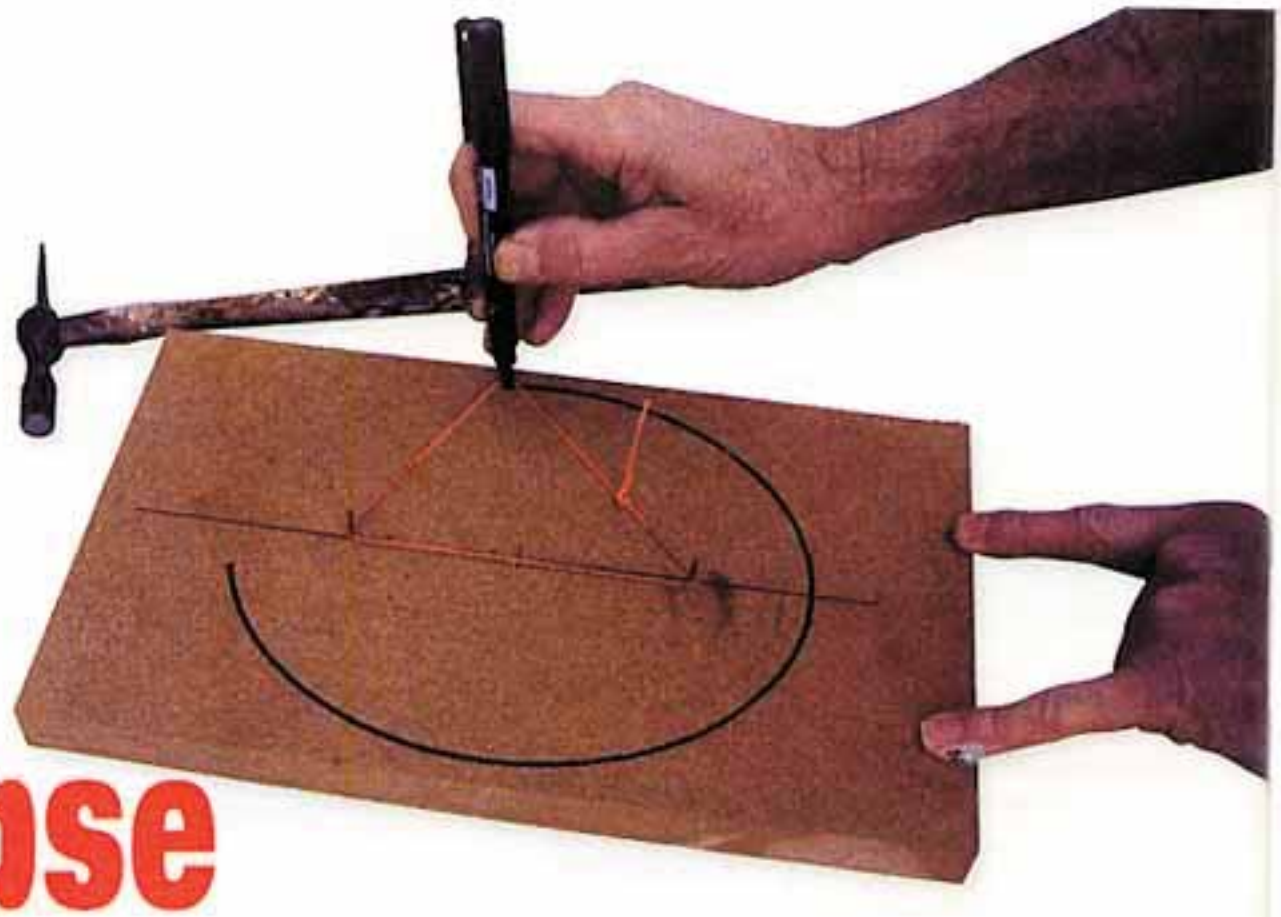
Ever wanted to use that most elegant of shapes, the ellipse, but been put off by the apparent difficulties? **George O'Brien** looks at methods of drawing, cutting and using this often overlooked design element.



Total ellipse

The elegant shape of the ellipse is eminently suitable for use in woodwork projects ranging from table tops to picture frames. Unfortunately, it isn't easily drawn with the usual array of rules, compasses and dividers to be found in a woodworker's toolbox. Reasonably simple techniques do exist, however, which, once understood, allow it to be added to any woodworkers repertoire. Here are four different methods of drawing ellipses, and a fifth requiring no drawing at all.

