Arching, Purfling & Edgework in Cremonese Instruments

By

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Chasing the Laser

Cremonese makers worked under very strict rules prescribe either by a guild system or some similar trade organization. They were required to follow exactly the methods of their masters. There is no doubt that at the beginning of the classical Cremonese school, the cities violin makers made every effort to produce highly accurate and symmetrical instruments as quickly and efficiently as possible. Nevertheless the restrictions placed upon them by their methods, tools and materials, inadvertently led to a form of 'built in inaccuracy'.

Because of their better economic circumstances early Cremonese makers were able to spend more time and effort on their work and consequently their instruments are generally more symmetrical that those of later Cremonese makers. Nevertheless, early or late, whenever inaccuracies occurred, all Cremonese makers attempted to correct them. Such corrections were applied optically rather than mathematically. In attempting to adjust such inaccuracies by eye, Cremonese makers developed a feeling for aesthetics and an astonishing ability to create the illusion of balance and accuracy, rather than the kind of mathematical symmetry that modern machines and methods are able to achieve. This process was largely responsible for creating the aesthetically beautiful works that have come down to us.

Unfortunately, this aptitude began to disappear very soon after the classical period. The French were amongst the first to lose some if not all of this ability. The highly accurate outside moulds used by many French makers, led in turn to accurate outlines, accurate corners, accurately placed sound holes and so on. This is one of the main reasons why no one mistakes a French violin for a Cremonese violin.

If we choose to work with machines, including routers and even lasers, then inaccuracies disappear almost entirely and we gradually lose our feel for aesthetics. Moreover, if machines are used without the operator having a healthy 'feel' for aesthetics, these machines will automatically impart a 'stiffness' to the work. Eventually this stiffness is conveyed to the brain, further diminishing our ability to differentiate between that which is and is not aesthetically beautiful.

Claiming not to have access to historical instruments is no real excuse. Just as we can appreciate music and works of art through various recorded images, we can understand something of the quality of Cremonese violins by studying images and descriptions of them. Since my early days as a maker, I have rarely copy to the nth degree. Far from it, I believe that overemphasizing mathematical inaccuracy, as well as mathematical accuracy; be it in thicknessing, shaping, weighing, tuning or whatever, is a recipe for disaster. Not only does it take too little account of the materials, it is certainly not the way in which Cremonese masters created their masterpieces. In my opinion it is time for modern makers to stop 'chasing the laser'.

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This illustrated article documents the arching, purfling and edgework of a small-pattern Guadagnini viola copy that I recently finished. The illustrations offer a practical addition to various articles and blogs that I previously published in the Strad magazine, the Del Gesù Exhibition catalogue, a VSA article entitled 'Classical Edgework' and the blog 'Making a Double Bass'. Most of which are published on my website.

Guadagnini's Violas

Guadagnini made several small, but powerful violas that make excellent models for anyone wanting an instrument of about 40cm and less (none of them are exactly the same length). These instruments also have violin-type heads that make them a little lighter on the arm. I made a poster of such a G. B. Guadagnini viola for the Strad magazine. Unfortunately, some time after finishing my last copy, it seems that someone who had visited my workshop also liked this model and they ran off with the folder containing all my original measurements, drawings and arching templates. Of course, I could have made new templates, but as I was looking for some thin plywood, I began thinking that perhaps I could work a Guadagnini arching by eye.

Arching & Purfling Tools and Fixtures

Before I begin this blog, I would like to mention some of the tools and gadgets I will be using. Although there are many violin making gouge sets on offer, most of the time you can get by with six or even less. The two gouges that I use most, are an 11mm Stubai no 7 (worn back from its original width) and an old Sorby flat gouge, which is 12 mm wide (also worn back from its original width). I use the Stubai gouge mostly for fluting. I use the Sorby a lot for flatter areas such as the volutes of scrolls, the corner area of the arching and for fluting the sound-hole wings. The Sorby was sold as a 'flat gouge'. It has the added advantage of being much easier to sharpen. Although the back edges have a soft bevel, the back is also more or less flat. The trick is in the curved cutting edge. I use it as I would a normal gouge. My rough arching gouge is a 30 mm no 6. And the tiny U shaped gouge, (page 5) is a 4.5 mm Pfeil no 11.

I have made handles for most of my gouges. These are all slightly different making it easier to identify them on the bench. This is why old carving tools often have handles of different shapes and woods.

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1 Giuseppe Guarneri del Gesù. C. Chiesa, J. Dilworth, R. Hargrave, P. Klein, S. Pollens, D. Rosengard, E. Wen, Peter Biddulph London 1998. Roger Hargrave website: www.roger-hargrave.de

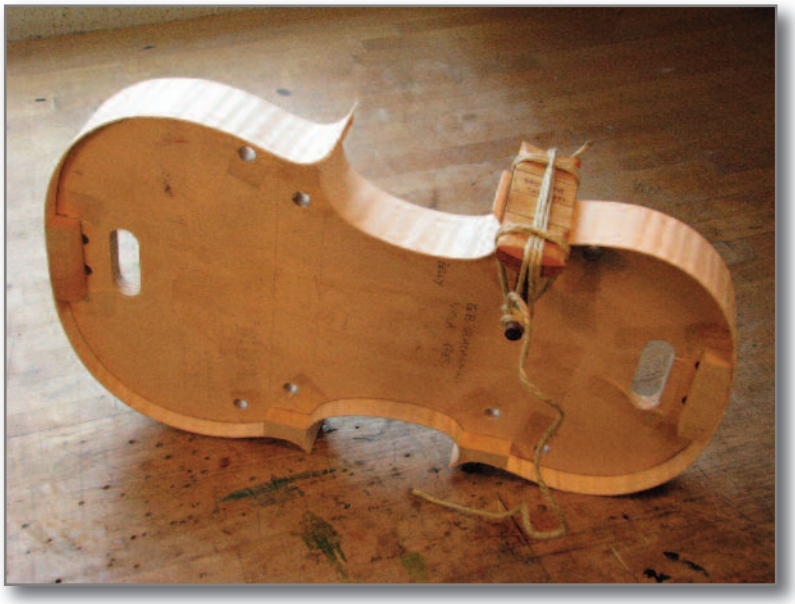
2 The Strad Magazine, December 1998

Also illustrated are the two single-blade purfling cutters described in the ‘Making a Double Bass’ blog. The integral depth stop on these tools is critical to cutting the channel to the correct depth. Finally I want to mention the V shaped board I use to hold plates using my rib tying sticks. In the Strad museum there is something similar, (although it was probably used for hollowing). On my board the sticks don't hold the plate in a fixed position; they just help me to wedge it while I'm working.

