

Restoration of a Broadwood square piano, 1793

Thomas Strange – Jan 2010



A Broadwood square piano of 1793 emerged as a donation possibility in upper SC in 2009. The piano was not in playing condition and the thought was that with some work perhaps it could be renovated to working condition. I inspected the piano and we found it to be in relatively good condition, with enough original elements left untouched to warrant consideration for restoration. A technician had been used some years earlier to do a semi-restoration and certain unfortunate modifications were made. Chief among these was the unnecessary loosening of the strings to replace the red flannel that covers the hitch pin area with an inappropriate red felt, and the soundboard was cleaned and re shellacked at the same time. Additionally, he decided to gild the top of the bridge! Whether at this time or earlier, someone completely refinished the piano, although the job is serviceable. Modern screws replaced old for the hinges, and incorrect screws used on the lid such that they have pierced the lid top.

All of the iron strings were original, but the act of loosening them on the tuning pins left them in a jumble around each pin shaft, many of the brass were broken, as well as 10 of the 26 over spun strings. To make the piano play, strings were moved about at random and looped to the wrong hitch pins, such that the lowest two octaves were either wrong or missing altogether. The top three octaves of iron were largely still there, but fragile due to the improper winding now on the tuning pin. At some point 7 oversize modern 1/4 inch pins designed for mid 19th century square pianos were used in place of pins that had probably become too loose. These were removed entirely and set aside.



On further inspection, the following was also found:

The dampers had worn flannels in the treble due to insect damage, several claspers had broken, one damper arm is a solder replacement, all the dampers were stiff with verdigris, and the dampers had at some point been removed and replaced somewhat out of order, so that heavy and light weight dampers were interspersed.

The soundboard had two cracks now repaired with epoxy, and newly shellacked.

The bass boards have shrunk on the left side, and there is some evidence of the case separating on the left now.

Wood boring beetles have infested the middle of the bass boards at some point coming completely through the thickness into the action frame area.

Some bottom veneer is loose. The right apron of the French frame is cracked at a natural wood splice when constructed and needs re-gluing.

The two front paterae are missing from the stand. Bolts are covered in what appears to be original veneer. Stand cannot be disassembled without removing veneer in place, but disassembly is not generally ever required.

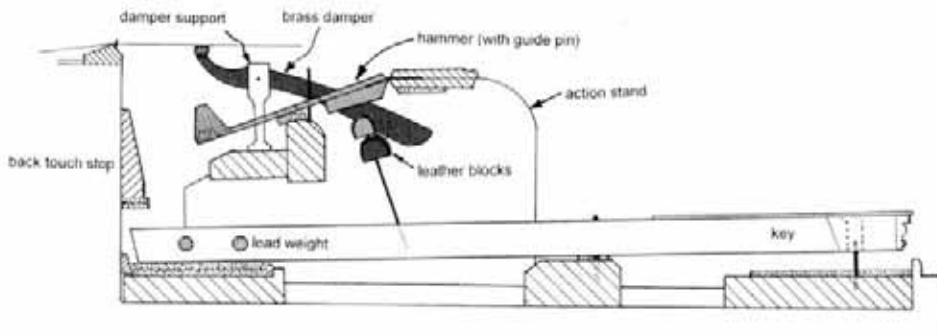
The Restoration

The instrument was thoroughly photographed with a Nikon D90 SLR or Canon Powershot at maximum resolution, and a CD of the resulting photographs is included in the appendix. On removal of any screws they are placed in order of where they came out to be returned as found. A screw too badly damaged to reuse is replaced with either a spare 18th century screw of the same size from a small collection that the restorer has assembled, or failing that, a screw that is a close modern equivalent in zinc coated steel and suitably blued as appropriate.

The action was drawn and inspected for signs of wear and insect damage. In this instance, all wear and damage appear insubstantial and it is thought that no replacement of coverings will be needed. In particular, the hammer faces all appear original and in good condition.



In this action, which strongly resembles the English Single Action, the hammer is activated on being impacted by a leather covered wooden button near the hinge point of the hammer, as shown below:



The brass dampers ride on a leather shoulder below the leather covered top button that propagates the hammer towards the string.



Modern felt has replaced the flannel that the damper counterweights once contacted, but it is serviceable and out of sight, so left alone. Each damper lever pivots on a brass stanchion with an iron axel allowing it to move freely though with a fairly close tolerance. Over the last two centuries, various oils, including undoubtedly whale oil, was applied to make the pivot freely. Over time, these oils oxidize and break down into fatty

acids, attacking the brass and producing the characteristic deep green verdigris, with polymerized oil chains making up the body, and producing a stiff thick gel which causes the dampers to pivot slowly or not at all. On warming, the joint will actuate, but becomes stiff again at room temperature.

To service the dampers, the hammer rail must be removed. This has been modified at some point when the instrument was undergoing an unadvisedly poor attempt to restore it, and the brass nuts were exposed by hewing out the mahogany to reveal them. This vandalism could have been totally avoided by removing the screws that hold the mahogany top on, but the hand cut screws were hastily made to begin with and had come into such poor condition they strongly resisted removal. The heads were made too shallow, and they were rusted into the wood.

