Sound post cracks are very common in the long life of a violin family instrument. When repaired properly with a sound post patch, the instrument can continue to be a reliable tool beyond your lifetime and perhaps even improve its tone.
Materials and tools

Block plane
Sharp knife
Wide gouge with tight sweep
Sharpened pencil
Compass
Bandsaw
Straight split spruce with grain tighter than the top
Plaster Cast
Cellophane Wrap
1/2” Plywood
1/4” Plywood
Aliphatic resin
1 large clamp Plaster Cast
Fresh Hide Glue, High Strength
Large Fan
White Chalk Without Grease or Oil
A Stiff Small Brush
Sharp Round Scraper
Graduation Calipers
4 Cam Clamps
Machinist square
Assessment and Preparations Before the Patch

There are several things to take care of before fitting the patch. A crack that is level and glued properly is paramount before starting any other work. You may also need to assess the whole condition of the instrument before the patch. Does it need major arching corrections before fitting the patch? What old repairs have been done that could interfere with this repair?

You Need to Pour a Full Plaster Cast
A full cast for violin, viola and cello is the best way to go.

It’s also important to give yourself plenty of time for this job. Cleaning and gluing the cracks, pouring a cast, drying the cast, correcting the arch (if needed), fitting a patch, waiting for the glue to dry, varnish fill and retouch all require a substantial amount of time. A cast can take a week to dry, and we generally leave the patch clamped up for several weeks for the glue to completely dry. Plan accordingly! Here are some of the things I had to address before fitting the patch.

Correcting the Cast Where Old Repairs Had Distorted the Arch
This crack ran from tail block to neck block, and the lower, older portion of the crack was repaired improperly and caused some minor arching distortion over time. To get the crack level and correct the arch in this situation it was best to correct the plaster cast in this area.

Using a Sand Bag to Correct the Arch

After correcting the cast, I pressed a sandbag gently and without heat on that portion of the crack. Doing so improved the shape of the arching and brought the two sides of the crack level. I also used bridge parchments soaked in glue to help close the crack while under the sandbag. This is not necessary for every crack, but it was very helpful in this instance.

If you have never poured a cast or brought level a stubborn crack, I don’t really recommend doing this repair just yet, since those two things are the most important part of this process.
Fitting a patch to a crack that is not level will ruin the instrument. There is no shame in walking away from things that you are uncomfortable with.

Preparing the Patch Material

There are many ways to skin this cat, but in this instance I made the patch material to the finished shape before laying out the patch bed. I have seen successful examples from other people working in the opposite direction, but this method has proven successful for me.

Find a piece of spruce that is straight grained and where the grain is tighter than the top. Split it out on all sides close to size. Leaving plenty of thickness for fitting, flatten the top with a block plane and square up all the sides, including the bottom. Glue a piece of 1/4” plywood with aliphatic resin (wood glue) to top of the patch. Allow glue to dry.

Now it’s time to lay out your patch size/shape.

Find a grain line in the center of your spruce piece and mark the entire length of the grain with a pencil. Continue the line up both sides of the spruce and onto the top of the plywood. Our finished patch is 25x45mm, and to lay it out draw two 25mm circles next to each other centered on the center line. Be sure to draw an arrow to show which direction the patch will be going for fitting.

Square up your bandsaw and carefully saw out the shape of the patch just barely over your line. It never hurts to make sure your bandsaw is tuned up properly and cutting straight and square. After sawing, take the patch to a squared up belt sander and sand to the finished oval shape. It is important that everything is flat, square and the exact shape you are looking for. The shape of the material will basically be the finished shape of your patch.

Preparing the Patch Bed
This is where the fun begins! To lay out the patch appropriately, there are several things to consider. The middle of the patch should surround the sound post while overhanging the bridge foot to optimize the strength under string tension. On this patch I also made the center of the patch line up with the crack which is the thickest part of the patch and therefore the strongest.

Saran Wrap

Now is a good time to *change the cellophane wrap that separates the top from the cast* and brush the cast to make sure there is no particulate on it before lightly clamping the top to
the cast. If you used any sand for pressing the arch out even a small grain could be jammed in the top creating unnecessary damage. When you have the placement of the patch laid out, roughly shape the patch to fit the top. The fit doesn’t have to be absolutely perfect just close enough that it doesn’t rock and there are practically no gaps along the side of the patch material where it meets the top. Next, lightly clamp the patch material in place and carefully scribe its outline onto the plate with your knife. Subsequently tracing around the patch with a sharpened pencil will help increase the visibility of your scribe line.