Beginning the Arch

I have never believed that starting an arching by routing a flat edge is a good idea, either for your aesthetic development, or your soul. An arching should begin to take shape from the very first gouge stroke. If done correctly, an arching develops itself as you work. You take your outline from the ribs, (made on an inside mould) and you saw it out by hand. Use a band saw if you really must, keeping to the lines is the important thing. From this moment on, you should be working from large tools to small tools, going as far as you can with each tool, before using the next tool to clean away the marks of the previous one.

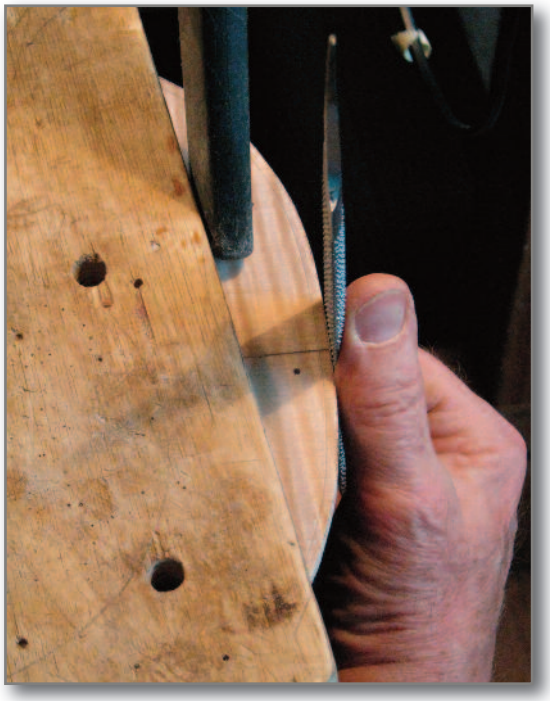
I like to let the final arching height develop from the arch itself. The shape of the arch and the edgework will largely be dictated by the method of working and the tools employed. No two Cremonese archings are ever the same height or shape even from the same maker in the same year; similar yes, but never the same. Marked with a cutting gauge, the edge thickness at this stage is roughly finished to about 6mm; this is, 1 to 2 mm thicker than the flat purfling platform. After finalizing the outline, this platform will be finished to about 4,75mm.



Finalizing the Outline

After rough arching, the outline can now be finalized. I always do this before finally thicknessing the edge. This is to avoid the edges being torn by the rasp, especially on the belly. To finalize the outline I use a V board, firmly clamped to the underside of my bench. With my knee I simply trap the plates against the underside of this board. I also use this same system when cutting out the outline with a coping saw. When I was younger I could saw out a belly outline faster and closer by hand than with the band saw. These days it takes a few seconds more.

Using a series of rasps, held at right angles to the plate, I finalize the outline. If you have sawn accurately it should not take more than a couple of minutes to complete. (As well as wearing a mask, I usually clamp a vacuums cleaner nozzle to the bench to remove most of the dust). This is also the point at which you can correct (by eye) any minor wobbles in the outline. At this stage the edge does not need to be finished with a file. Later when it is rounded off it will be cleaned up properly; cleaning up is not a job that we should ever do twice. The outline, even straight from the rasp, is clean enough.



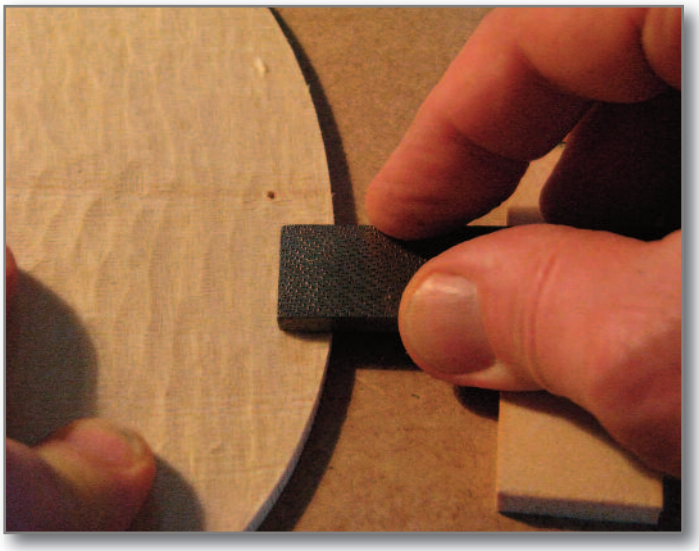
Marking the Edge Thickness

With the outline now complete, this is the time to mark the edge thickness with a cutting gauge. I made this one from bits of scrap wood. The blade (flat on one side) was made from an old file. You do need to be a little careful not to cut too deep at the corners, especially on bellies, because they can easily split. The edge thickness at this stage is about 6mm; it will now be finished to about 4,75mm. Later this height will also be reduced as the edge is rounded.

These edges are marked to the same thickness all around the plates. The fact that most Cremonese makers had thicker corners and slightly thicker C bouts is a result of the edge finishing system not the marking process. This system was also responsible for Cremonese wedged shaped buttons. Guadagnini on the other hand had thinner corners and a fatter area of edgework around the button. This too was a result of his working method. Neither the Cremonese makers nor Guadagnini marked out different thicknesses at the corners or button areas.

