



## Laying out f-holes – part one

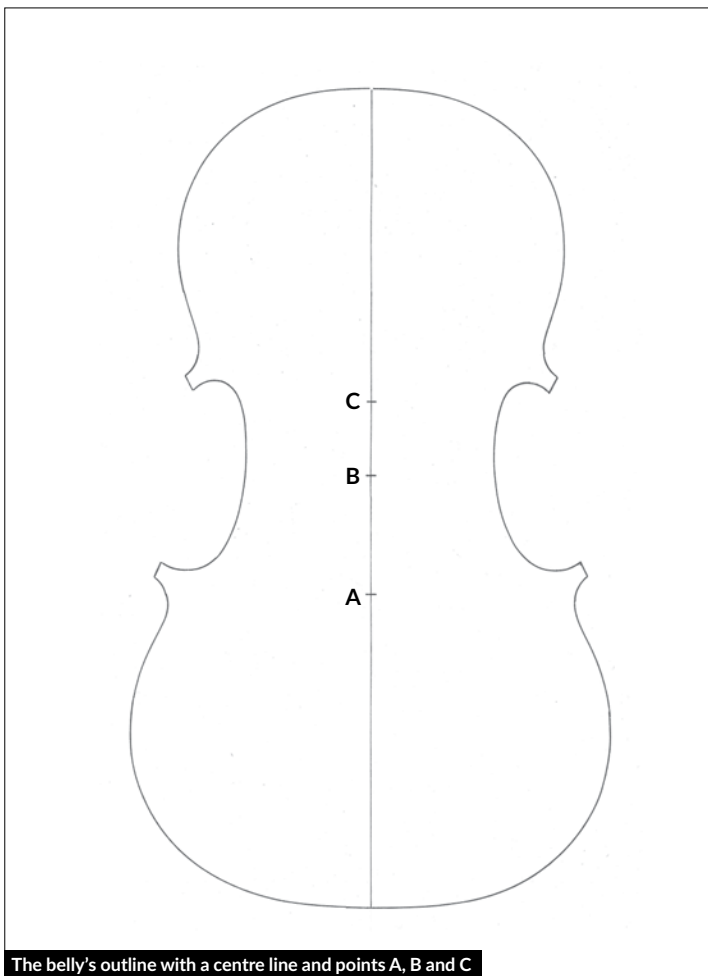
The first of two articles detailing a method that Stradivari may have used for making a template

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Stradivari's f-hole layout templates have been a subject of interest for makers since they became widely known through Simone Sacconi's book *The 'Secrets' of Stradivari*. Sacconi described Stradivari's process of applying the templates to the inside of the instrument, but only gave a vague explanation as to how Stradivari had arrived at the correct placement 'by trial and error'. I wanted to understand it on a deeper level, so in my first year of

violin making school I developed a method based on the geometry that I knew, which was largely about the so-called Golden Section. Luckily it seemed to work and I used it throughout my student days and after, until I developed a violin model of my own. By that stage I had strayed away from the golden mean on to other territory. When I got an apprentice, I dusted off my old method and discovered again how amazingly well it works. Here I present it for the first time with illustrations.