The hammer rail top must be removed to replace hinges, and one was nearly broken at the FF note, so the screws now must come out. To remove an 18th century screw, first carefully deepen the slot for the driver with a small diamond blade on a Dremel or similar tool. This cut must only be deep enough to allow the screwdriver to mate snugly, but not deeper, or the head will split in two with torque. Next, using a soldering iron with about 200-300 watts capacity, heat the screw well until it becomes very hot, generally until you can just smell the scorch. Remove the iron, insert the screwdriver, which should fit into the screw EXACTLY the width of the screw and with NO play in the slot, but able to insert to the bottom of the improved slot. Pushing down and gently but quite firmly rocking the screwdriver, get the screw moving and then ease it out. Done correctly, all but the most damaged screws will easily come out. Screws that are attempted without heat will almost certainly strip. In this case, six of the seven screws came free with the seventh having too much corrosion damage to allow it to be removed.

Broken screws present a problem to the restorer, but they CANNOT be left in place and another screw attempted next to it. It will not work, and you run the risk of two broken screws where there was one. Easy Out screw extractors work fairly well for screws larger than a size #10 equivalent. But on these small squares most screws are the modern equivalent of a #4 or #6. Several techniques can work to remove these screws. If the screw is readily visible and presents a flat break, a series of drilled holes starting with about drill size 55 and increasing in steps of 3 sizes will drill the body of the screw out and allow the remaining treads to be picked out. Usually it is not possible to easily center the drill bit however.

If the hole is visible and critical, estimate the screw size and obtain a piece of thin walled steel tube with an ID the size of the screw body. Cut about a 3 inch length, and with a fine file notch one end around the circumference as a saw pattern. Chuck it into a drill motor carefully so as not to crush the tube (a nail of the right diameter inserted into the hollow tube end will help with this) and with the drill motor spinning counter clockwise, drill past the screw with this arrangement. In most cases the screw will spin out, usually at the loss of the tube of course.

In some cases where a plug will not be objectionable as in under a hinge, using a #60 drill bit and clearing an area around the screw in the wood will allow it to be wiggled free after clearing away the wood. Alternatively, a diamond bit used to drill hole in ceramic and stone at 3/8 " size can be used with the drill in the counter clockwise rotation, and like the tube example will spin out the screw. As with removing the wood, it will leave an enlarged hole, but this can be drilled to accept a 3/8 or 1/4 inch dowel glued in, and the hole re-drilled for the correct size screw. A well-repaired hole is as good or better than new.

The hammer rail top was now free, and since the screws were in poor condition, new #6X1/2 screws were turned to flatten the faces, and blued to look appropriate and used for return to service. Removal of the hammer rail top should no longer be an issue.

Cleaning and repairing the Dampers:

Short of total disassembly, the best way to clean these pivots is by use of a multi solvent non-polar mixture that can dissolve and clear away residual fatty oils and etc. The product Goof-Off contains a suitable mixture at low viscosity to accomplish this task. Goof-Off is applied carefully to the joint, the joint worked back and forth, and using a high pressure air hose the joint is blown clean, and the operation repeated until the product removed is clear. The hammers and all action parts and framing are covered to do this. Since the stanchions are cemented into the frame removing them all was deemed too invasive at this point, so all cleaning was done in-situ. Once the damper pivots freely, a stable oil such as Liquid Wrench L204 is applied. These will not oxidize quickly and should provide decades of trouble free service.

Several of the dampers had little or no flannel left in them, and some had broken or missing clasps. These brass clasps were designed for one time use, and the metal work hardens quickly such that prying them open to insert new flannel is problematic. A razor blade, carefully worked into the slot and gently wiggled will allow old flannels to be removed, but this can be done on a very limited basis. All the good flannel was reused and the clasps opened just enough to allow adjustment. Lost flannel or felt was replaced with bushing cloth of the right thickness of about 0.8 mm. Five damper levers had broken clasps and these were replaced with reproduction damper levers from David Law at Traditional Brass in the UK. The damper size was ground to the correct size for that position in the keyboard, and bushing cloth inserted and the clasper closed for it.

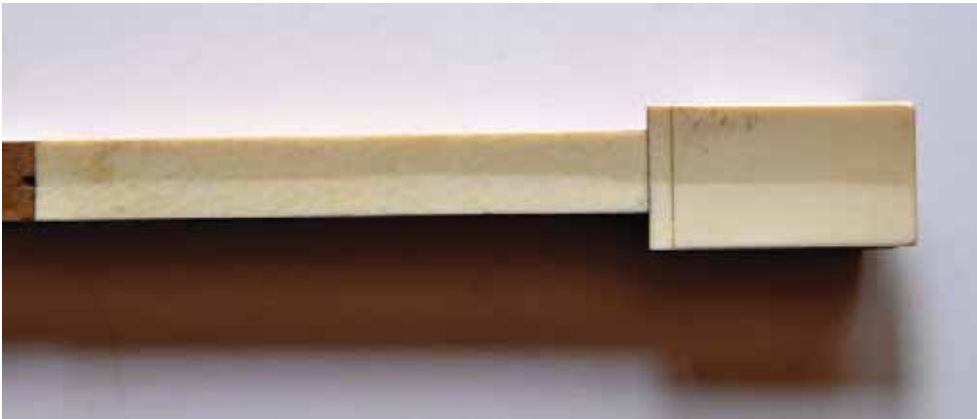
Removing and inserting the action with the dampers is a problem, as the damper flannel wants to catch on the strings. **It is critical to completely cover the dampers with paper prior to insertion or removal of the action.** Insert the paper carefully and secure it so that it will not pull free as the action is removed. Should it shift, replace it before continuing to draw the action.

