means that they will be more rigid and less likely to deflect and wander in difficult cutting situations. These blades are the best choice for resawing thick stock.. The tensioning marks on the average consumer bandsaw are aimed at carbon steel blades. My ow3n method is to tension at least to a musical note when plucked (the middle C method). Not very scientific but it

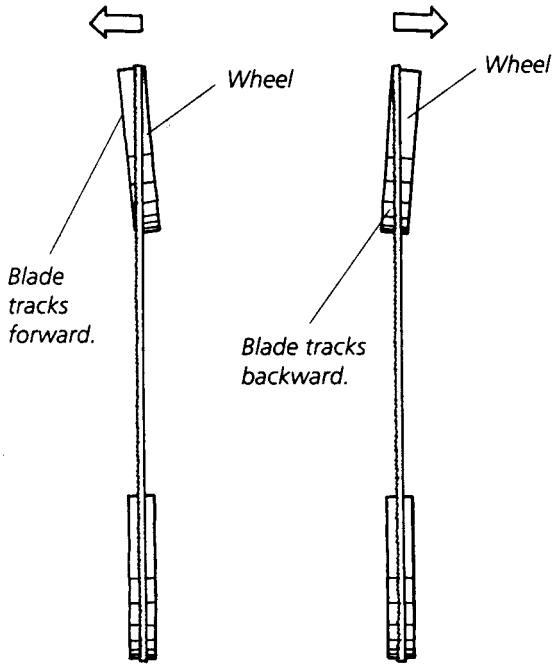
works most of the time. Usually you will find that you need just a little more than the indicated tension, but experience will show. If the blade wanders or bows, check the tension first.

Tracking a Blade

Most bandsaws don't need a tracking adjustment until the blade is tensioned at or near the maximum. That is when the upper wheel may become misaligned so that the blade won't track on the center of the tires. You can easily correct the misalignment by carefully turning the tracking knob until the blade settles on the center of the tires.



The upper wheel tilts from side to side to keep the blade on the center of the wheel. The blade will follow the direction of the top of the wheel.



And finally a few pointers on Tuning the saw:

- Disconnect the power.
- Remove the insert and clear the blade removal slot that runs at Right angles to the miter slot.
- Open top and bottom covers, fold down the dust collection hook-up and lower the guide post almost to the table or so that they don't interfere with the blade at the sides or the back.
- Release the blade tension. Generally, lower the upper wheel just enough to slip the blade off.
- Remove the blade through the removal slot.
- Install new blade, first on the upper wheel and then around the lower wheel. This may sound silly but check that the teeth are pointing down (you may have to "turn the blade inside out").
- Apply just enough tension to take the slack out of the blade.
- Turn one wheel a few times by hand and check the blade is central on the tire, and that the guide blocks and bearings are free from the blade.
- Tension the blade with a meter, or if as is more likely you are using the saw's gauge, set the tension for the next widest blade.
- Check that the blade tracks correctly. If you have a straight edge check that each of the 2 wheels is running parallel and as close to the same plane as can be achieved.
- Adjust the upper and lower thrust bearings so that they don't quite touch the blade (a paper thickness is about right).
- Adjust the upper and lower guides so that they are again a paper thickness away from the blade and that the blade teeth are proud of the guide blocks. This is not possible with very small blades where the best solution is to use sacrificial blocks, home made hardwood blocks work well.
- Square the table to the blade.
- Round the back of the blade.

Happy Cutting

Ian