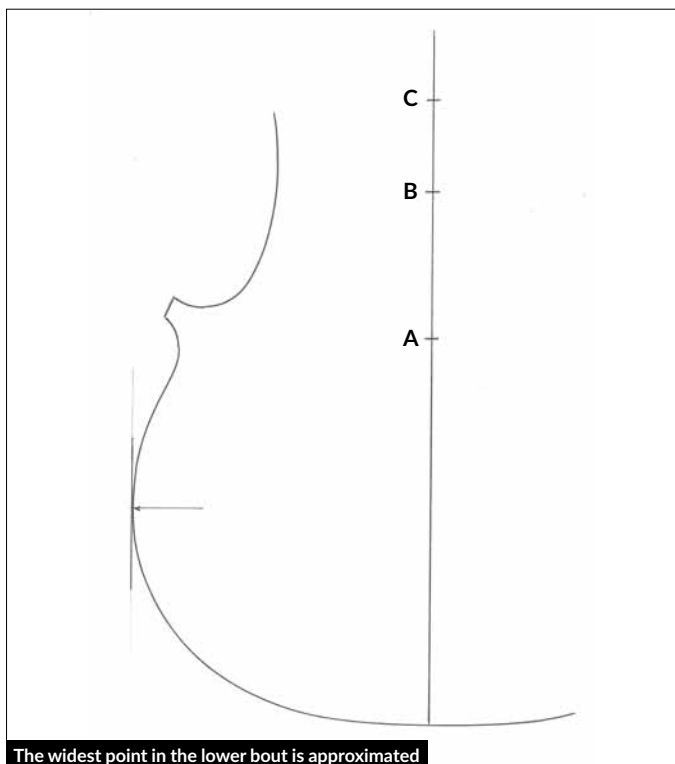


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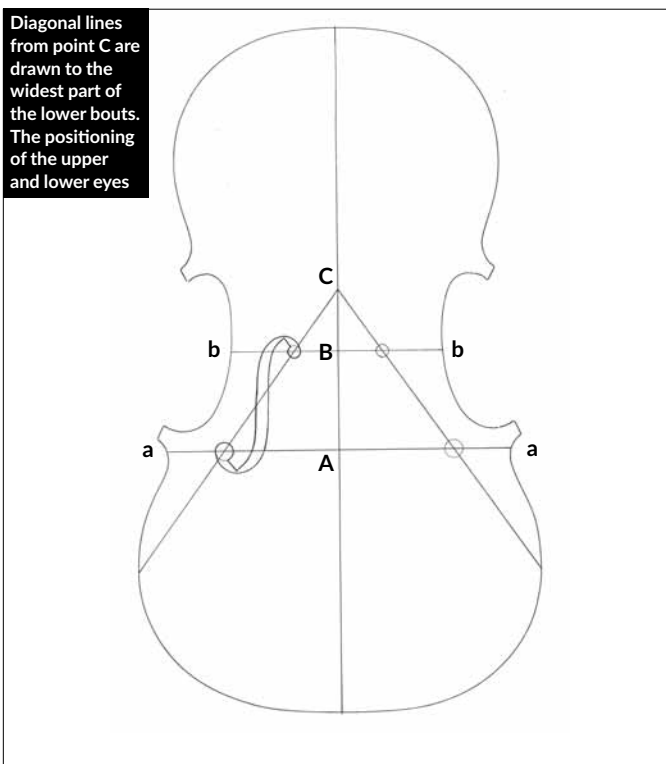
The belly's outline with a centre line and points A, B and C

1 First I trace the outline of the belly on to a piece of paper, and draw a centre line as measured between the upper and lower bouts. I measure the full length of the belly and divide it by the golden ratio ( $\approx 1.61803$ ). Then I mark it out on the centre line twice; first from one end and then from the other, so that I have two golden means marked out on the line.