Starting simple

Steak plates, biscuit tins and other pre-formed elliptical objects surround us in our daily lives and many are suitable for drawing around. The advantages of this method's obvious simplicity must be weighed against the design restrictions imposed on any woodworking project designed around an ellipse of a set size and proportion. Also it isn't ideal for projects that call for two or more parallel ellipses — such as picture or mirror frames — as any inaccuracies in the initial copying process are likely to be magnified each time a further ellipse is taken from it.

Ovals & ellipses

The words 'oval' and 'ellipse' are often treated as interchangeable, which is, in fact, not the case. An ellipse precisely describes a curved, symmetrical shape with a constantly changing radius, whereas an 'oval' is any kind of elongated circle. Both an egg and a running track can be accurately described as oval whereas neither is elliptical!

String & nails

Almost as simple, this method allows the drawing of reasonably accurate ellipses of any proportion or size with as many parallels as required. It probably isn't precise enough to satisfy draughtsmen or engineers, but is perfectly adequate for most woodworking requirements. The only equipment needed is a pencil, a length of string tied into a loop, two nails or pins, and a backing board if the ellipse is required on paper.

Start by drawing a single centreline through the major axis of the intended ellipse. Partly drive the two pins into this line equi-distant from the ellipse's centre point. Drop the string over both pins and position a pencil within its loop. Keeping the string taut, 'drive' the pencil around and watch as it describes its elliptical path. The distance between the pins and the diameter of the string-loop will be the determining factors of the size and proportion of the finished ellipse, so a good deal of trial and error may be required if set dimensions are called for.

The accuracy obtained will depend on the pencil being held upright and the string being kept equally taut throughout. If a tiny washer or eyelet is tied into the loop, and the tip of the pencil passed through it, the string will be kept as close to the paper as possible and minimise some of these inaccuracies. Parallel ellipses can be easily added by tying different sized loops.

Computer generation

Various software programmes (such as Corel Draw or Microsoft Power Point) will allow the computer-equipped woodworker to generate ellipses of any size or proportion within the scope of the equipment. Once happy with the on-screen ellipse, it can then be printed out ready for transferring to the project. This method obviously depends on the necessary hard and software you have, but is as quick and easy as the string and nails method and just as versatile. It also has the unique advantage in that once an ellipse has been saved to disc, unlimited numbers of copies can be printed out immediately or at any time in the future. Similarly proportioned but differently sized ellipses are also available, as are as many parallels as needed, all at the press of a button or two.

Draughting

And now for the 'proper' draughtsman's method which offers accuracy commensurate with drawing skills and infinite freedom of choice when it comes to positioning, size and

If you have computer, a printer and some drawing software, you should be able to produce ellipses quite easily.

proportion. However, this method is time-consuming and calls for a mastery of basic drawing equipment and skills.

The timber or paper ground, on which an ellipse has been generated by this method, will be, by necessity, covered in unwanted lines and curves so separate drawings may be needed if more than two parallel ellipses are required. A way around this problem is to use paper thin enough for the drawing to be visible from both sides and then only draw one quarter of each required ellipse. As long as the project blank has identical centre lines to the paper version, each ellipse can be built up by transferring the same quadrant four times, turning the paper from end to end and top to bottom.