Final Arching

Now the final gouging of the arching can begin in earnest. Once it is complete, the flat platform can be dusted over with the end of a flat rasp. There should be no need for a step between this platform and the arching.



Determining Purfling-to-Edge Distance

There are many things that determine the purfling to edge distance including the corner length, the corner width, the overhang and even the purfling width. The main determining factor seems to have been that they tried to place the line of the purfling over the rib and lining. This was obviously to add stability to what was potentially a weakness in the edge. For this reason instruments, where the purfling is located further from the edge, usually have larger overhangs, heavier edges and generally thicker and often shorter corners. Conversely, long slender corners tend to have smaller overhangs and the purfling is set closer to the edge. There are exceptions to this general rule.

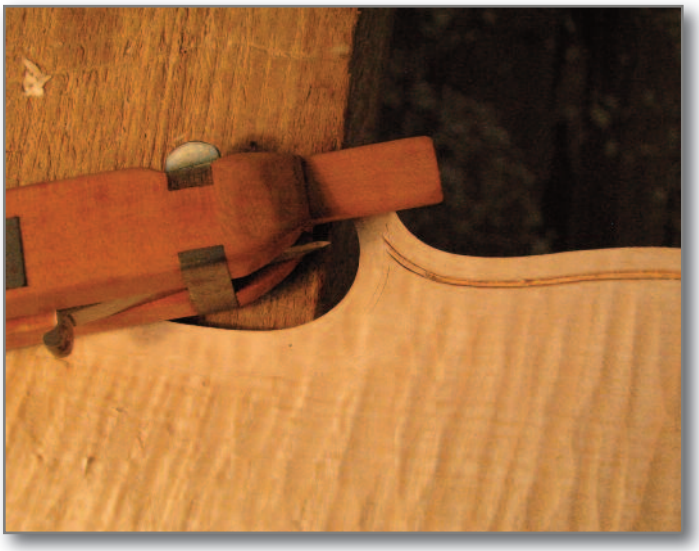
Cutting the Purfling Channel

Using my single blade cutters, I almost always partially cut the purfling channel, before removing the central portion. Without undue pressure, the blades easily take the first cut to a depth of about 2 mm plus. The second cut is just as easy. This time the blades cut down to the full depth without any need to press hard. Even when working with a double bladed marker and a knife, I have always worked in two stages, but it is never as easy as two single blades.

Working with these single cutters makes perfecting the depth with the pick, so much easier. They slice so much easier than twin blades which tend to block. Because they are flat on the outside edge, single blades also cut perfectly vertical walls, something that is more difficult with hand-held knives, which tends to under and overcut. The beauty of this system then, lays in the ease of cut, the perfectly straight side walls, and of course the fixed depth. It really makes complete sense.

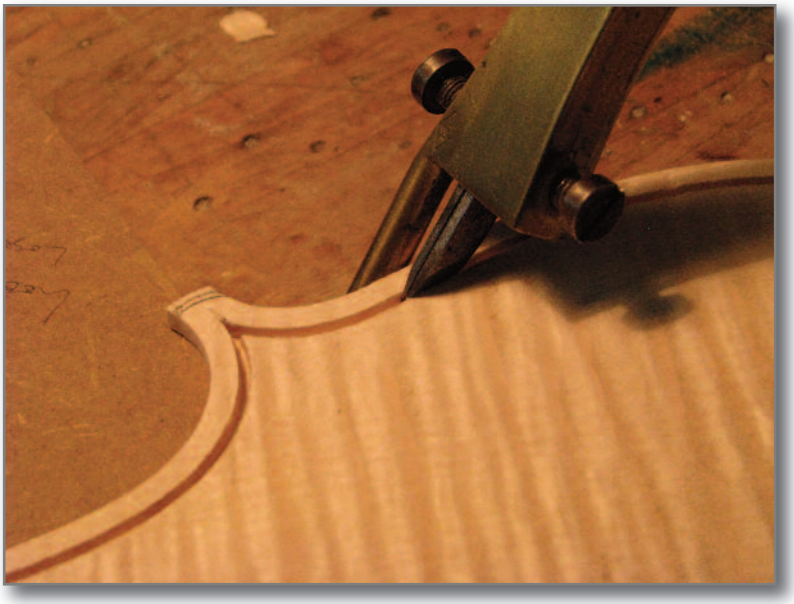
I realize that the photographs present a purfling channel that was not cut in the true classical style, with the arching almost finished and the box closed. But the system works equally well on baroque instruments where the box is closed.

The corners are a lot longer than they will eventually be. I always leave them long because it makes it easier to control their outlines. You can also see how they begin to form a trumpet shape at the end. The corner outlines on Cremonese instruments were almost always created from such a trumpet shape.



Inserting the Purfling

After cutting the purfling channel I always take the lazy way out and open the channel with a double bladed cutter. This effectively creates a V shaped channel that allows me to drop the purfling in much easier. However, it also has another important function. As described in my bass blog, I finish my purfling, with a coating of animal glue on the outside. Opening the channel slightly to form a V shaped trench, allows me to run boiling water into the gaps between the channel walls and the purfling. This reactivates the glue and swells the channel walls causing them to tighten on the purfling, so that there is no need to swamp the area with boiling water.