The Keyboard:

The keyboard is in the best condition of the instrument and is original and unaltered throughout, with all ivories and key fronts and a clean key bed. The action cloth under the keys in the front saw limited insect damage and certain punchings were replaced, but the hammer touch cloth is in good condition and the back white flannel is good as well. The action is clearly marked with the scaling and string material as shown below.



The keys were dingy from storage and playing with less than clean hands. Hands should be washed just prior to any playing on these instruments. The cleaning is done with saddle soap and a moist but not wet cloth, and dried immediately, as below.



Ivories are, as with all Broadwood instruments before about 1800, cut thicker than most and being about 2 mm or more as shown.



The accidentals are solid ebony, unlike most makers of the time, and rather than ink the key at the back of the accidental as was often done, the ebony is cut back and a thin slip left in place on the sharp to give a good appearance at the keyboard.

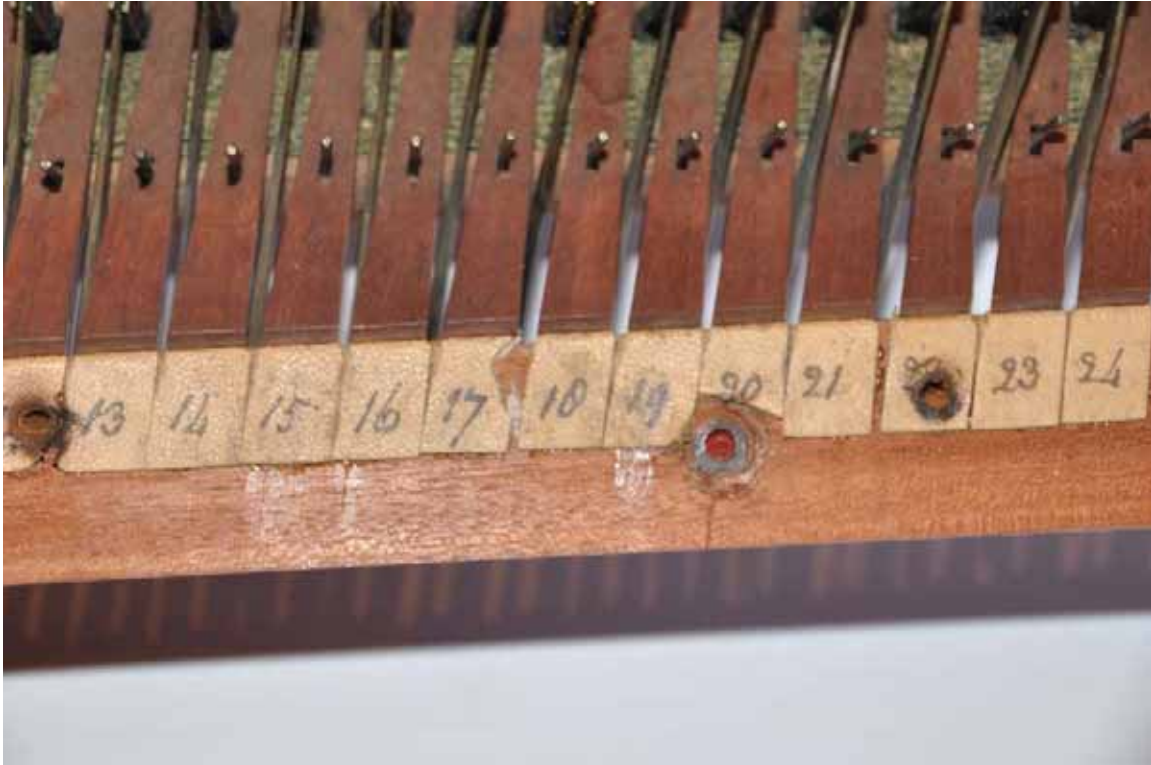


The action frame has the name 'Hendenon / 2433' written in pencil. This was most probably the maker of the action, though senior staff occasionally did sign instruments over which they had control. Hendenon was an established name in London at the time. 2433 is obviously the serial number, as we knew.





The upper feature is the wooden/leather covered 'old man's head' that impacts the hammer, the lower feature is the leather covered shoulder to actuate the damper. A key front is shown as well.



The hammer hinges beneath the hammer rail top are individually numbered as shown. These are of course all original to the instrument, and are in the hand of the keyboard maker, probably Mr. Hendenon.