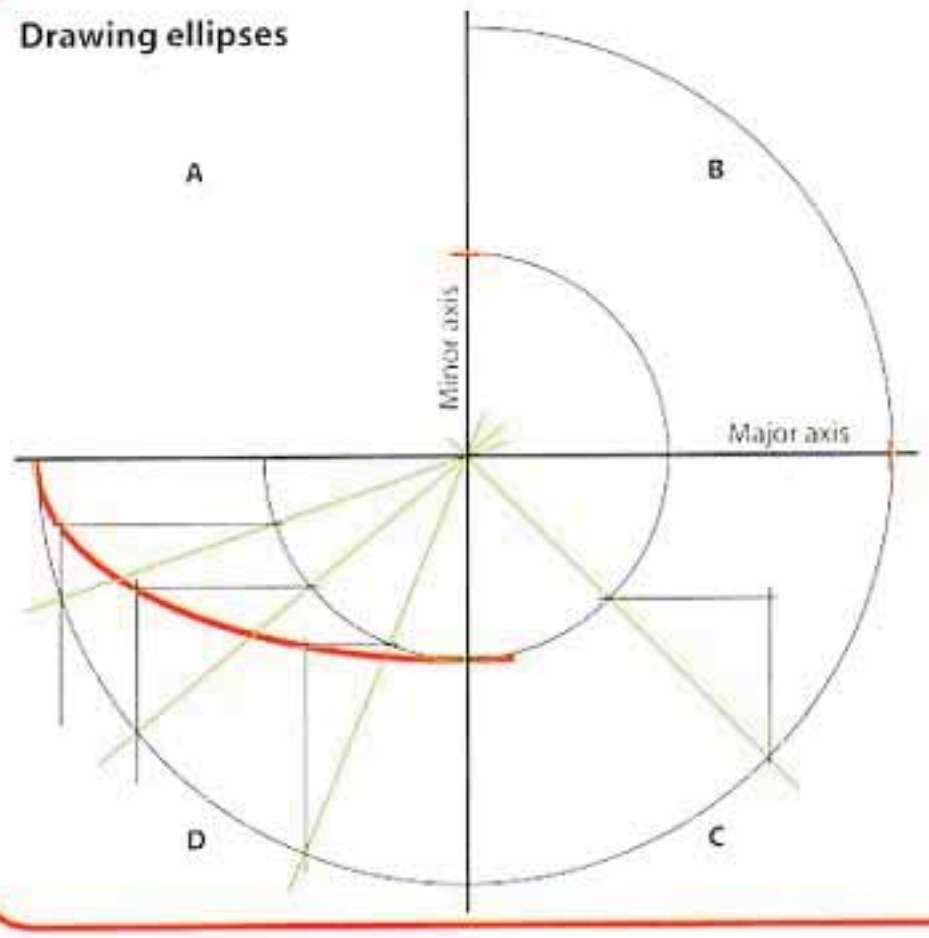
How to do it

A Dreferign to the diagram, draw centrelines marking the ellipse's major and minor axes in the desired position.

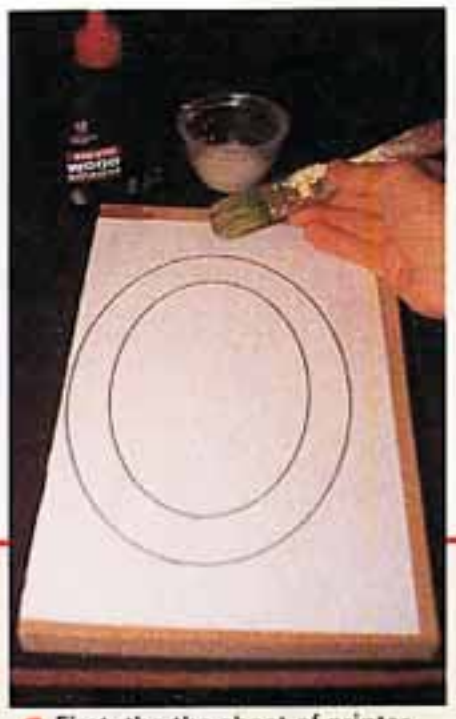
B Add two circles, on the same centre, whose diameters correspond to the required major and minor dimensions.

C Draw a radius line (at random) emanating from the centre-point and long enough to cross both circles. From the points at which the radius intersects each circle, draw two interesecting lines parallel the major and minor axes, as shown. The intersection of these lines indicates a single point on the ellipse's periphery.

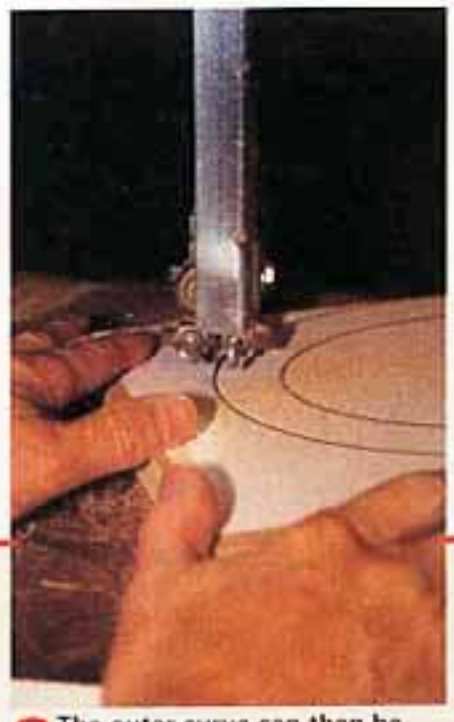
D A series of similar radii and secondary lines will indicate the passage of the ellipse, which can then be drawn in freehand or with a flexible rule. The more radii you add the more accurate the finished ellipse will be and the simpler the freehand drawing, but the spiderweb of lines may make adding a second ellipse confusing.



