

# Dealing with the Heart of Musical Boxes

Chemical cleaning of steel musical box combs by Stephen Kember - BAFRA Specialist Accredited Member



*A 'Six Bells in sight' Cylinder Musical Box by George Bendon, Swiss*

Many antique musical boxes that come to me for restoration have very often been stored in less than ideal conditions. The steel comb that produces the music is especially vulnerable. Any changes to the shape and weight of a musical box tooth could affect the performance. What is the best way to clean such a vital component? If rusty, some musical box teeth produce a dull sound and can be quite badly pitted but still produce a pleasing performance. Once the accumulated grease and oil have been removed (over night soak in L + R Clock Cleaning Fluid) dealing with the rust may be considered.

The musical box comb is made from heat treated high carbon steel. When the comb rusts, some of the iron atoms from the steel combine with oxygen to form rust. This rust has entirely different properties to those of the original steel comb. The original steel tooth will vibrate freely to give us the preferred sound. The steel is very elastic, a tooth could be plucked again and again and its properties will not change. The new material present, rust, is unstable and will fall apart. The rust contained in the pitted surface will quickly damp the vibrating tooth, producing an undesirable sound. The fact that some rusty teeth still produce a good sound may be due to the fact that a large part of the corrosion exists at the node of vibration. A theory put

forward by Anthony Bullied in his book, 'Cylinder Musical Box Technology'.

The rust may be removed by physical cleaning using emery cloth or abrasive paper. The disadvantages of this method are that the cleaning process is uneven and will not remove rust from the pitted areas. Chemical cleaning removes rust from all areas and produces a more even texture to the comb surface.

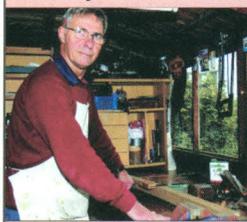
The product I have used for this process is called 'Evapo-Rust'. Although the name suggests some connection with a Wallace and Gromit film, it does do exactly what it says on the tin (or plastic bottle in this case). This almost pH neutral liquid may be disposed of safely and is non-toxic. The manufacturers offer the following explanation of how it works.

'Evapo-Rust works at a pH of 6.1 to 7 (neutral) through selective chelation. This is a process in which a large synthetic molecule forms a bond with metals and holds them in solution. Most chelating agents bind many different metals. The active ingredient in Evapo-Rust bonds to iron exclusively. It can remove iron from iron oxide, but is too weak to remove iron from steel because the iron is held much more strongly.' So now we know!

What is 'chelation'? The Encarta Dictionary gives the following definition; Chelate, a chemical compound in which metallic and non-metallic, usually organic, atoms are combined. These compounds are characterized by a ring structure in which a metal ion is attached to two non-metal ions by covalent bonds.

The cleaning liquid only reacts with iron and is therefore ideal for cleaning musical box combs. Brass damper pins and lead tuning weights remain unaffected. An illustration of the ringing times/attenuation rates of musical box comb teeth cleaned by both methods is shown by the oscilloscope below. The top trace being the product of mechanical cleaning, and the bottom trace, chemical cleaning. Clearly, a better restoration will result. This product has also been used to clean musical box discs very successfully.

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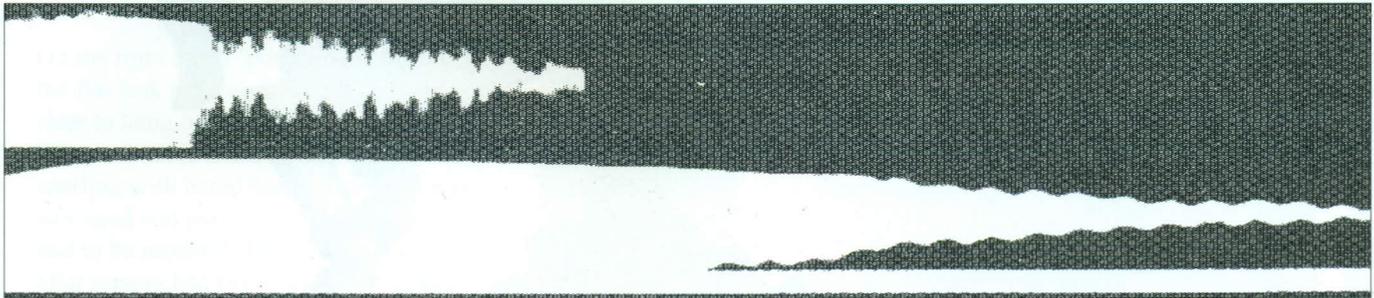
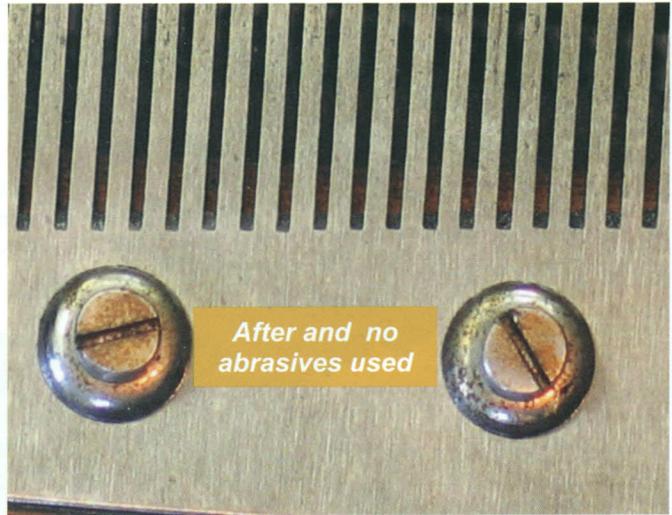
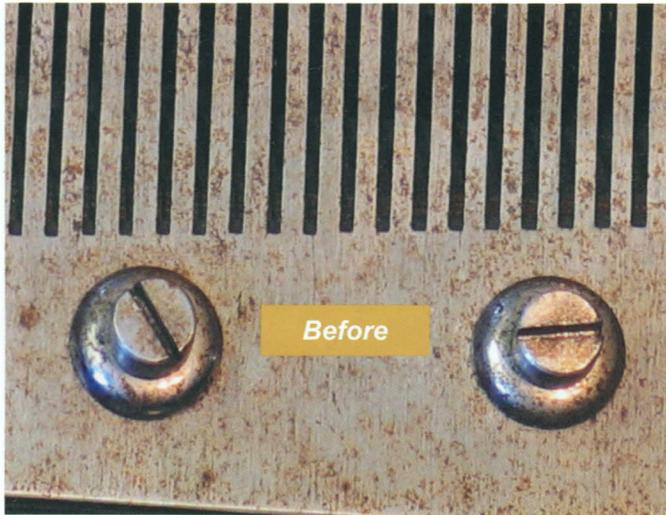
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Oscilloscope trace shows improvement in 'Ringing time' with chemical cleaning'



A Disc Musical Box by Kalliope, German c.1900

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[1] G. Wayne Finger PhD. PE 'Cleaning Rust Damaged Musical Combs' Mechanical Music Vol 52, No. 6 November/December 2006.

Thanks to Wayne Finger for generously sharing his data and John Farmer, 'Evapo-Rust' UK supplier 01562 741108, [www.musicanic.com](http://www.musicanic.com) orders@musicanic.com

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