The lowest bass hammer (FF) was broken at the hinge. The end was soaked in very hot water to loosen the glue and the remaining leather slid out. New goat skin was shifted into place and glued, then the flap trimmed and glued to the hammer rail. The hinge should stand just proud of the edge of the hammer rail by about 0.5 mm to 1.0 mm but no more, or the hammer will have excessive play on actuating.



Documenting the case and repairing/restringing:

The case is made of veneered mahogany on the front and sides, oak at the back, and pine for the baseboards. The hitch pin area was covered in red felt, glued down with white glue. This was soaked until semi soft, pulled away, and the remaining glue scraped up.

The case is mostly intact with the left side showing some parting with the baseboard in the left rear corner. This was to be repaired as described.



Gap to be repaired



Whole case minus strings, pins, hitch pin cloth.

The gap was washed out with hot water shot from a syringe until the water ran clear. Hot hide glue (Luthiers Mercantile Int. FHG #192 gram strength) was liberally injected and the case was clamped to close the gap, and excess glue wiped up. The clamped case was allowed to sit 48 hours, and while still under the clamp, three holes were drilled for 4 inch stainless steel screws, which were given a pilot hole into the case, a through hole of the baseboards, and counter sunk to clear the head. The screws were driven in under torque to 5 ft-lbs. The screw acts as a lateral anchor to keep the case from shifting and breaking the glue, but the glue does all of the bonding of case to bottom boards.

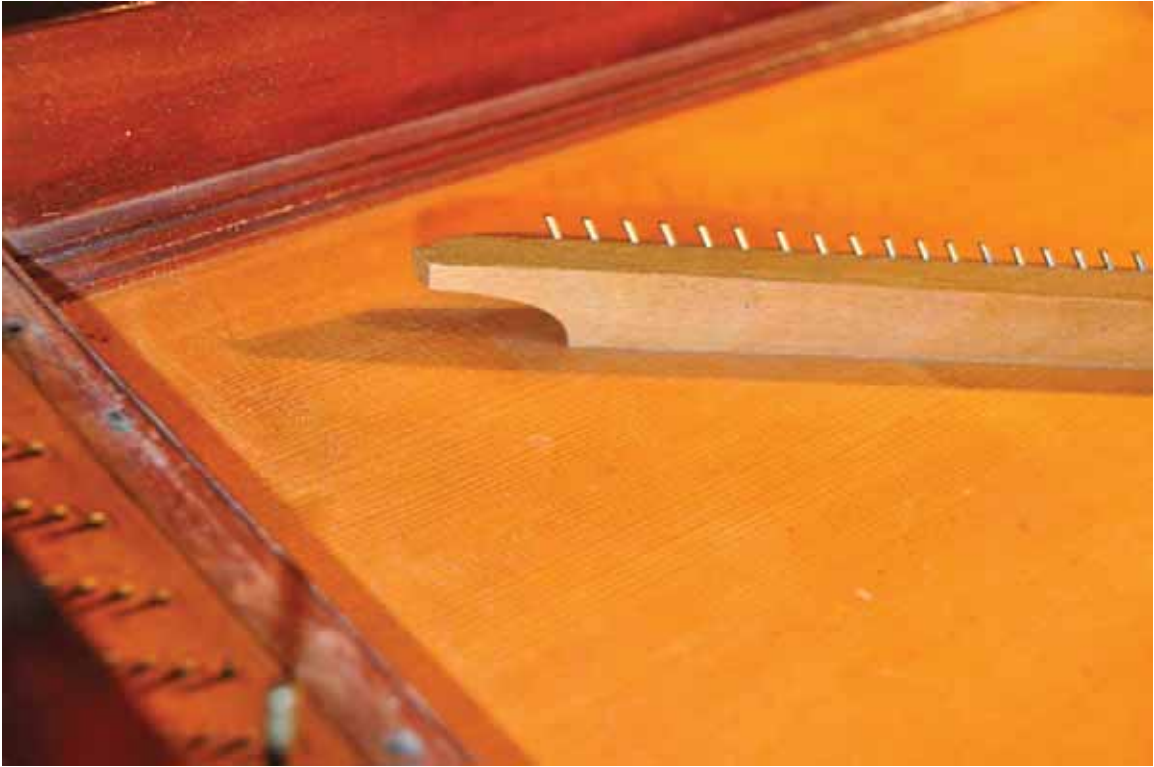
A word about glue is needed here. There are only a few types of glue that should ever be used on these instruments, and these are all reversible such that a future restoration is possible. Hide glue made from animal hide and hoof, and fish glue from the fish bladder are acceptable with the latter used for high strength but low load bearing applications like leather hinges and etc. Wood glue, white glue, Titebond I, II, and III are unacceptable with no structural properties and poor to very poor reversibility. Epoxy can be structural but nearly impossible to reverse or rework. Urethane glue like Gorilla Glue is unnecessarily messy, holds no better than hide glue, and is impossible to reverse easily. Super glue is permitted on the wire hitch loops to keep them from unwinding.

Hide glue is used at about 140 F, and has amazing archival properties. It holds well, easily reverses, can be completely removed with just water, and will not allow slippage with time like Titebond products, which though they appear to harden, are essentially rubber like all the time.