COMPUTER GENERATED ELLIPSE

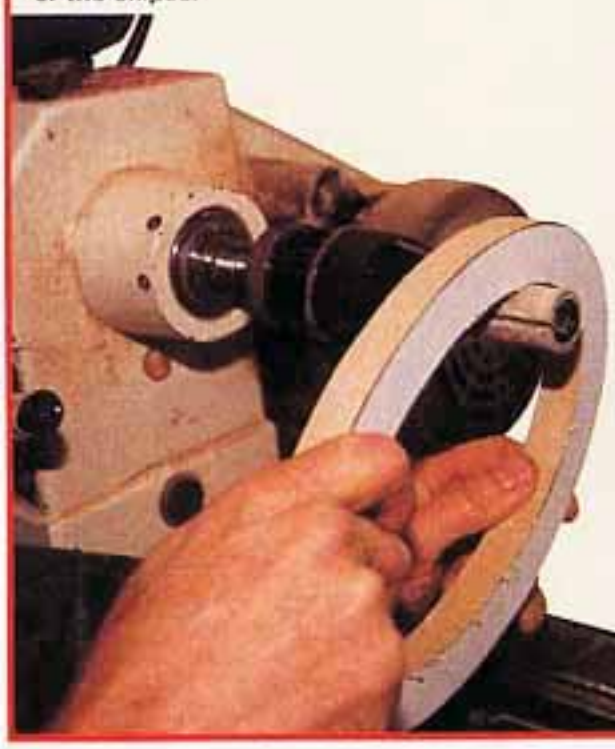


1 First, the the sheet of printer paper, containing a pair of computer-generated ellipses, is glued directly to a suitable piece of material (I used 18mm MDF) with diluted PVA (about 80% water) and allowed to dry.



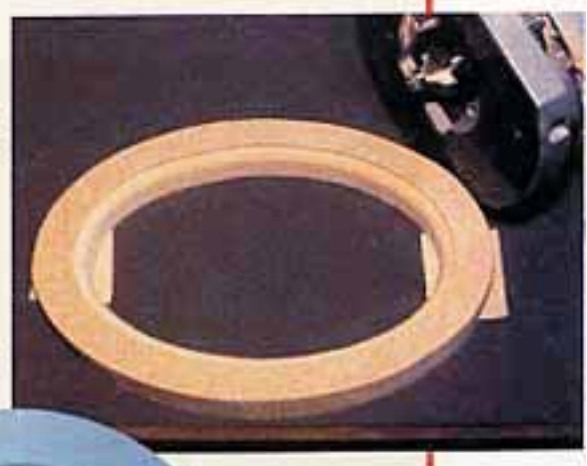
2 The outer curve can then be cut on the bandsaw using the widest blade that will comfortably follow the curves without binding.

3 A jigsaw will remove the centre which could then be further machined to become a smaller frame or ornament base.



4 I used my home-made lathe-mounted disc and bobbin sanders to smooth the inner and outer edges of the ellipse.

5 The hollow ellipse can now be held to the bench top with double-sided tape while a bearing-guided router cutter forms a rebate for the picture or mirror.



6 The workpiece has been turned over and the router cutter changed to cut the ogee pattern. The adhesive on the double-sided tape will grip the workpiece strongly enough to risk breakage on removal if more than a couple of small pieces are used.

A larger version, painted and framing a mirror.

Trend's Mini ellipse and circle cutting jig.