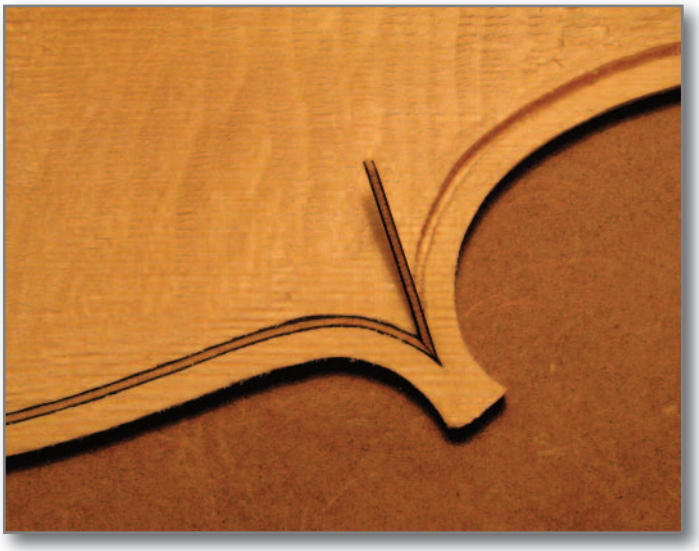


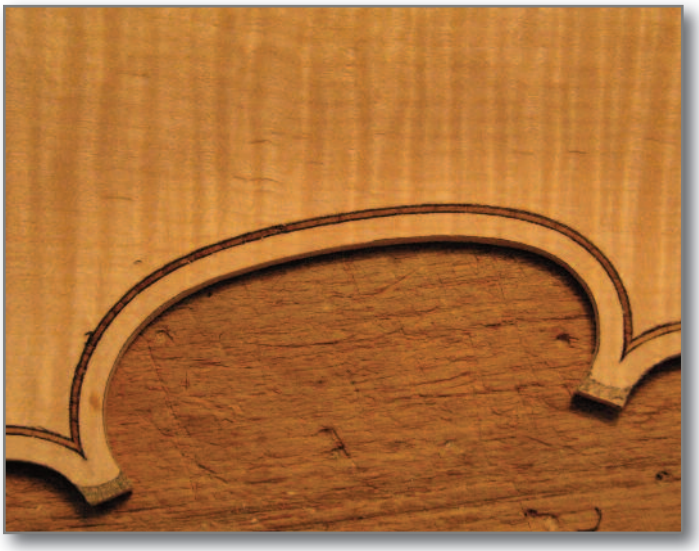
This purfling is made of (white) walnut, as was Guadagnini's purfling. I cut and thicknessed it some time ago. With a few exceptions most classical purfling has blacks that are the same width as the whites and appear to be made from the same wood. The blacks are just dyed. In this case in spite of the slightly different widths, the strips are all of walnut.

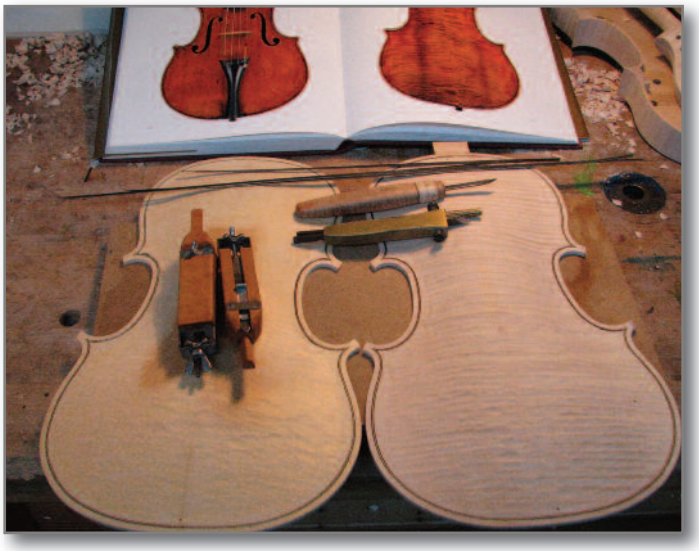
This older purfling was a little dry and brittle, but the trick I use to make it more flexible works for any purfling. Just boil some water in the bottom of a pan with a lid and leave the purfling in the steam for a few seconds. If it is really stiff dip it into the boiling water, again only for a few seconds.

Because this is a modern viola, I am going to arch the plates on the bench and finish the purfling and edgework before I close the box. As indicated earlier, for baroque instruments, I finish to a flat edge, hollow the plates and close the box before finishing the purfling, edgework and fluting. I know that this leaves out an important process, which governs the appearance of Cremonese (and Guadagnini) archings, but I am going to imitate this process on the bench.

As can be seen, I have marked the extent of the finished corners and there probable shape when worn. This allows me to calculate the shapes and lengths of my miters. (Cremonese makers would have been working to previously calculated guidelines). I always insert my upper and lower bout purfling first. I use a short piece with a miter cut, to hold them in place at the corners, while I run the boiling water in one section at a time. This piece is removed just before I insert the centre sections. The obvious way to make the central strip is to use a single strip of the correct length, with a miter cut at either end. The problem for me was that my purfling was old and very dry. This meant that bending it was not going to be easy. I got around this by bending the two ends and joining them in the middle with a scarf joint. This practice was not unusual in Cremona.