Dove tails at back of case

In general once properly re-glued and screwed the case will give no more difficulty. With through and blind dovetailing at all corners the case is magnificently strong and resistant to warpage. The Achilles heel is the connection to the base boards, which is a simple flat glue joint to the rather thick case wall (~1.5 inches at base). The baseboards are two runs of 1.5 inch pine, one run lengthwise parallel with the case, and the top run parallel with the strings.



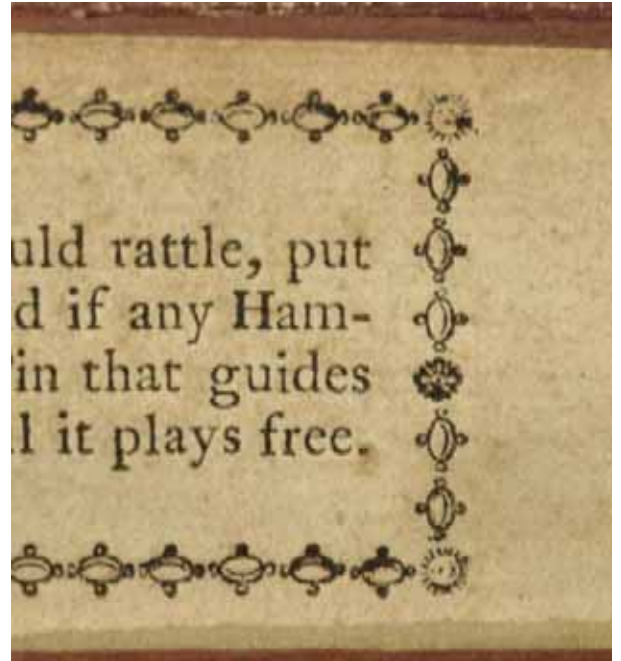
The bass end of the bridge



Treble End



Instruction to the regulator and detail of the printer's device border.



The mouse hole cut opening under the soundboard, with the thickness of the soundboard showing.



A typical tuning pin showing the box file cut spiral and flattened head. Approximately 1 7/8 inch long, 4.5 mm diameter.



Stop to catch the action frame on inserting action into the instrument. The card stock to space the action is original.

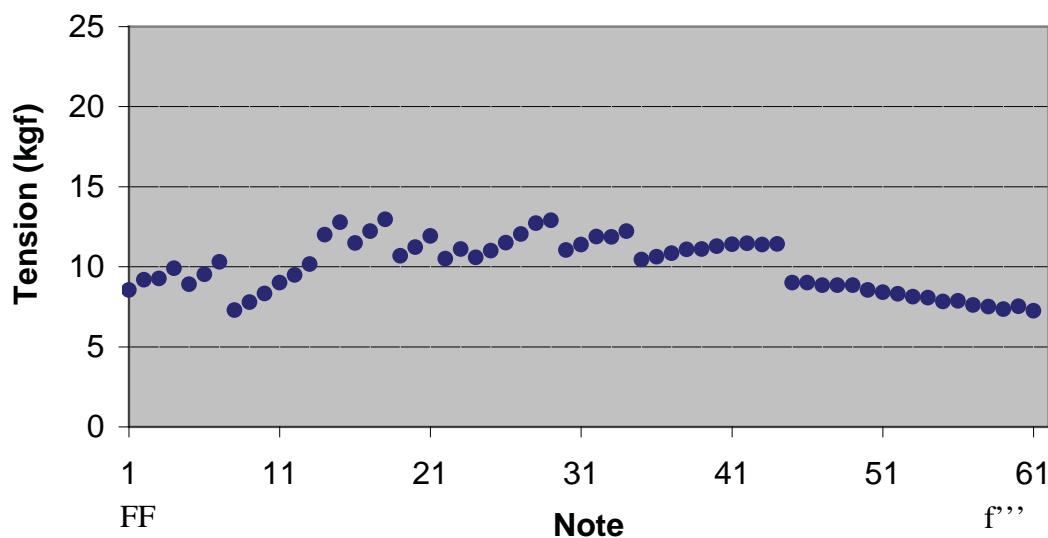
Tuning Pins and Re Stringing:

Seven of the tuning pins are later replacement with a pin similar to what Broadwood used in the middle of the 19th century, and from 4.5 mm they are ~6 mm or ¼ inch pins. These are not correct, present a challenge to the tuner who must shift tuning wrenches, and were replaced with hand made pins the correct size. These were cut from cold rolled 3/8 “ steel and heated and flattened at the head, and filed at the tail to a bullet shape as seen in the original. The oversize hole was plugged with an oak plug cut 1/32 inch shorter than the true depth of the hole and glued in flush to the surface. A pilot was drilled and the final hole drilled two drill sizes narrower than the pin. The plug set up for 48 hours before drilling. All the pins were taken out and kept in order, and before wrapping the wire on, the pins were tested against their holes for snugness by inserting by hand and seeing how far in they go. Very loose pins are easy, but occasionally a pin will seem to be snug and prove loose after driving it home. Shimming loose pins is treated further into the text.

