

Harpsichord & *fortepiano*

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HARPSICHORD REGULATION, PART II

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Originally written for the Harpsichord Magazine in 1976

but somewhat revised in 2005.

Part II deals with firing order of jacks, and regulation of dampers, as well as sticking notes, registers binding and non-repeating notes.

Now that the instrument is voiced, the firing order of the jacks must be adjusted. The distance of the plectra under the strings of the 4' row is set as close as possible (remembering that the notes must be able to repeat quickly and faultlessly). The back 8' jacks are set to fire soon after, but far enough behind for you to be able to hear the two notes individually if the key is moved very slowly. The row of jacks on the top keyboard of a double-manual instrument is set to fire almost as quickly as the 4' row, the idea being that when the keyboards are coupled, the play between upper and lower keys causes the front row when played from the lower manual to fire later than the back 8' row. Any other rows of jacks that may be fitted should be adjusted to fit into this pattern.

The important things are that the jacks do not pluck simultaneously, and that the order of firing is the same throughout the compass. If all the jacks were to fire at the same instant on a 5-row instrument you'd need a sledge hammer to play it. The same instrument with a properly staggered firing order would be light and even to play, since the after-movement from one pluck helps with the ones that follow. A key dip of 8mm. is enough to accommodate five staggered plucking heights without difficulty, so this operation is not unduly complicated.

The last stage is fitting the dampers. There are many types, mostly using a thin hard felt, known as "bushing cloth" or a rather thicker, woven cloth called boxcloth: both are available in many finely-graded thicknesses from piano supply houses. Jacks from old instruments have one or two sawn slots alongside the tongue to below the plectrum height for the damper felt to fit into. Nowadays there are two; methods of cutting damper felts - either as described below (at 45°) like most old instruments, or by the damper slot being cut to just above the quill slot; the damper flag being left at right angles to the jack body, and hanging on the string at

all times. This method has the advantage of allowing the soundboard to expand and contract a lot, moving the strings up and down, without any change to the damping; but the strings have to be spaced out more, since the damper must stay on the string when the row is off and on. The beautiful sympathetic vibrations from an undamped, unplayed row of strings produced by the older method of damping is lost, however. I prefer the traditional way, but many modern "traditional" harpsichords by fine makers use square hanging dampers; anyway, you will probably use whatever method the instrument was set up for when it was made.

The correct felt should be cut into strips about 8mm wide. It should fit the jack slot tightly without spreading the top of the slot. This ensures that the felt is gripped along the whole of the slot and is therefore less likely to work loose. You slide the strip down into the slot and pull it back until it protrudes a little longer than the plectrum. The felt is trimmed close at the back of the jack with the scalpel, and cut level with the end of the plectrum (using very sharp, straight nail scissors, the sort that cut right up to the tip) so that it looks rather like a flag.

The 4' row is tackled first since it is the hardest. It is useful to use a board laid across the instrument, or if the lid is on and closed, use that. Do them a few at a time since then you don't have dozens of jacks everywhere. Fit the "flag" on each of the batch, starting at middle C for convenience, and lay them out in order. I usually do middle C and cut it to damp first to get the feel of it; then one at a time, cut the lower free corner off at 45°. The exact amount that is cut off is determined by trial and error at first. It becomes easier very quickly so that eventually only one cut is necessary. The correct cut is achieved when, the jack being replaced, the string can be moved away from the jack horizontally without the jack dropping vertically appreciably. The note must of course damp (when played) immediately when the jack returns. If the jacks hang onto the strings by their dampers, and the row is moved to the "off" position, when you try to move it back "on", the dampers will press against the strings, thus

not allowing the jacks to resume their correct playing positions. One piece of felt is easy to bend, but fifty or sixty are definitely not. The 4' dampers must be trimmed so that they do not touch the nearest 8' string on the way past it, and the top corner of the 4' damper is best cut off too, since this leaves less to foul the 8' string by accident. This operation is fairly important and critical. The rest of the dampers are simpler, so should give rise to no new problems.