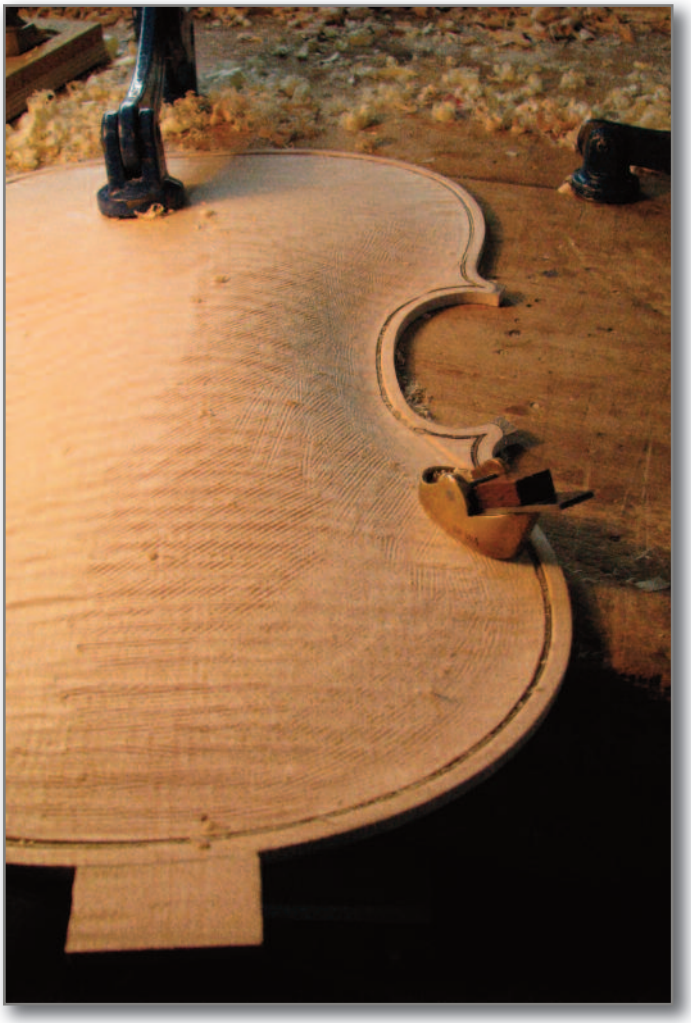


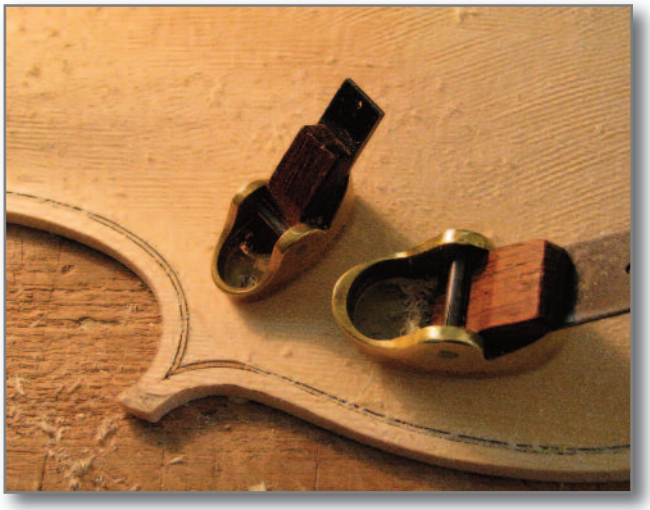
Cutting the U-shaped Channel

The next stage is cutting the narrow U shaped channel along the line of the purfling. This effectively separates the two sides of the channel so that you are never required to cut against the grain. As I have pointed out, on a baroque instrument the arching would normally be completed to the flat platform. Here the arching is still from the gouge. I work this way because it allows me to leave out one of the processes altogether, thus saving time.

Blending the Arch into the U-shaped Purfling Channel

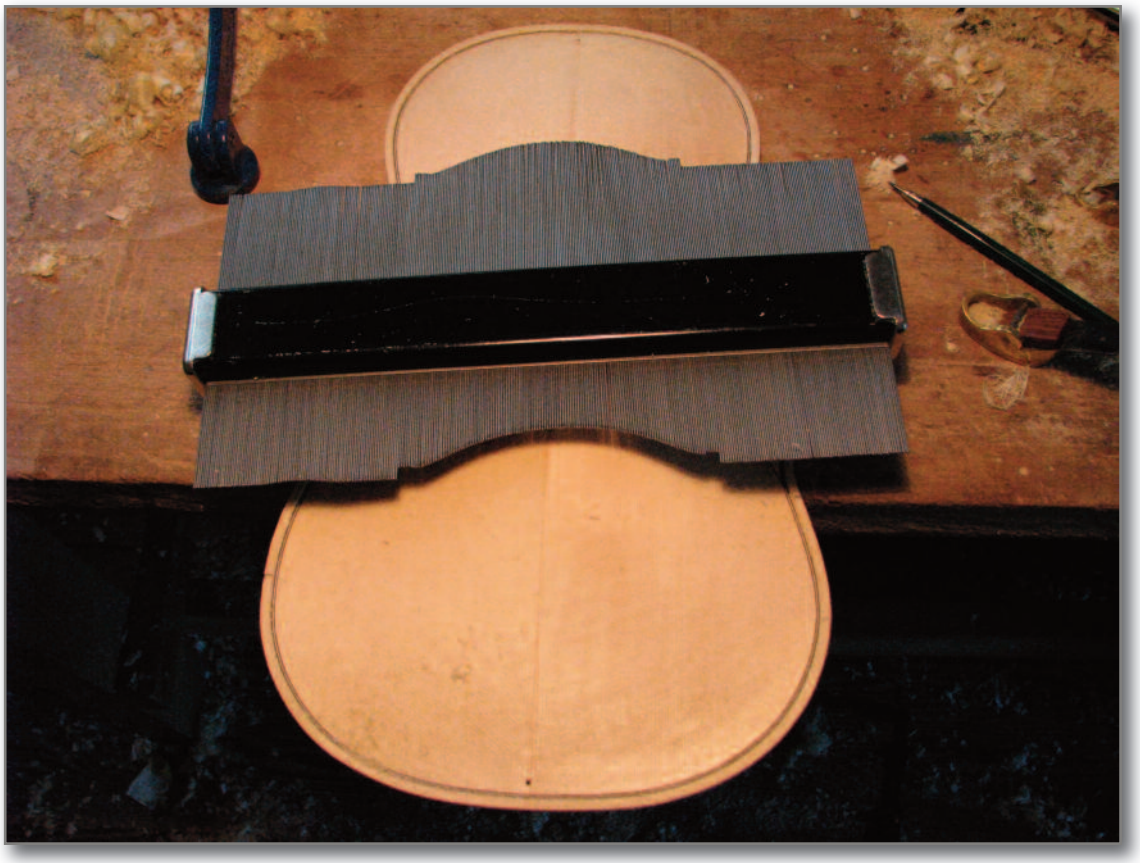
With the channel cut, I blend the arch up to the line of the purfling. I start this process with a gouge and thumb planes. As you can see, I have wet the channel slightly to make cutting the C bout groove a little easier. Do not try to do this with the belly.