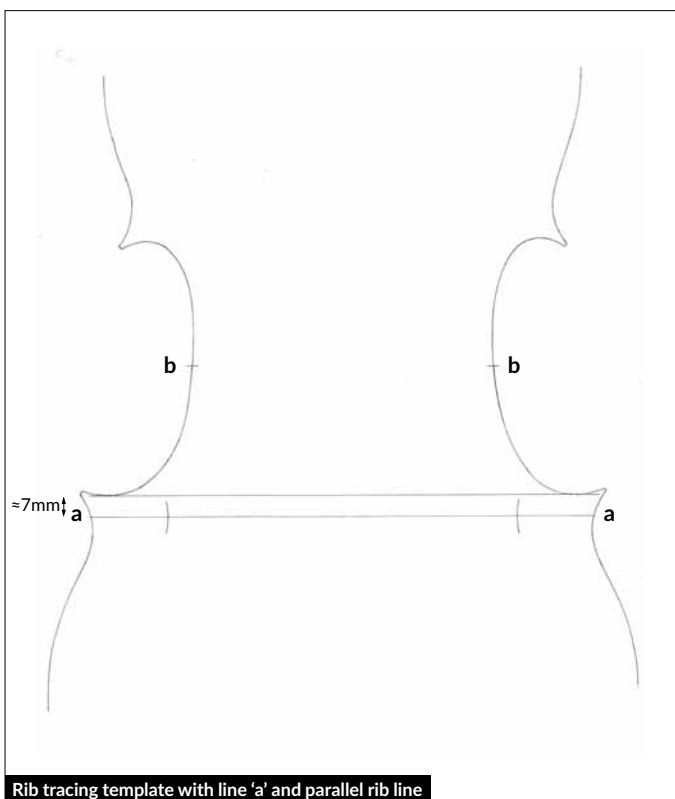
Then I find the golden mean between these two points, and mark it on the centre line. This point corresponds to  $\approx 0.528$  of the total body length as measured from the tailpiece end. For clarity in this article, I will name these points from the bottom up: A, B, and C (A and C being the golden means and B:  $\approx 0.528$ ). ▷



The widest point in the lower bout is approximated



3 From point C, I draw two straight lines diagonally to the points at the lower bouts. At points A and B, I draw two horizontal lines ('a' and 'b') to cross these diagonal lines. The crossing points mark the centres of the upper and lower f-hole eyes on both sides. (For greater clarity, I have added an f-hole to the drawing.) The basic layout for the f-holes is now complete.



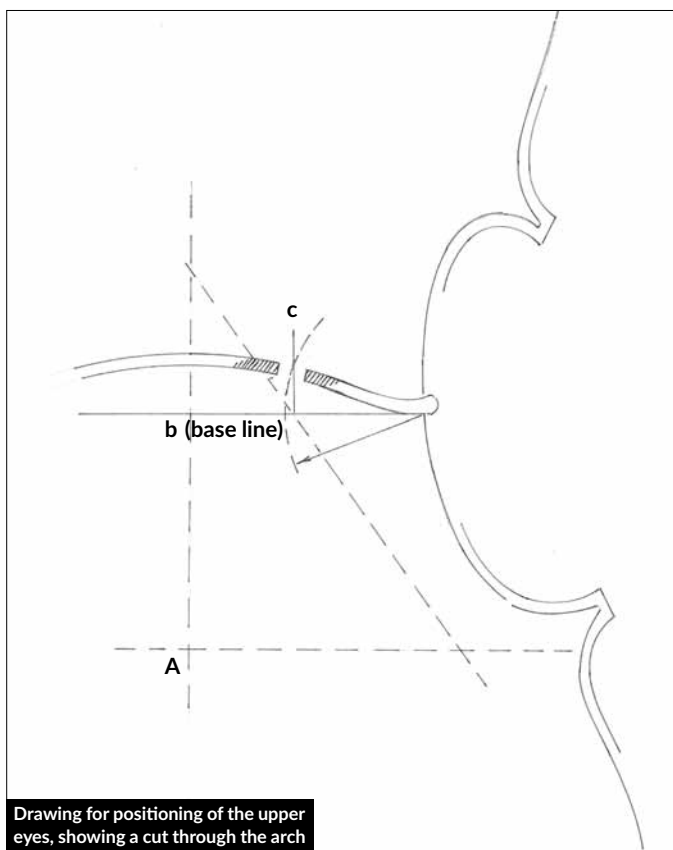
Rib tracing template with line 'a' and parallel rib line

4 The next step is to make a template for laying out the f-holes on the belly. This was done with the ribs as reference, so we'll have to transfer the horizontal lines 'a' and 'b' to a new tracing of the ribs. The rib-tracing template needs to show only the centre of the belly between the C-bouts. (On larger instruments such as cellos, you can make a template that shows just one C-bout – as Stradivari and his sons did, probably to save paper.)

I trace the outline of the C-bout portion of the ribs on a piece of paper. Then I draw a line that connects the lower portion of the C-bout curves. This line serves as a reference for the line 'a' that runs in parallel, just below it. According to Sacconi, the distance between these lines is usually about 7mm for violins.