As the wire was mixed up, sizes were checked at random to see if the wire diameters corresponded to the original scale, which they did nicely in the treble, and poorly in the brass and tenor iron. The scaling is written on the keys and goes as shown below. The bass strings were measured from remnants on the pins and from lengths of wire misplaced further up the treble end. The bass is written as the core/over spun winding diameters, all others as conventional.

| Note | Note # | Gauge # | Diameter (mm) | Overspun pitch, turn to turn (mm) | Length (mm) | Composition |
|------|--------|---------|---------------|-----------------------------------|-------------|---------------------|
| FF | 1 | | 0.74/0.41 | 1.2 | 1372/1359 | Brass/tinned copper |
| FF# | 2 | | 0.74/0.41 | 1.2 | 1342/1329 | “ |
| GG | 3 | | 0.71/0.41 | 1.3 | 1311/1297 | “ |
| GG# | 4 | | 0.71/0.41 | 1.3 | 1280/1266 | “ |
| AA | 5 | | 0.62/0.41 | 1.3 | 1251/1236 | “ |
| AA# | 6 | | 0.62/0.41 | 1.3 | 1221/1208 | “ |
| BB | 7 | | 0.62/0.41 | 1.5 | 1199/1179 | “ |
| C | 8 | | 0.55/0.32 | 1.6 | 1164/1152 | “ |
| C# | 9 | | 0.55/0.32 | 1.6 | 1137/1123 | “ |
| D | 10 | | 0.55/0.32 | 1.6 | 1109/1095 | “ |
| D# | 11 | | 0.55/0.32 | 1.8 | 1088/1069 | “ |
| E | 12 | | 0.55/0.32 | 1.8 | 1054/1044 | “ |
| F | 13 | | 0.55/0.32 | 1.8 | 1030/1017 | “ |
| F# | 14 | 14 | 0.74 | | 1003/990 | Yellow Brass |
| G | 15 | | 0.74 | | 976/966 | “ |
| G# | 16 | 13 | 0.68 | | 950/939 | “ |
| A | 17 | | 0.68 | | 925/912 | “ |
| A# | 18 | | 0.68 | | 899/887 | “ |
| B | 19 | 12 | 0.60 | | 873/863 | “ |
| c | 20 | | 0.60 | | 845/836 | “ |
| c# | 21 | | 0.60 | | 822/811 | “ |
| d | 22 | 11 | 0.55 | | 795/785 | “ |
| d# | 23 | | 0.55 | | 771/761 | “ |
| e | 24 | | 0.55 | | 745/734 | Iron |
| f | 25 | 11 | 0.55 | | 717/709 | “ |
| f# | 26 | | 0.55 | | 692/683 | “ |
| g | 27 | | 0.55 | | 668/658 | “ |
| g# | 28 | | 0.55 | | 643/634 | “ |
| a | 29 | | 0.55 | | 616/605 | “ |
| a# | 30 | 10 | 0.50 | | 592/582 | “ |
| b | 31 | | 0.50 | | 567/557 | “ |
| c' | 32 | | 0.50 | | 547/534 | “ |
| c# | 33 | | 0.50 | | 516/506 | “ |
| d | 34 | | 0.50 | | 494/488 | “ |
| d# | 35 | 9 | 0.45 | | 479/471 | “ |
| e | 36 | | 0.39 | | 456/448 | “ |
| f | 37 | | 0.39 | | 435/426 | “ |
| f# | 38 | | 0.45 | | 415/405 | “ |
| g | 39 | | 0.45 | | 392/385 | “ |
| g# | 40 | | 0.45 | | 373/365 | “ |
| a | 41 | | 0.45 | | 354/347 | “ |
| a# | 42 | | 0.45 | | 335/329 | “ |
| b | 43 | | 0.45 | | 315/308 | “ |
| c'' | 44 | | 0.45 | | 298/292 | “ |
| c# | 45 | 8 | 0.40 | | 281/275 | “ |
| d | 46 | | 0.40 | | 265/259 | “ |
| d# | 47 | | 0.40 | | 248/244 | “ |
| e | 48 | | 0.40 | | 234/229 | “ |
| f | 49 | | 0.40 | | 221/214 | “ |
| f# | 50 | | 0.40 | | 205/200 | “ |
| g | 51 | | 0.40 | | 192/188 | “ |
| g# | 52 | | 0.40 | | 180/176 | “ |
| a | 53 | | 0.40 | | 168/165 | “ |
| a# | 54 | | 0.40 | | 158/154 | “ |
| b | 55 | | 0.40 | | 147/144 | “ |
| c''' | 56 | | 0.40 | | 139/135 | “ |
| c# | 57 | | 0.40 | | 129/127 | “ |
| d | 58 | | 0.40 | | 121/117 | “ |
| d# | 59 | | 0.40 | | 113/111 | “ |
| e | 60 | | 0.40 | | 108/104 | “ |
| f | 61 | | 0.40 | | 100/98 | “ |

Tension calculator for John Broadwood 1793 square



All wire is from Malcolm Rose at the Workshop English Passage LEWES BN7 2AP, GB. The iron is Rose B type, the brass all yellow brass, and the over spun tinned copper. Rose wire comes closest to the wire original to this instrument. Other types such as Puresound is a stainless steel and while producing acceptable results is not even close to authentic in the opinion of this restorer. Modern music wire is hard to obtain in small diameters and again is not particularly authentic, producing a brittle sound over rich in partials. There is little reason not to use Rose wire so long as it is available. In time, some other substitute will need to be found, but if we do a good job and the instrument stays protected, that choice might be many decades away. Indeed, had not the wire been loosened to foolishly replace the hitch pin cloth (purely cosmetic) the iron wire on this instrument might have been perfectly serviceable for another hundred years or more.