Finishing the arching in this way gives me that figure of eight look to the arching that is so typical of Cremonese (and Guadagnini's) work.

At this stage the rough arching has to be right. To avoid wasting time, you do not want to be taking off more with the planes that is necessary. Now, I have made this arching without either measuring the height, or using arching templates, so just before I began scraping, I used my modified form copier to check my eyes. I briefly checked only the central cross archings; the long arches and the upper and lower bout archings before finishing the rest entirely by eye. The shape needed only a few passes with the plane before I was able to complete the scraping.



Cutting the Outer Channel

Once you have scraped the arching up to the purfling, it is a simple matter to cut the outer channel to the outside edge. I have left the corner flat as it would have been left in Cremona for fixing a clamp. (Look behind the gouge in the photo below and see also my web site). Again, it is important to remember that both Guadagnini and the Cremonese makers would have closed the box, before any of this work was done. Finishing the arching up to this area is what created that figure of 8. When they were blending these flat corner areas into the arching some makers worked this area a little too deep. On Andrea Guarneri's instruments, it often looks as if someone has pressed their thumb into this corner area.

Guadagnini style Buttons and Corners

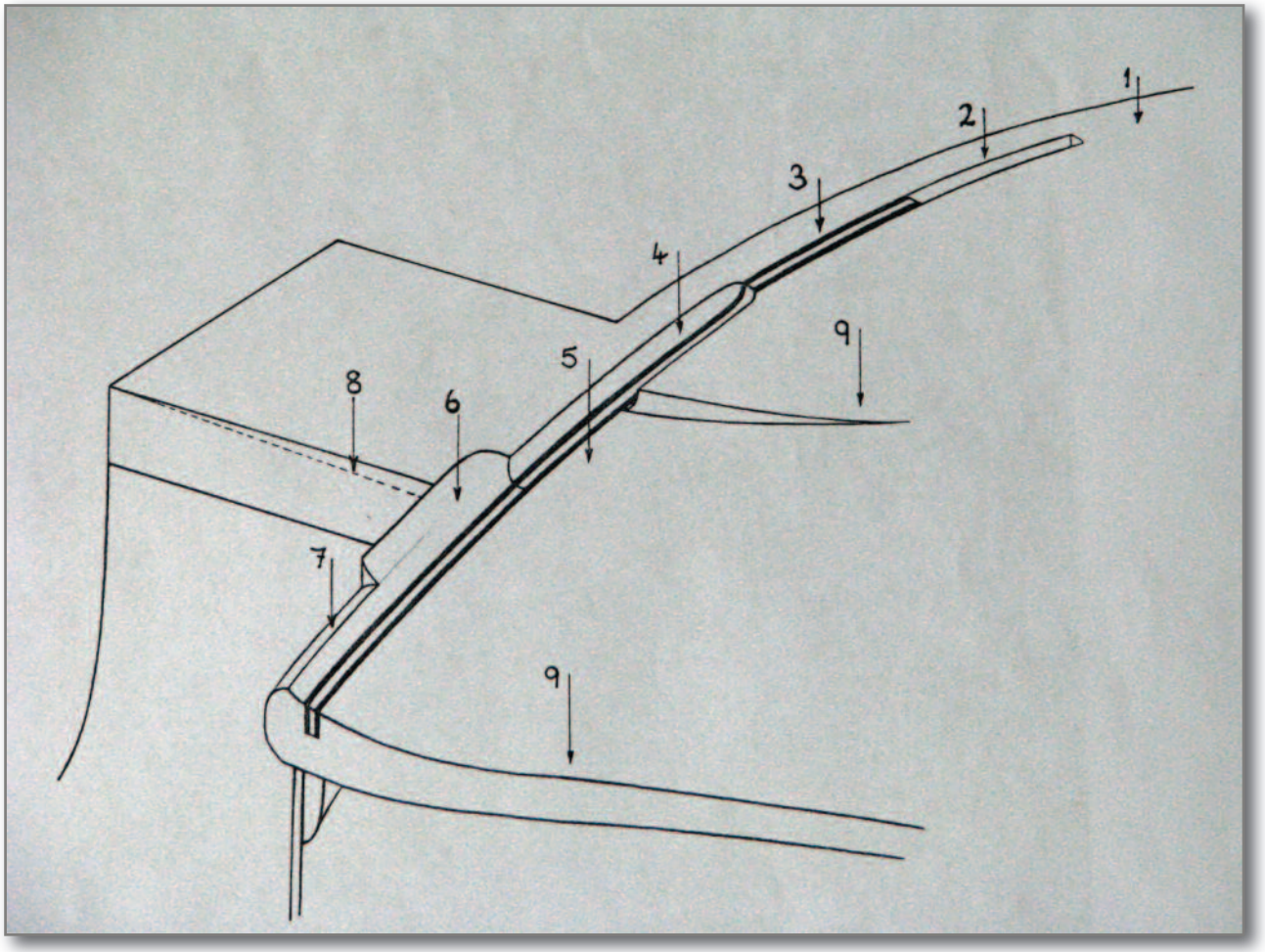
Since this is a Guadagnini copy, I have skirted the button area. This is what Guadagnini either did not understand or chose to do otherwise. In effect, he works the edge at the button using a similar logic to that the Cremonese makers used for their corners. This made Cremonese corners thicker, but on Guadagnini's works it made the button and the adjacent edge thicker. Also in contrast to the Cremonese, Guadagnini ran the channel out of the end of the corners as I have shown. When the edges and corners were rounded off, the corners became thinner than the surrounding edgework (See final images in the Corners and chamfers section.)

