Restoration of a plucked string instrument TMTR08 – Guitar by Perrin fils à Mirecourt



Mats Nordwall Gitarrbyggeri (Guitar making) Carl Malmstens CTD Stockholm 2005-06-03 English translation by Kenneth Sparr

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David Holm, Mats Nordwall and Nicola Nerström at Carl Malmsten CTD who restored the guitar

History

It is difficult to find reliable information about the origin and history of this guitar as there are neither authentic sources nor written documents. I therefore have to use the research and the hypotheses of the present owner, Kenneth Sparr.

According to Kenneth Sparr the guitar was built by E. Perrin in Mirecourt, France, in the beginning of the 19th century judging from the brand stamp on the inner side of the back and opposite the sound hole. During the 19th century Mirecourt was a French centre for violin, but also guitar making. There are several other guitars preserved from this period stamped with "E. Perrin" which in appearance, details and many other things are reminiscent of this guitar. Kenneth Sparr assumes that the guitar was brought to the US c. 1830-1850 and was subject to several changes and repairs. Indications of these changes and repairs are a new neck, a new peg head and a new bridge. The changed neck and bridge are reminiscent of C.F. Martin's guitars of the mid-19th century. It is hardly probable that Martin made these changes, but there were several other American guitar makers who constructed guitars in the same way. CF Martin did a great many repairs and restorations on imported and other guitars not of their own manufacture, and these jobs were usually noted in pencil inside the top. The usual notation was "Repaired at C.F. Martin mm/dd/yy." And maybe two initials. The original (?) wooden coffin case is typical of the 19th century and early 20th century.

The guitar probably has been repaired and restored at different occasions in the US. There are obvious signs of this: the cracks in the soundboard where splints are inserted as well as reinforcements on the inside of the soundboard. But, there is no documentation preserved about these repairs. Kenneth Sparr bought this guitar in 2001 from the American cellist Chase Morrison, but she could not supply any information about the guitar.

Condition of the guitar before restoration

When we first saw the guitar we soon realized that considerable measures had to be taken to make the guitar playable. The most important was that the back was loose and that there was a big fracture and hole in the upper rib. After a more thorough investigation we concluded that the following actions were to be done:

Back bars

- glue crack on the end of the upper bar on the bass side
- glue crack on the end of the lower bar on the descant side
- squeeze glue into the back
- if necessary shorten the length of the back bars

Neck-block joint to back

- remove earlier repair
- separate earlier glue joints of loose parts
- re-glue these loose parts more tightly
- glue new veneer, which should be fitted to the neck-block

Cracks in the back due to drying

- there are three cracks, but it is uncertain whether these could be better repaired
- either you simply squeeze glue into the cracks or you try to remove old glue and reinforcements in order to re-glue and make new reinforcements

Other observations concerning the back

• check if the back fits to the ribs

Soundboard bars

- should not shift positions
- all four bars need glue squeezed between the bars and the soundboard

Cracks in the soundboard due to drying

- squeeze glue into the cracks
- as an alternative try to open the cracks, remove reinforcements, re-glue and make new reinforcements
- the bridge should not be removed

Neck- and end-blocks

- cutting them down to fit with back
- glue the neck-block to the ribs

Rib binding soundboard

- looks rather good considering the circumstances
- glue need to be squeezed in at some places, particularly in the waists

Rib binding bass side of back

- looks rather good
- if necessary a repair at the waist
- squeeze glue into a crack some distance from the end-block
- the upper part somewhat damaged and if necessary be replaced at some places
- glue binding at the neck-block

Rib binding descant side of back

- a few more cracks on this side.
- squeeze glue into cracks and replace some parts
- the upper part somewhat damaged above all near the joints for the bars

Rib cracks

- a large hole in the rib of the bass side
- remove loose parts from the hole
- make a new piece of maple
- fit this piece carefully and glue it
- if necessary also reinforcement pieces on the inside
- squeeze glue into the cracks at the descant part of the waist, at the end-block and on both dies of the neck joint
- if necessary new reinforcements

Together with the owner of the guitar, Kenneth Sparr, we decided that, as far as possible, we should try to keep the guitar in its present state and not change the modifications that were made in previous repairs. The replaced neck (similar to those made by C.F. Martin) and the bridge, which were both in good condition, should not be changed as they reflected the changes that the guitar underwent during its stay in the USA. On the other hand we felt we should redo some of the less successful repairs such as the cracks in the back and in the

soundboard, and should complete the wooden and ivory parts that were missing. We also felt we should not devote ourselves to staining and retouching of varnish damages as this work demand many years of experience to acquire a good result. The aim of the restoration was to render the instrument playable and hence make it possible to hear and experience an impression of how it may once have sounded.