Excavating the Patch Bed

With a large, but tight sweep, gouge, begin to excavate the patch bed. Be sure the gouge is nice and sharp. When hollowing the patch bed many people have a tendency to make the inside shape into something that resembles a bathtub, with straight sides descending into a barely rounded bottom. This will make fitting the patch unnecessarily challenging. Try to make an even, gradual bowl shape. It’s important to make sure that everything is clamped down well, and remember that without the cast the plate is very fragile. It’s not a good idea to take it out of the cast and walk around the room with it. I’m sure it’s fun to show everyone how you can see your fingers through the patch bed when you put it up to the light, but a horrible idea just the same.

With the gouge, bring the bed down to 0.6 mm and then scrape to 0.3 mm. Almost
invariably, the sound post crack opens up in the patch bed. Don’t worry too much! Let the tears dry off of the patch bed and remember that the hide glue from gluing in the patch combined with the support of the cast will close the crack back up nicely.

**Fitting the patch**

I think fitting the patch is fun. I don’t know why, but to me there is something very calming and rewarding to making those tiny little knife cuts and pretty facets that just keep getting smaller and smaller.

Now that the patch bed is finished, place the patch on the marks you made earlier when you scribed the top. From there start fitting and gluing cleats around the patch to keep it aligned while fitting it. I use aliphatic resin for these and just finger clamp them in place. Eight small cleats, evenly spaced around the patch bed should do the trick. I also make a small chamfer on each cleat where the bottom of the cleat meets the top and faces the patch. This will help keep chalk from building up on the cleats, giving you false chalk readings while you are fitting the patch. I would recommend lightly clamping the patch material in place while doing this to make sure everything is nice and snug. With the cleats in place start rough fitting the patch. At first, chalk isn’t necessary, but as things progress it will be essential.

Chalk
Chalk is your friend, but it is also your enemy. If you are not paying close attention, rest assured it will lie to you. When you are chalk fitting, it’s always good to doubt what it’s telling you. Feel what’s going on first, then read the chalk and see if it corresponds to what your hand is telling you.

The kind of chalk you use is also very important if you are looking to minimize headaches and achieve good results. The brand of chalk pictured above is the best thing I’ve come across and it’s very reasonably priced. It’s important to pick a chalk that isn’t greasy, fatty or oily. Some brands of chalk will leave a residue that once applied will only come off with warm water (which won’t do you any favors while fitting), or after the first few applications will become extremely frustrating.
To apply the chalk use a stiff brush to powder it on from above. Too much chalk will give you a false reading, so I often lightly breathe with pursed lips over the layer of chalk I just powdered on. To remove the chalk, you can use the same brush to simply brush it away. Don’t use water! It will raise the grain.

Only White Chalk!

Unfortunately, I have had the displeasure of seeing a bass bar on a double bass that had been fit with blue chalk. After hide glue was applied it will most likely be blue forever. The
luthier was probably thinking it would be easier to see, and I’m sure it was, but I think it’s just unprofessional to leave a big blue mess inside someone’s cherished instrument. The colored chalk could also show itself through the sound post crack which would be a nightmare worth remembering.

It’s hard to see, I know

When chalk fitting, especially as the fit gets close, you have to look carefully to find all of the chalk on the patch. You will need to rotate it slowly under the perfect lighting and, boom, there it is. It is definitely subtle, but if you look closely you will see a very delicate sheen of white in the areas where the patch is making contact. Again, be wary of build-up. If you’re seeing big blobs of chalk, that can indicate a false reading.

Rock It!
No, not like Led Zeppelin. I literally mean while you are fitting the patch you need to fit it with a certain amount of rock. This might seem counter intuitive, but please let me explain. Even though the plaster cast is an exact copy of the plate, and you clamp it to the cast, there is still a tendency for the patch bed to ever so slightly lift up off of the cast. Have a look.