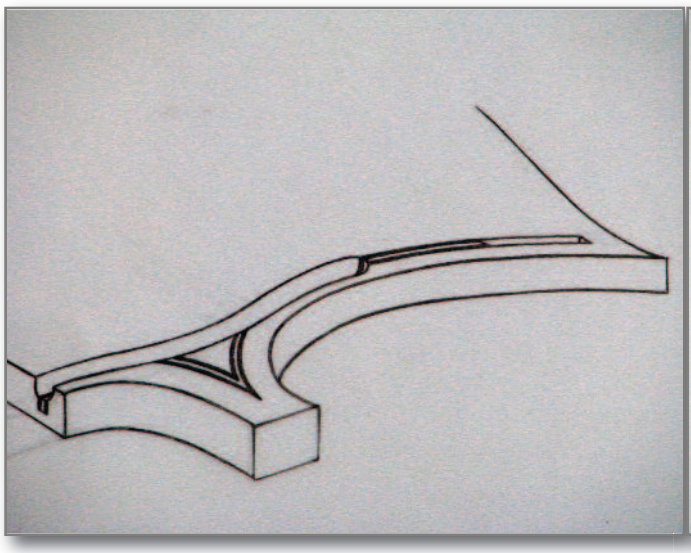


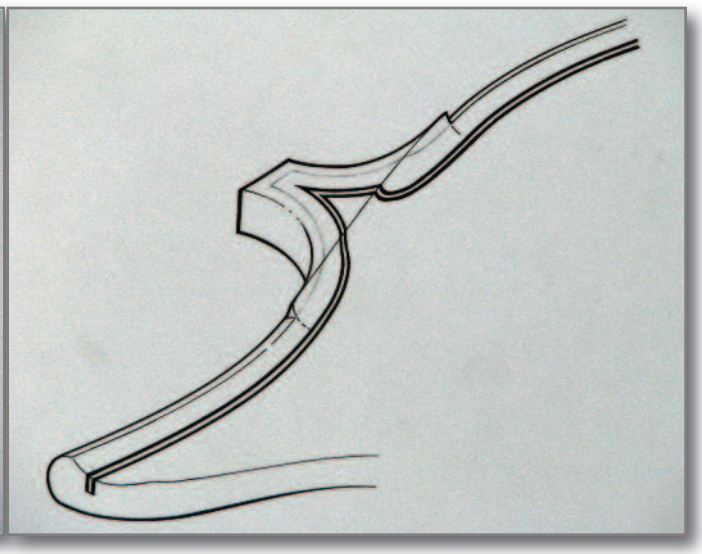

Purfling and Edgework Sequencing Drawings

Although these drawings are from the Guarneri book they really have more of a Stradivari quality about them. Very often the remains of the U shaped gouge can be seen in the corners of Del Gesù's instruments. The 'Alard' is an excellent example, although the photographs don't always show this. Missing from these drawings are the fine scribe lines that the Am-

ati and Stradivari families used to mark the point to which the edges should be rounded off i.e. the high spot of the edge. Clearly with the flute going to the outside edge, this scribe line would have been marked on the downward slope. Had it been on the original flat edge, it would have been totally removed as the flute was being cut. Only in the corner areas was this fine scribe line marked on the surface of the original flat platform. For a full description of the sequencing see the del Gesù book and the bass blog on my web site.







The Difference between Stradivari and Guadagnini Buttons

The first illustration shows how Stradivari by-passed the button; Fig 10, creating the typical Cremonese wedge shaped button Fig 11. Figure 6 shows why Guadagnini's corners were thinner at the ends. Fig 7 shows how he by-passed the button as in the photograph above. The final sketch Fig 3 is how Guadagnini's buttons appear from an end view. The edge and the button remains thicker, (the thickness of the original flat platform). The button has no taper.

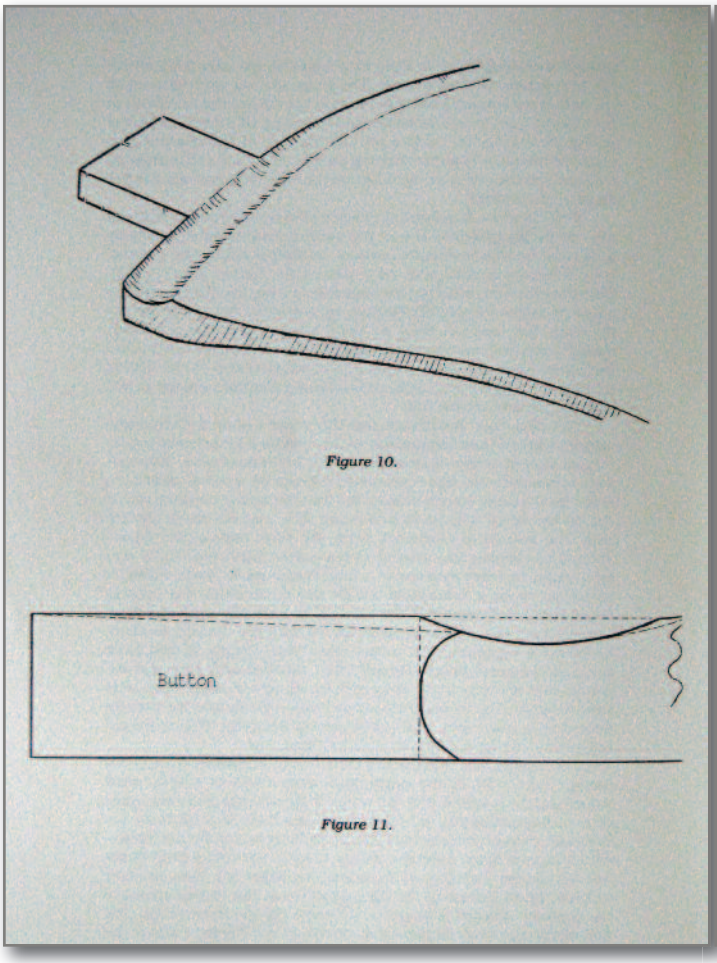


Figure 10.

Figure 11.

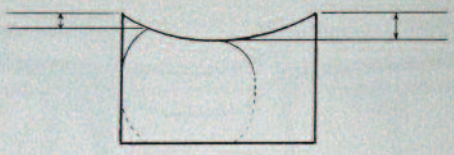


Figure 6.