Start of the restoration

We decided that the restoration should be divided in three main phases:

- 1. make a survey of the whole guitar and make sure that all parts were fixed properly and repair all cracks as well as remake some earlier repairs
- 2. glue the back to the body
- 3. completion of the missing wooden details

Securing of the guitar

I (Mats Nordwall) started with trying to restore the back to a working condition. Earlier there were made some less successful repairs on the back which I intended to redo. The damages were two cracks near the end-block, one bigger and one somewhat smaller, a crack at the waist on the bass side and some loose parts at the neck-block.



The back in the condition when we received it

Repair of the back

I started by removing the pieces of veneer which were attached to the big crack as part of an earlier repair. These pieces of veneer were glued with hide glue, which made them easy to remove. I dissolved the old glue joint by placing damp cotton on the veneer pieces and at the joint of the crack. The moisture of the cotton spread itself into the glue joint and slowly dissolved the glue. I had to fill the cotton with water regularly to keep it damp enough. After 30 to 40 minutes the glue had softened to the extent that the pieces of veneer could be removed. The crack was then cleaned of glue. I used a toothbrush moistened with water and brushed the edges of the crack. I also used a needle to pick glue from the crack. This procedure was used until the glue joints were completely free from old glue.

I had to detach the lower back bar, which passed right across the crack, to be able to re-glue the crack. Again I used damp cotton to dissolve the glue joint but I also used a feeler gauge which I inserted between the back and the back bar and in that way separated the joint.



The large crack in the back

At the neck-block there was damage to the back, probably caused by a blow, and several pieces had come loose. These pieces were already glued back, but unfortunately the joint was not tight. I dissolved the old glue joint by putting damp cotton upon the veneer that was glued to the back to fit the neck-block and before that I shaped the veneer to a high degree of thinness. The moisture from the cotton spread into the old joint and slowly dissolved the glue. I had to fill the cotton with water regularly to keep it damp enough. After 30 to 40 minutes the glue had softened to the extent that the pieces of veneer could be loosened and removed. The pieces were cleaned of glue with a tooth brush and a needle. To get the glue joints free of all old glue, the same procedure was carried through on the back from where the pieces were originally removed.

The pieces were re-glued with sturgeon glue. The sturgeon glue is similar to common hide glue, but has additional qualities which enable it to contract and pull cracks together. Furthermore one doesn't need to use very high pressure to get a tight glue joint. To ensure that the pieces were level, I used a transparent plastic sheet which was pressed on the outer surfaces with two small clamps. When the pieces were fixed, a new thin veneer was glued on. This was later cut to fit the neck-block.



New veneer at the neck-block

The two smaller cracks in the back were also glued with sturgeon glue after having been cleaned of old glue.

The big crack in the back was of a size that made it necessary to insert a splint of maple. At first I cut the edges of the crack and fitted the maple splint, which then was glued with hide glue.



Gluing of the crack in the back

The crack after the insertion of splint

When the glue had set, the protruding parts of the splint were trimmed to get a good level surface. Great care was taken not to damage the adjacent varnish. Three new reinforcement pieces, or "stamps," were glued over the crack on the inside of the back. After that the back bar was reglued.



The "stamps" over the crack on the inside of the back

After these measures the back was prepared to be glued to the body. I continued with preparing the body before gluing it to the back.

All three soundboard bars were loose at the ends. The lower and the upper were re-glued by squeezing hide glue between soundboard and bar. The middle bar had been placed obliquely, probably when it was glued for the first time. It had been misplaced outside the opening in the

lining. We decided to remove it completely in order to re-glue it in the right position in the lining. We used damp cotton to dissolve the glue joint. The soundboard was cleaned from old glue before the bar was re-glued.



Removal of the middle bar

To secure that the soundboard should remain in level with the bar we put a board under the soundboard and clamped the bar with a block on the bar.



Gluing the middle bar

The gluing was very successful and the soundboard became more plane than before.

Gluing cracks in the soundboard

There were two long cracks in the soundboard above and under the bridge. These were repaired earlier, but had split again. These cracks were repaired in the same manner as the big crack in the back though with splints of spruce.



The cracks in the soundboard with inserted splints of spruce

Repairing the hole in the rib

After discussing the problem with violinmakers Backa-Mikael Ericksson and Christer Berglund, I decided to try to keep as much material as possible and only cut off a small amount around the hole, and that I would then thin the edges around the hole in order to have a larger glue surface for the new piece of maple which should be fitted in. These thin edges would also make it easier to get a tight glue joint, as it would render them more pliable and easier to clamp.