The last part of the action to receive attention is the jack cover, which is not there just to stop the jacks flying all over the room. When the cover is fitted, the jacks should actually touch the felt a fraction before the key-front "bottoms." This helps the jacks to return more quickly, and keeps the action quiet. The felting should be built up to the required thickness using layers of "display" felt, or old French army blanket material, sewn, not glued, to a strip of card or wood which is then attached to the inside of the jack cover (I use small screws at each end, and at each side twice down the length). It is quite obvious that this cannot be done until after regulation is complete, since only then are the jacks at their correct and final height. In fact the jacks are best made a bit too long at the top, so that they can all be cut exactly to length after regulation. 4' jacks are often found to be lower than 8' jacks; then one is forced to do athletic things with battens and felt inside the cover.

Now the instrument must be played and tuned. It may sound perfect to your ears, but it's more likely that the odd note sticks out, or is too soft. (A soft note can be made louder by carefully pushing the plectrum through from the back of the tongue and cutting it off to the correct length again.) It will take a little time and a lot of playing to make it perfect. The string band may settle down in the first month if it's a new instrument, and you may have to re-adjust the heights of the jacks. If this happens, wait for the settling process to complete itself, then regulate the whole instrument again as methodically as the first time, and recheck the damping.

If the plectra are quill, when they are finally voiced they can be oiled sparingly with olive oil, applied with a cotton swab, being careful not to oil the dampers in the process. This makes them last longer, but they will become a lot harder quite quickly, and a second voicing is necessary. I don't do it this way now. Quill should last two years or more, depending on how much the instrument is used; but the odd quill will split vertically, or de-laminate horizontally: the owner really should learn to fit new quills and be prepared to do it at short notice. I have known quill to be still good after

five years and working for far longer, but it's more usual that the instrument needs to be checked at six-month intervals if it's played a lot.

Delrin seems to work-harden (there is some disagreement about this: maybe UV light hardens it). Usually the instrument needs voicing down a little every year in parts of the compass as it gets louder with age and gives a harder sound. A well-played instrument will need new plectra after about four years; the signal for a new set is when one or two plectra break off at the root, near the tongue. The rest won't be far behind. I've known Delrin still working after ten years. The sound will become hard enough to merit new plectra long before the material actually breaks.

Maintenance

There are some other matters which need to be explained; new harpsichords undergo changes as they get used to the tensions placed upon the structure by the strings; wood moves; and sometimes things stop working as they should. The commonest problems are hanging jacks, sticking keys and binding registers. The first two years are when most of the changes happen, but a radical change in the environment will have an effect on an older instrument. If you and your harpsichord live in a damp cold Scottish castle and you move to Texas, both you and your harpsichord will have problems (and the other way round, naturally). So here are some tips.

Registers Binding

If you cannot move the jackslides using the levers, or if doing so seems too difficult, the registers could be binding. It is possible that a large change in the weather is the cause.

If the registers are covered with leather, the edges of the leather probably protrude a little beyond the edge of the register sides. The most usual reason for registers binding is if there's very little free play and humidity increases, causing the wood or more likely the leather to swell. So the first thing to do is --DON'T PANIC-- and wait; check the relative humidity level. Are you running a humidifier? if so you probably should not; humidifiers are really to combat the drying effect of winter heating. Some people find that they have to run dehumidifiers in summer. The problem can often go away when the weather changes. A small hygrometer is very useful; cheap hair types are slow but they react in much the same way as wood, so don't go and

buy a museum quality device. I like the ones that have a maximum and minimum temperature read-out as well as relative humidity; you can have endless fun with them in the kitchen.

However, binding registers are an example of the things that can and do happen in the first two years of an infant harpsichord's life. It can be corrected by removing all jacks, and the levers; then opening the spine window and easing out the registers, which can then be planed a little thinner before being replaced. It's not difficult but is best done by a harpsichord technician or maker. It is possible but unlikely that the gap has closed a little, in which case this bit of surgery is the only solution. You could check this by seeing if there is more free play at the ends of the registers than in the middle; you may need to remove the levers to check this as they will otherwise prevent movement across the gap.

Notes Sticking

The most common cause of a sticking note (if your instrument has leather-covered registers) is restriction at the upper register, which could be caused by muck of some sort (this is cured immediately the jack is removed and replaced) or by swelling of jack body or more frequently the leather. It is also possible that the pin through the tongue somehow protrudes from the side of the jack and fouls the register; this is easily corrected -- simply push the pin back in. If this happens repeatedly, squeeze the end that sticks out with pliers to squash it a little, then push it back.