Restringing starts with making the hitch loop. About 2 meters of wire are drawn off the spool, and passes through a brake covered in leather that restrains the wire and keeps it from spooling off the drum on cutting away. The end is held firmly and in an open cup-hook like device, the loop is formed with about three inches of wire clear of the hook. The hook is turned and several loose spirals are made, and the wire is bent at right angles and close turns put on for about 6-8 turns to secure the loop. Super glue is applied to the hitch loop turns and blotted, and it is ready to attach. It is important that the loop not unwind, and use of a super glue here secures the wire. Original wire is sometimes seen with pine rosin or sandarac applied for the same purpose.

This instrument had the original hitches made in a very satisfactory alternative way. The wire is looped as before and a few (3-5) spirals made, when the loose bit is doubled back

over the end of the last spiral and one turn made, then cinched tight and snapped off. No glue needed if the hitch is made this way. While the close turns are somewhat more attractive, this restorer will be using the double back method on subsequent hitch loops.



Some original hitch loops from Broadwood square.

The wire is cut about 8-10 inches longer than needed and with the hitch secured, the tuning pin in the left hand and the wire in the right, the pin is held next to the wire parallel to it, with the ends together at the same length. The pin is turned clockwise so that the wire is tangent to the right side looking down, and the wire comes spiraling up to the pin head to just where it makes a flat, and one loop around begins to descend, all the while keeping firmest tension on the wire. At the mid point of the spiral down the wire begins to make close turns around the pin, securing the first part of the wire against the pin body. After 4 or 5 turns, the remaining free bit of wire is cranked vigorously to break off at the turn, and the pin continues to turn until it is close to being over the destination hole. The wire is fitted to the bridge and nut pins, and keeping everything under tension the pin is eased into the hole. A slight twist with the wrench secures it, and it is tapped home with a hammer. Once in place, the pin is turned to tighten the wire to a low tension and checked for looseness.

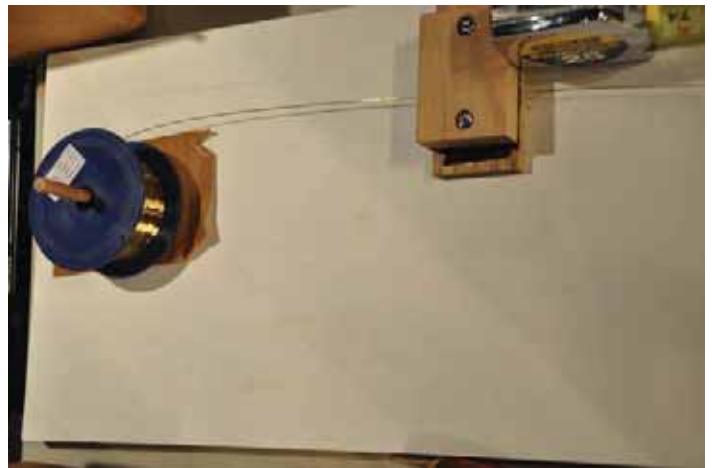
Shimming the hole best restores a loose pin that is not terribly loose. Ahead of time, clamp a timber of beech or hickory into a vise, and with a hand plane, run off several full shavings about 0.2 mm thick or so. These are then wet to being fully soaked, and ironed flat. Cut them into bits a little less deep than the average hole depth and about 8 mm long. Apply a bit of hot glue to the cut shaving and insert it into the hole, checking to see it fits without bunching or standing proud. Then insert the pin and retry the hole for tightness. Usually one shim will be more than enough, but if the pin wobbles at all, use another piece. If it needs more than two shims, drill for a dowel and plug the hole, then re-drill and continue. If you have already wound the wire onto the pin, someone will need to hold

the pin while the other shims, or prepare a vise grip in a fixture to hold the pin/wire combination under tension while you work.

The instrument is usually strung sequentially from treble to bass, but at about 1/2 tension until all strings are on. Once the strings are in place the piano can be chipped up to first approximation of pitch. This is done from the middle octaves and working out to the bass and treble. The wire will need to stretch and set, so a first tuning will fall about 1/2 step over the next several hours. A second tuning will also tend to fall as the case begins to assume its final shape and hold under tension. The third tuning is generally good for two weeks or so, and a fourth is required before the instrument can be considered becoming stable. In general it will need tuning every two months for the first year. After that, the full metallurgical response that is going to occur will have taken place in the wire, the case and soundboard will be under their required tension, and if humidity is kept constant the instrument will maintain a good tune for a year or more. If the instrument falls suddenly, and always if it falls below a semitone, look for a parting of the case from the baseboard or case warp. Do not continue to tune if the instrument inexplicably drops in pitch.