The hole in the rib from the inside

The hole from the outside

The next step was to find and fit a piece of maple that matched the graining of the rib. I aimed at getting a match between the largest grains. I sawed and shaped the piece of maple a little too big and bent it over a bending iron to the same shape as the rib. After that started the strenuous work of fitting the piece of maple to the rib. I had to make a clamping caul with the same bend as the rib. I clamped the block on the outside of the rib in order to prevent damage to the thin edges of the hole when fitting the new piece. Using chalk to mark the edges of the hole, I pressed the maple piece and I could thereby see where it came in contact with the edges of the hole. I then knew where I had to remove more material from these places. After several hours of adjusting, I finally succeeded in getting the maple piece to fit fairly well in the hole. When I glued the new piece of maple, I used the clamping caul I had made earlier and also made another block for the inside. I succeeded in getting a rather tight glue joint by clamping these blocks with the rib and the new piece of maple in between.



Gluing of piece of maple



Many clamps give a high pressure



The piece of maple from the inside

The result from the outside

To repair the hole and I had to remove a piece of the lining above it. I made a new piece of lining which I bent and glued back. The lining of the guitar was damaged in several places, so I cut away the damaged pieces and replaced them with new ones. When these were fitted they were trimmed to fit the back.



New lining at the hole

New pieces of lining

Both the end- and the neck-block were cut down to fit the back. I also discovered that the back bars were too long and gradually would push through the rib, so they were cut down to leave a distance of a millimetre to the rib. When body and back were fitted to each other, it was important to check that the neck was level with the body. In order to ensure this, a jig was made. The jig was constructed in order to fix the correct position of the bridge and the soundboard, to get a good level of the soundboard and the neck. Before gluing the back to the body a label was made to show where, when and by whom the restoration was carried through.



Label on the inside of the soundboard

Gluing the back and the body

I used hide glue and adhesive tape to glue the back. First I taped the back in the right position. I loosened the tape a short distance and applied hide glue with a feeler gauge and taped it up again. I started gluing at the neck-block and continued around the ribs until the whole back was glued. After a couple of hours the tape could be removed.



The glued back

Complimentary addition of rib bindings and other

When the back was in place the next step was to put binding on it. The back had shrunk in relation to the body and was above all smaller than it used to be. This meant that the binding on the ribs had to be made broader to compensate for the shrinkage. In some places and in order to make broad enough but still bendable binding I had to make two or even three bindings one outside the other.

The bindings, made of ebony, were sawn, trimmed and bent to shape on a bending iron. I used a file to get a tight perpendicular surface to which the binding could be fixed. The bindings were glued with hide glue. I also used adhesive tape to press them in place. I had to lengthen the binding somewhat below the waist. After several trials I succeeded in fitting the complete binding to the back.



Gluing of bindings

Then the binding was cut and scraped to the level of the back and the ribs. I used a razor blade scraper where half of the cutting edge was taped in order not to damage the varnish of the guitar. Finally I rounded the binding in order to get the same shape as the binding of the soundboard.



Binding in place

The binding on the soundboard was not complete and in several parts, both purfling, ivory parts and binding, were missing. I had to take pieces of mammouth ivory which I trimmed to the right thickness and length. When they became very thin it was no problem in bending them. I then glued the purfling and the missing mammouth ivory pieces where needed by starting with the inner purfling, continuing with the mammouth ivory part and finally the binding. I scraped the binding and the purfling in the same way as I had made on the back. I used a putty consisting of ebony dust and hide glue to putty up the binding joints which were not tight on both soundboard and back.



Gluing mammouth ivory purfling and binding

The holes for the tuning pegs in the head were too large for the pegs to be used so I had to put in plugs. I started by redrilling the holes to get them round and even. I used a plug cutter to make plugs of mahogany, which were tapped in the holes and glued with hide glue. I trimmed the plugs level with the rest of the head and used the same ebony dust and hide glue putty to fill the irregularities in the joints around the plugs. Eventually, I got an even surface which I coloured with black stain. A few layers of shellac were applied to the head which made the stained surface really black and the plugging practically invisible. Six new holes were drilled for the tuning pegs which then were enlarged by a reamer. The tuning pegs were also shaped to fit nicely in the new holes.



Measuring for marking the placement of the new tuning pegs



I finally varnished the bindings of the guitar with a few protective layers of shellac.

The varnished and finished guitar

The guitar was then ready to be strung, which was made by the owner, Kenneth Sparr.