Play the note, let the key return, watch the jack; lift the jack by hand and let it return; if the restriction is at the register it is then apparent. Lift the jack out and rub its surfaces on a hard smooth piece of wood to burnish it - a real wooden pencil will do if it's not painted or varnished; I use the handle of a scalpel, which is very straight and smooth. Return the jack; if it is still sticky you can move it up and down rubbing it sideways to press on the leather, not too hard. Usually this works. The spinet I restored in Sulgrave Manor is kept at 90% humidity or so the curator says, no heating and doors open all year for countless visiting parties, and each time I prepare it, I have to burnish all the jacks or they all stick.

If it seems to be the key itself, that's a different problem. Is it an upper or lower key?; my guess is that it's a lower manual key. What happens is that stresses in the wood release themselves over the first year or two of an instrument's life, and as atmospheric

conditions change. Lots of makers use the softer and lighter American basswood for keys to avoid the problem almost completely (Ruckers used poplar after all which is lighter still), but lime although tough is not quite so reliable, and we suffer the consequences - or you do! Sometimes the release of stress in a key results in the key bending up or down, as is intended; this is easily corrected after a year or two by levelling the keys with paper washers under the balance rail. But sometimes keys twist or bend sideways, causing binding at the far end where its position is controlled (either by a pin or blade set into the end of the key running in a slot in the rack, or by a steel pin driven into the key frame running in a slot in the key end).

Take all the jacks out and to remove both keyboards together. Locate the offending key and see exactly what is binding. It is sometimes possible to press the rear guide pin slightly to one side to release the friction; this can move the front of the key in such a way that it rubs on the next one, so it may not be a solution; in any case the pin should be bent gently from the bottom, and not with pliers which could mark the pin and make matters worse, but with a rod of metal with a hole a little larger than the pin diameter. Releasing the pin momentarily this way really tells you the extent, direction and "cure-ability" of the problem - it makes you feel better!

If you remove the key and examine the surfaces within the mortise where the guide pin runs you will see dark marks made by the pin rubbing. They will almost certainly be at the top on one side and at the bottom on the other side of the mortise. Since it does not matter if the mortise is wider at the top and bottom surface of the key than it is at the centre, you can remove these marks gently with a fine file. A nail file or board will do very well, just a little at a time. If you make the whole mortise wider the key will of course be able to move sideways as well as up and down, something we try to limit as much as possible. You can rub a *very soft* pencil lead (one of those graphite pencils artists use) on the inside of the mortise too, this reduces friction and noise. I don't do this on brand-new instruments because then the tell-tale marks I've just told you to remove wouldn't be there to see!

While you have the keyboards out, you should examine every key in the same way since stiffness in key movement is much easier to detect without the weight of the jacks returning the key, and you will find a few more instances of barely detectable stiffness. Correct them all and blow or gently vacuum out any bits of fluff etc. you may find on keyboards and inside the keywell. Then refit the lot, and

award yourself a nice drink to celebrate your successful completion of a first service.

Non-Repeating Notes

There are a lot of independent causes of this problem, and you must determine the specific cause before doing anything.

Play the offending note, watching the plectrum. Stop the vibration of the string with the finger then let the key return while watching the jack and see that the tongue returns past the string. If it doesn't, pressing the jack down with the finger may do it. If this is the case the jack may need to be shortened using the adjusting screw at the bottom. This usually means that the string band is now lower than it was, and you should expect a few adjacent notes to require the same attention possibly on all three rows. Then you would possibly have to manipulate the dampers too, since they may be pressing too hard against the string (play the note, release the key, then with the finger move the string gently and horizontally away from the damper; if the jack drops appreciably

you need to trim or move the felt until the damping works but the jack returns to the key).

If the plectrum hangs on the string, either

- (a) the tongue has settled forward in the jack and the plectrum is now too long (the note is often a bit loud too) or
- (b) there is roughness under the end of the plectrum or
- (c) something is physically preventing the tongue from returning, or
- (d) the spring is too weak or missing.

If (a), the cure is to cut the extreme tip of the plectrum with a No. 11 scalpel blade still at 45°; great care, it is easy to cut too much

If (b), same cure but don't reduce the length of the plectrum, use the blade almost parallel to the underside of the plectrum

If (c), move the tongue manually (I use the tip of the scalpel) and if there is anything preventing movement you should be able to correct it.