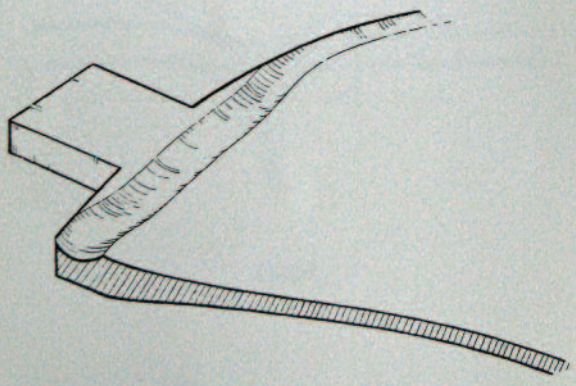
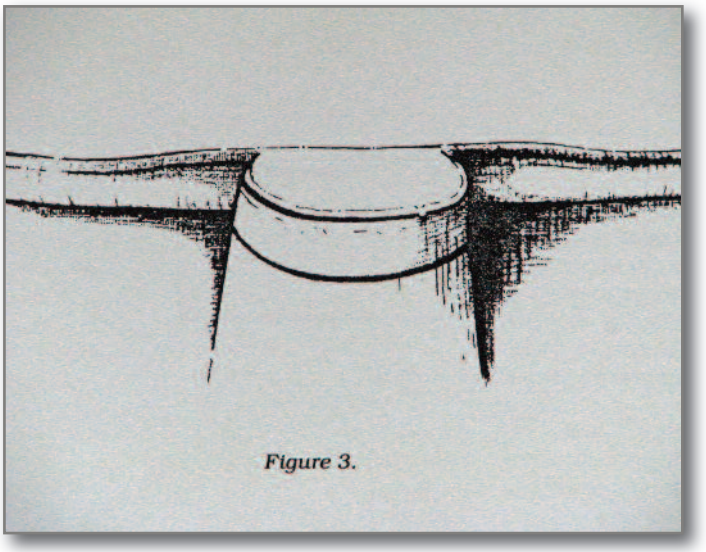
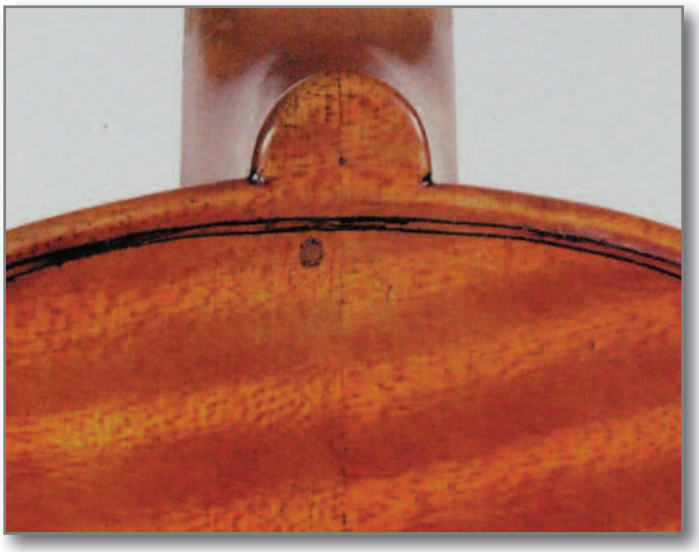


Figure 7.



Unlike many modern purfling markers or cutters, the blades on these "Strad" cutters cut in both directions. They can also reach further than the (very narrow) guide, because they can be tipped allowing the blade to travel further. Moreover, whenever they are working with the back not attached to the ribs, modern makers usually leave the button a little wider, (as I have done) This is to allow for movement when the neck is being inserted, but this extra width tends to stop the cutter even sooner. However, in classical times the button width was absolutely established at the time when the purfling was being inserted. This allowed the cutter much closer access. As you can see from the pictures below, no two of Guadagnini's instruments turned out exactly the same. In different periods, for various reasons, (often horrific political and family reasons, as described in Duane Rosenguard's excellent book), he worked in slightly different ways.



The first picture is from Duane Rosenguard's book, the second was provided by Bruce Carlson. Here you can see that the gouge scoop only runs to the high spot of the edge.

Rosengard, Duaane, Giovanni Battista Guadagnini

This created a slightly more extensive area of thickness to the edge, close to the button on either side. As most of you will know, Guadagnini did not always purfle across the button area. It is said that like having more thickness, this was done because buttons often broke off. Although added strength is undoubtedly a bi-product of this working method, I do not believe that this was his reasoning. I believe that it was simply easier.

One final point; where the left hand purfling ends, the remains of two cuts can be seen. If you look very carefully you can see that they are not actually parallel, indicating that they were made with two separate cutters.

Finalizing the Edge

Here I have applied a knife cut chamfer to the underside of the edges. To avoid damaging the ribs with the knife blade, or any other tool, this initial chamfer was applied before the plates were attached to the ribs. This first chamfer is a little flatter than a normal 45° chamfer. This is because a second chamfer will eventually be applied connecting this chamfer to the flat outline. From the opposite side, two more chamfers will begin the edge rounding process from the tops of the plates, once the instrument has been glued together. These initial chamfers may not always have been applied with a knife. They could just as easily have been done with a rasp, especially if they were in a hurry and did not mind not having a rough edge to start the turn. For some reason, Stainer, who used most of the Cremonese method, does not appear to have started with a knife cut chamfer. The undersides of his edges are always soft and round.

Corner and Chamfers

Finally it is a simple matter to gradually round the edges. On many classical Cremonese instruments, where the edges are not too badly worn, remains of the underside knife cut chamfer can still be seen especially in the C bout corners. I used a scraper and two grades of sandpaper to finish the edges. I prefer dogfish skin because it lasts longer, (a good piece will last many months) and it holds a curve better.

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