Next, I transfer the horizontal line 'a' on to the rib template. Then I transfer the vertical distance AB to the C-bouts' rib outline. I transfer the lower eyes to the rib template, by calculating the distance to each eye from the rib outline.

With a compass set where the line 'a' meets the rib outline, I draw an arc to indicate the position for the lower eye, and repeat on the other side. We have now transferred the horizontal positions for A and B to the rib template. ▶



Drawing for positioning of the upper eyes, showing a cut through the arch

**5** To transfer the upper eyes to the rib template, we need to take into account the rise of the arching at this point. This is done by means of a new drawing.

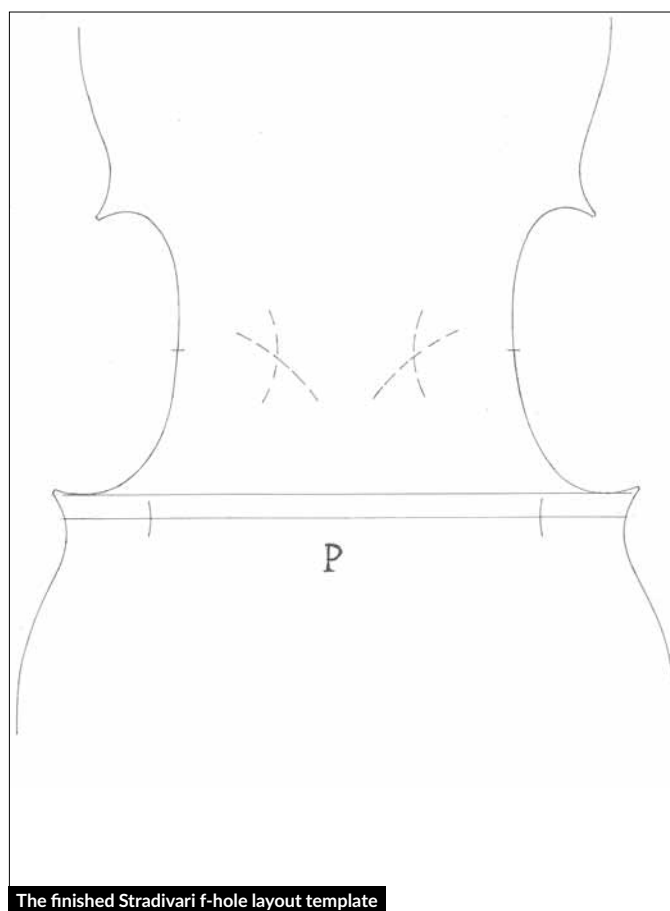
I re-draw the horizontal line 'b', which connects the points previously drawn, on to the rib outline. Here I'll call this the base line. I draw a tracing of the arch, including the plate thickness, on top of the base line, so that it shows a cut-through view of the arch. (For this step, Stradivari must have designated an arch height for all instruments made on that particular pattern.)

Next, on the junction between the diagonal and line 'b', I extend a vertical line ('c') upwards through the arch. I set one leg of the compass at the point where the rib outline crosses the base line, and set the other leg at the point where 'c' protrudes through the outside of the arch. Then I draw an arc from this point so that it crosses the base line. This arc marks the distance to the centre of the upper eyes from the rib outline, arch included.

**6** To trace the arch from the lower eye to cross the arch from the base line, I return to the diagram I used in figure 4. I adjust the compass legs to the diagonal distance between the upper and lower eyes. I then transfer this distance on to the rib template, by putting one leg of the compass in the lower eye's place on the rib drawing, and making an arc that crosses the upper eye's arc.

I've added the letter 'P' in the manner of Stradivari. It represents the form that he used in conjunction with that particular template.

The template for laying out the f-holes in Stradivari's fashion is now completed. The next article will show the steps for laying out the f-holes on the belly.



The finished Stradivari f-hole layout template

**NEXT ISSUE**

The second part of this article