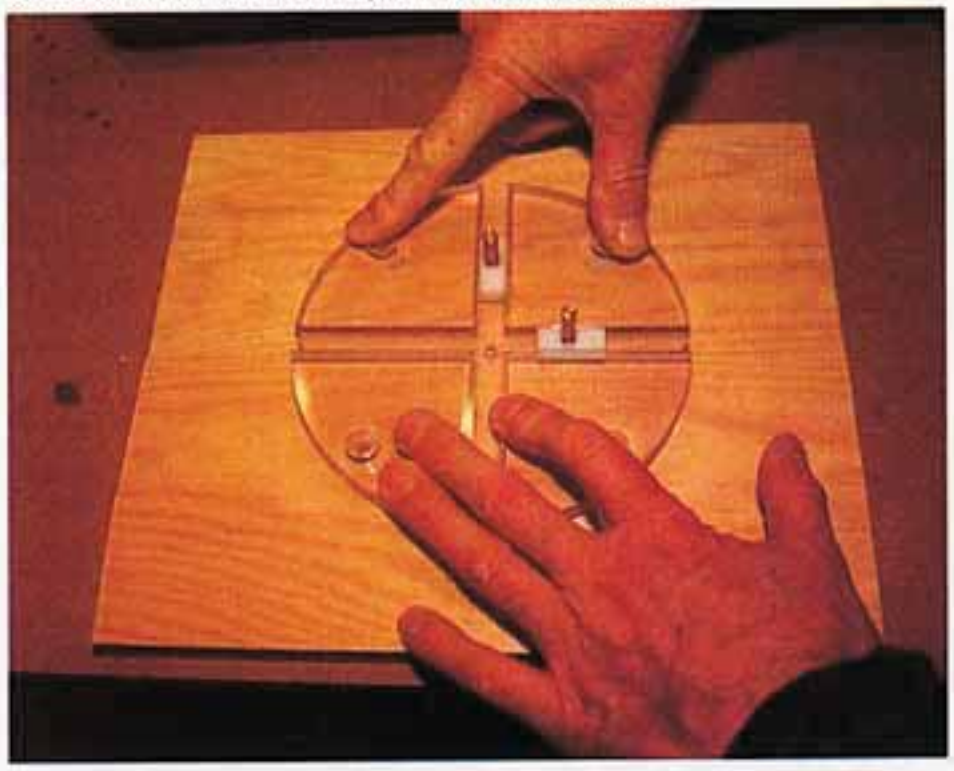
Follow the Trend

It's a relatively simple task to transfer a drawn ellipse from paper to timber, using carbon paper, in readiness for cutting with bandsaw or jigsaw. There is, however, another option that does away with the drawing stage altogether.

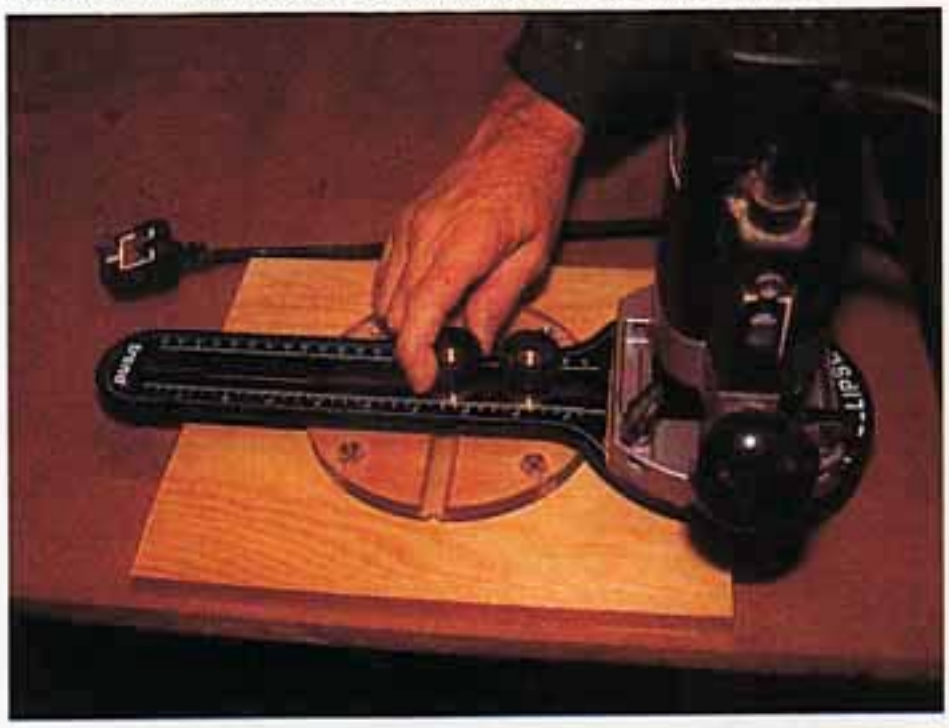
Trend, the routing equipment specialists, offer two ellipse and circle cutting jigs for use with most makes of router. They differ only in their size and scope. The larger J/A model (£149.99) would be needed for elliptical table tops or curved door heads but its smaller sibling, the Mini (£69.95) would be better suited to smaller projects, such as picture or mirror frames, painter's blanks, clocks and ornamental bases. Both jigs are well made and easy to use, with each consisting of two main parts: the Plate, which attaches to the workpiece and carries two accurately machined 'tee' grooves, and the Crossframe, which is guided by two sliders running within it.