The bass strings are over spun and these must be made or ordered. In our case we have made these using a self-constructed string winder (and that is really what everyone uses who makes the early strings. Later heavier string is made on professional lathes and set-up cost for this is in the thousands of dollars.) Alternatively they can be ordered in the US from Tim Hamilton in Boston, who is available on the web. Since the over spun strings are the bulk of most restoration costs consisting primarily in labor cost, being able to wind them yourself is of use. An appendix contains further information on this operation.





Winding a bass string, views of the stringing in progress, the wire brake for spooling off wire.

As described earlier, repairing the dampers consists of careful work to loosen the old flannel, move more active flannel back into play, or replace it entirely. Broken arms and clasps were replaced with newly cast parts made by David Law of Traditional Brass.

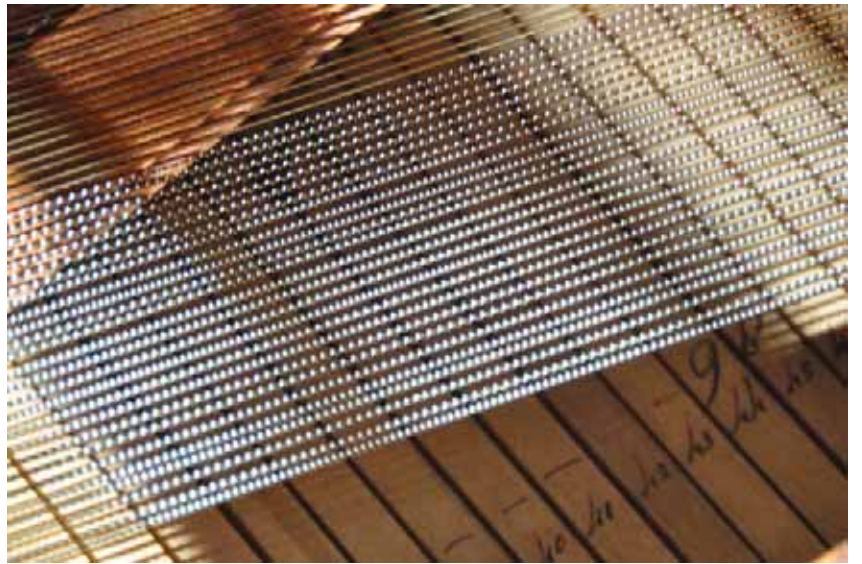


Replaced damper arms were cut to length and height and inserted into the original pinion stands. Damper arms need to be a few thousandths thinned than the pinion stand slot, and a little oil will quiet any that are slightly too loose. Slots more than about 5 thousandths must be squeezed tighter and adjusted for easy travel of the damper. As many original dampers were left in place as possible. For two, an additional pad was cemented over the remaining tuft, to avoid possible breakage during replacement of an otherwise well operating arm.

A dust cover was cut against the dimensions of the case and the standard pattern for these in the mid 1790s. The value of this cover is to act as a resonator and diminish action noise. This was painted a cream color as one of the two possible color selections, with the traditional gold band around the perimeter.



The stand apron was disassembled and re-glued, then the poor finish areas feathered back into the finish now on the instrument. Two bolt cover paterea were obtained from David Law as exact copies of Broadwood and replaced on the front. Side panels never had them.



This instrument has been stabilized to A415. Raising the pitch will not improve the sound, but will add stress on the case that may prove unacceptable, or lead to failure. Original pitch ranged from A415 to A430, but was never at modern concert pitch. Since no more than a few instruments will be expected to play in concerts with this piano, it is better to ask the string players to tune down than to attempt to make this piano work at modern pitch.

The best approach to tuning is a simple circle of 5ths, using the rubber wedge provided to bring the first string to pitch, then the unison, and proceed to the next 5th and so on. Do not force a mute cloth into the gaps, as this will overly crowd the strings, and the tenor and bass will touch on energizing. Work the wedge near the nut and after setting the middle two octaves, work down, and finish at the top treble. If the tuning brings the pitch up or down more than 1 semi tone, it may be necessary to go back through once again if an exact pitch is desired.

Early pianos will be a bit off almost at once, but if this is only a few cents it can add to the charm of the sound.

Banging on the key to “set” the string will do nothing but cause premature hammer hinge failure. Do not bang the keys for any reason. The instrument will go out of tune mostly due to changes in humidity. If kept steady, it will remain in tune for many months. Treble notes require very slight adjustment. If the pin is too jerky, raise the note slightly above pitch and press on the string gently to lower to the correct value.

The action has been left intentionally loose, held by one screw in the far right. This is because the base boards have shrunk, and attempting to screw the action with the original holes will result in hammer misplacement. As the humidity changes the case dimensions, some of the hammers toward the bass end may hit the note above or below them incorrectly. A slight shift of the key frame on the action bed will stop this, so the key frame is intentionally left loose. Under normal playing conditions or normal moving of the instrument, this should be entirely invisible to the player.

Prepared by Thomas Strange, Oct 2009-Jan 2010