You can also see the wooden “bridges” or clamps that are applying pressure to the patch bed area. It is absolutely necessary to help fit the patch to the correct rock. If you were to fit a patch without rock to something that gives like this it would distort the arch in the area of the patch. Causing arching distortion does not make for satisfied customers. Rocking the patch with correct clamping pressure, the give of the plate against the cast will allow everything to be nice and happy. Here is where the rock on this patch ended up before gluing.

http://trianglestrings.com/video/rockit.mp4
Fitting With Clamp Pressure
Along with fitting the patch with a slight rock you will also need to fit it with light clamping pressure. This light pressure will be the same pressure to use when gluing the crack. It’s extremely important to get the clamping pressure right. Over tightening the clamp could flatten the texture of the top, and perhaps reverse the grain of the top. If you are working on an instrument with ample texture you may do some seriously irreversible damage. I wholeheartedly love the texture of varnish, crackle, wood grain, and flame. It’s just as important to me aesthetically as the arch on the instrument. Destroying the texture on an instrument and turning it into a bowling ball is not ideal.

Before clamping the patch in to get a reading make sure to chalk the patch bed, but not too much. It’s also a huge timesaver to have something to hold the clamp open while fitting the patch. Taking the clamp on and off can be tedious. Here is a video of me clamping the patch, and hitting the clamp lightly with a soft piece of wood to help it register.

http://trianglestrings.com/video/tapit.mp4
Now that everything is coming together you can bring it home with some light scraping to knock off the sharp edges of your facets before gluing.

**Gluing**

When the patch has the correct rock, at the correct clamping pressure, and is showing chalk everywhere and just looks and feels right, it’s time to glue it up. Make sure to use the fresh glue that you made this morning in anticipation of finishing the patch in order to optimize efficiency and you definitely didn’t forget to do it. Now is a good time to once again dust the cast and change the cellophane wrap. You will also need to wash your hands. Dust away any chalk on the patch and the patch bed (if there is some left it’s ok, it has the same index refraction as hide glue and will disappear unless it’s blue or some other color). Practice the motions of brushing on glue, placing the patch, and dry clamping. When you have it in your hands and feel confident, it’s time do it for real, but wash your hands first.

*If you happen to be fitting the patch on a back, and especially a slab cut back, get a move on as soon as the glue touches the wood.*

Maple tends to go crazy when you put glue on it, especially when it’s thin. On spruce you definitely need to be swift, but relaxed and in control. You do have some time with high quality glue as long as it’s a reasonable temperature in the room. Freaking out is never a good idea. No one is going to die, just get it done and don’t dilly dally. Once you brush the glue on the patch bed and the patch, rub the patch bed with your clean finger to work glue into the crack if it opened up. Here’s a video of gluing this patch.


After gluing and clamping go wash your hands again. There is no need to get hide glue everywhere with your filthy paws. When you are done drying your hands take a toothpick and sharpen it into a paddle. You can then use it to remove the congealed glue from around the patch (there shouldn’t be all that much). Then, also with the toothpick, run a small bead of hide glue around the patch. This will help ensure that the edges don’t dry too far in advance of the rest of the patch area, which could affect the fit.
Once glued, the patch needs to stay clamped up to dry for quite sometime. A fan expedites the drying process. After a week you can split the plywood piece off the top of the patch carefully, or cut it off. This will help moisture escape through the spruce. Put a sandbag on top of the patch with a piece of wax paper as a buffer and clamp it down lightly with a piece of plywood on top of the sandbag. This is also only finger tight, but tap the top of the clamp lightly with a piece of wood while clamping. This will help settle the sand in the sandbag. Continue clamping for another week.

**Cutting down the patch**
After several weeks of the patch drying in clamps it’s time to carve it down. I used assortment of gouges, finger planes, and scrapers. Be careful! Don’t scar up the top. The patch should be flush with the top on the edges and generally be 3.5mm in the center where the sound post sits. When finished, sand the patch with 220, 320, and, finally, 600 grit sandpaper. Wet the spruce and let it dry between sanding with each grit. Don’t sand the top! Just the patch. Color it with earth tone pigments.
After coloring the patch, shaping the cleats and closing the box, don’t forget about the new sound post that you are going to make better than the one before it. The old one should be useless anyway. The violin should be a different animal with the new sound post patch and taking the time to adjust it with your customer would be beneficial. After your happy customer walks out the door you can finally relax, go home and get some sleep. Calm down, it’s time to celebrate!