Trend's larger J/A ellipse and circle cutting jig.

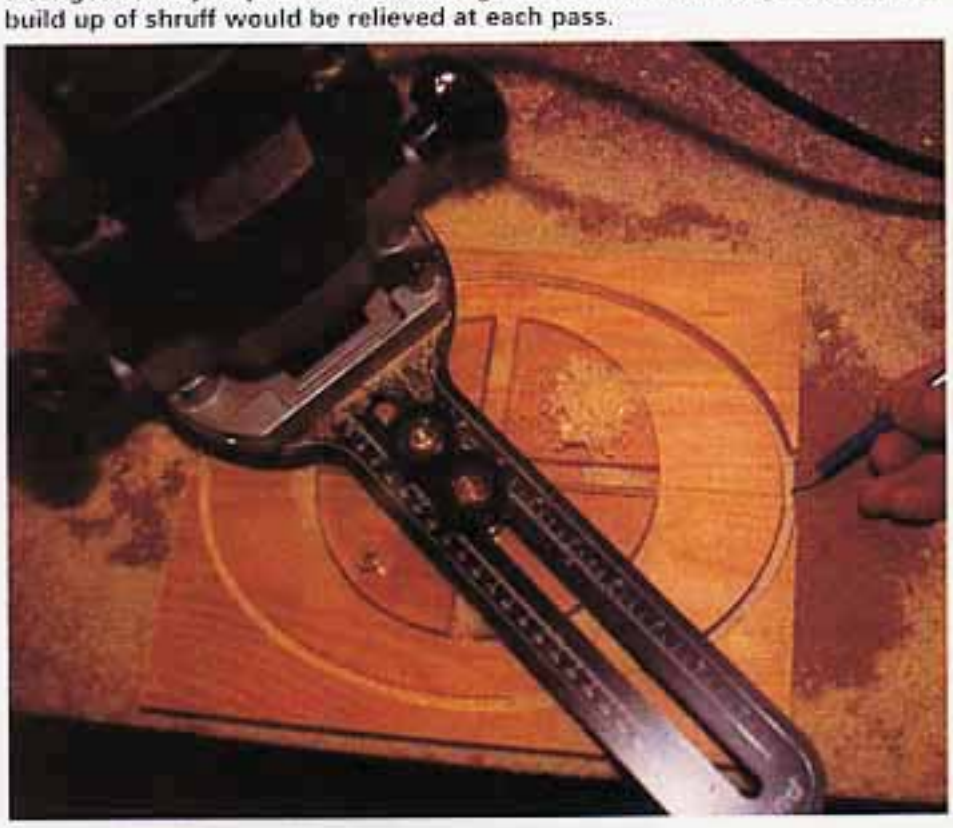
The Plate must be attached to the workpiece with the tee grooves aligned with the ellipse's major and minor axes. I used tiny slivers of double-sided tape, so that the finished ellipse would remain unmarked, but four countersunk screw-holes are provided for the purpose.



With a router fitted to the sliders and the adjuster knobs fitted loosely, the jig can be manoeuvred until the cutter is positioned over the ellipse's major dimension (I relied on a pre-existing mark on the timber but could have used either the metric or the imperial markings on the Crossframe's tail). With the first dimension set, the adjuster is tightened directly over the Plate's centre point. A similar routine can then be followed on the minor dimension.



With the setting up complete it's then simple to 'drive' the router around the ellipse; a series of light cuts is preferable to a few heavier ones. I'd arranged for my ellipse to break through the blank's outer edge so that the build up of shruff would be relieved at each pass.



I made this number plaque entirely with the router, using Trend's Mini ellipse Jig, Lettering template and Powercarver.