Kenneth Sparr stringing the guitar

Consumption of time for the restoration

Check for damages and document them	2 hours
Take photos of the damages on the back	30 minutes
Cut away reinforcements and removing glue from cracks in the back	3 hours
Loosen end of bar to tighten crack	3 hours
Prepare the crack for gluing (washing out)	30 minutes
Glue crack	1 hour
Thinning of reinforcement at the neck joint on the back	2 hours
Dissolve glue and remove reinforcement	2,5 hours
Remove and clean pieces and glue joints	1,5 hours
Prepare for gluing and dry gluing (pieces at the neck joint)	1 hour
Glue pieces at the neck joint	1 hour
Remove one piece (was displaced) and dissolve glue	1 hour
Glue the piece again and glue small crack at the end-block	30 minutes
Make and glue reinforcement pieces onto the crack	45 minutes
Make and glue reinforcement pieces at the neck joint	1,5 hours
Prepare the big crack and a piece to glue in	2,5 hours
Glue piece into the big crack	45 minutes
Cut clean the splint in the crack	1,5 hours
Glue "stamps" on the crack	1 hour
Squeeze glue at the bottom bar	30 minutes
Squeeze glue at the soundboard bars	30 minutes
Re-glue ends of the upper two soundboard bars	1 hour
Dissolve glue and remove the middle soundboard bar	1,5 hours
Clean the bar and the soundboard from old glue	30 minutes
Prepare gluing of the soundboard bar	1 hour
Glue soundboard bar	1 hour
Make, fit in and glue splints in cracks in the soundboard	2 hours
Cut down splint	30 minutes
Make, fit in and glue the third splint in the soundboard	2 hours
Cut down splint	30 minutes
Remove a piece of the rib lining and prepare for repair of the hole in the rib	1 hour
Find a piece of maple, shape it roughly and bend it	1,5 hours
Make clamping block for inside of the rib	2 hours
Thinning of edges around the hole in the rib	4 hours
Fit in and adjust the piece of maple into the rib	12 hours
Dry glue the piece of maple	1 hour
Glue the piece	2,5 hours
Make a piece of rib lining above the hole (bend it etc.)	1 hour
Glue the piece of rib lining	30 minutes
Make and glue "stamps" on crack in the back	1 hour
Cut away damaged parts of the rib lining	1,5 hours
Bend and make new pieces and fit these	2,5 hours
Glue the pieces	1 hour
Fit in pieces of rib lining to back and cut down end-block	2 hours
Make a template for neck angle	30 minutes

Make and glue label 30 minutes Glue back to body. Test, fix, and so on, glue a little at a time, fix with adhesive tape, etc. 30 minutes Saw and shape the binding to the back. 30 minutes Bend binding (bass side) 1 hour Clean-cut for new binding and remove the old one 2 hours Glue binding (failed unfortunately) 1.5 hours Saw new binding (3 mm) 30 minutes Clean-cut and shape for binding 2 hours Glue veneer 30 minutes Glue weneer 30 minutes Glue binding (2 mm) (failed unfortunately) 1.5 hours Saw and shape binding (6 pieces 1,5 mm) 1 hour Bend binding (2 mm) (failed unfortunately) 1.5 hours Saw and shape binding 1 hour Clean-cut for next binding 30 minutes Glue binding 1 hour Saw and shape binding (descant side) 1 hour Clean-cut for binding on descant side 1 hour Shape binding (0,8 mm) 30 minutes Glue binding 3 hours Glue binding on all sides 1.5 hours Glue thoinding on soundboard 1	Cut back bars	30 minutes
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Fit in and glue mammouth ivory piece in waist45 minutesFit and glue purfling45 minutes	Clean-cut plugs	30 minutes
Fit and glue purfling 45 minutes	Fit in and glue mammouth ivory piece in waist	45 minutes
1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 +	Fit and glue purfling	45 minutes
Shape mammouth ivory piece (outer waist) and glue 30 minutes	Shape mammouth ivory piece (outer waist) and glue	30 minutes
Glue piece of binding (near neck joint) 30 minutes	Glue piece of binding (near neck joint)	30 minutes
Cut down and round pieces of binding 30 minutes	Cut down and round pieces of binding	30 minutes

Get binding	30 minutes
Shape binding	45 minutes
Glue binding	45 minutes
Cut down binding and round it	1,5 hours
Mix a putty (glue and dust)	30 minutes
Putty up and shape	2 hours
Varnish with shellac	1 hour
Stain black (several times)	30 minutes
Varnish peg head with shellac	30minutes
Putty up with black on back binding	3 hours
Varnish with shellac on back binding	1,5 hours
Varnish with shellac on soundboard binding	1 hour
Varnish with shellac on soundboard binding again	30 minutes
Drill for tuning pegs	2,5 hours
Enlarge by a reamer for tuning pegs and sharpen pegs	45 minutes
Putty up around the holes for the tuning pegs	1 hour
Varnish the peg head again	30 minutes
Total time consumed for the restoration	158,5
	hours

The text has been checked and revised by Kenneth Sparr in April 2006. Many thanks to luthier Paul Hostetter, who made many corrections to the text.