Voicing Sideways

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Keith comes from Michigan's Upper Peninsula. This week he tuned a 9-foot grand for George Winston and a U-2 in a high school. He has a piano rebuilding shop and hopes one day to rebuild a piano. In the Midwest his dad taught a class on pianos.

Keith showed pictures of the various tuning hammers that he has used and still uses. From tuning as many pianos as he has, he has broken a couple tuning levers. Most of his tuning hammers have shaped wooden handles.

We develop targeted voicing skills to enhance our prestige, pay, and job satisfaction. After Keith voiced one customer's grand piano and the customer ran arpeggio's up from the bottom to the top, the reserved customer's comment was, "Oh!" That word alone was Keith's payment for his work: the customer was pleasantly surprised. It's the delight, reward and joy to contribute to the betterment of music.

Why is voicing needed? Something is not right: the sound is out of balance. Even though the piano is perfectly in tune, it still doesn't sound right. Tuning is one dimension that we listen to and we can focus on; when the piano is in tune, we like it. However, the customer doesn't hear the distinctions we listen for with tuning, but the customer will notice if a note stands out with a different quality of sound.

How do we know a target sound? It is important to have some kind of image in your head about what is a good tone and what is a bad tone. Read the descriptions in the grocery stores describing different aspects of the flavor and taste experience of wine. Compare these descriptions to the vocabulary that we employ to describe piano sounds and tones. We talk about brassy, strident, glassy, nasal, percussive, mellow, soft, or quiet. Our terminology is much more primitive and limited compared to the wine vocabulary.

We listened to some sound tracks on Roger Gable's amazing sound system. Keith played six different bass-baritone voices singing the same aria from The Magic Flute. Out of the five voices, there were a couple that sounded distinctly more impressive. Two and five had more fundamental, three had more upper partials. Five was more buttery. One had too many high partials, and number Two had too many low partials. The last three voices were richer, number Four had great power that was restrained and used the most change in dynamics and inflection. One voice had a full body sound. Notice which voices have higher partials and which have more fundamentals. Sometimes they use higher partials to cut through the orchestra.

Put the piano in the context of the music that it grew up with. Put Western music in a different context. Eastern music is different because it is based on a different scale. Music is music, and it's all good. Keith played Chinese traditional music from broadly the same era when the piano was invented in Europe. He played the Purple Bamboo melody. Rivers and Streams, Horse Races, Beautiful Evening, Spring Comes to the Hyung River. How would we describe the qualities of this music compared to Western music? The Chinese music was more evocative of nature, more nasal, not much bass, flexible rhythm, panatonic, and more breathy. Logically, this is how the first oriental pianos sounded like when they came over to the U.S. The Chinese piano representative commented that "We need to remember that the piano is a western instrument." The piano has a different heritage where it is most comfortable in a different kind of tonal spectrum. In Oriental music, the fundamentals decay fast, higher fundamentals and nasal sounds obscure the fundamentals.

The original harpsicord had no stroke dynamics. The piano was trying to become something from its inception. It was trying to fit in with the other instruments that were of a higher level of maturity than the piano was. There was a push for the piano to fit into a context. Halls were getting bigger, instruments were getting bigger. Music was coming out of palaces and into concert halls for the masses, so the piano became not just louder, but the character changed as well. Yes, there was other music happening, like touring minstrels with harps that sounded more like Chinese music, but pianos were not brought around to those people.

We listened to Bach's Brandenburg Concerto with a harpsichord that we could hardly hear. The tension in the board helps regulate the attack and the decay. When generating a tone by plucking you get a certain type of coloration that is different from striking the strings.

Next we listened to the same piece played on two different violins by two different performers. Half of our group chose the first, the other half preferred the second player. Words used were: emotional, strained, full, scratchy, smooth, dynamic, overtones, false. We need to be able to discriminate between all the qualities and how we feel.

We listened to two different versions of violin and orchestra playing the second movement of the Tchaikowski violin concerto. Everyone had a preference as to which sounded better. We must cultivate our ability to identify and discriminate between tones and qualities. By developing our tonal palate, we can then discern fine differences in tone and quality. Which could you listen to over and over?

Next we listened to some track comparisons of piano pieces. There was fast decay on one. Glen Gould was playing on the second. The second had a faster decay, for which the pianist was compensating. The first had more sustain, and the tone on #1 was more complex and colorful. Both pianos were well prepared and professionally recorded. Over five years the soundboard will degrade and there is a noticeable difference on how pianos sing out.

Two more piano pieces were played. The first piano had less sustain, and was played more staccato; it had a clean sound and worked well for Bach. It sounded as though the tenor had been voiced up, so it sounded more like a harpsichord. The second piano had more sustain and was mellower, although the recording was a bit muffled. These were the same two pianos as the previous sets of pieces we heard, but the order was switched.

We listened to Ravell's Prelude from Le Tombeau de Couperin. What would we do to improve each piano? For the first, possibly reduce the harshness of the treble; it was brassy, had a lot of surface quality, and felt as if there were grooves in the hammers that were bowing the strings. The second piano was more even and uniform between high treble and low bass.

We listened to the Toccata from the same suite. The first piano sounded as though the hammers were very hard, whereas the second piano hammers sounded noticeably softer. The first piano was bright, the second was muffled. Both pianos were Steinways. There was an imbalance in tone in each. The second had a fat treble. Steinway tends to be voiced with a cutting tone. The second had more color resources and had a rounder tone, but had a twangy bass. Was the first piano in tune? Tuning and voicing come close together, so that enhancement in one department can influence the other. The treble in the first piano seemed a little flat. The first performance was more exciting. What would happen if we put the first pianist on the second piano? The more energetic and engaging performance can sound exciting on either piano. These professional pianists make the best of whichever instrument they are given. The second piano sounded homogenous as if the lid were down; there was less variety in the performance.

We listened to another pair of piano pieces, played by "Bump." This time, first we heard fast jazz. Then we heard the same artist, the same piano, but this time a slow, musical piece.

This piano had great balance. There was more definition, the tone was more focused, and the instrument was versatile. It handled the two totally different styles. How do we define what made this a good piano? We like quality, clarity, definition in the bass, enough attack, and uniformity.

In the next recording, the piano is providing support to a vocalist and a couple other instruments. Pay attention to the piano during this performance. This was not a 9' piano; it was a Steinway L (5'10"). The piano had a mellow tone, and the sound was well defined. It was a good accompaniment instrument. One of the elements we are looking for when we voice a piano is the feeling that there is something there that you like.

The Asian pianos twenty-five years ago fresh from the factory were significantly bright. Now the two have come closer together. It is important for us to be conscious of the tastes of different cultures.

There was a study done a few years ago, wherein they combined aural piano technicians and normal people to determine if piano technician brains were different from normal people. Steinway advocates aural tuning, for development of tonal voicing skills. The kernel of truth is that as we listen to something we get used to certain qualities. Our mental processing power is increased even though our hearing decreases with age. The same process that happens for aural tuning is similar to that of learning tuning. Each skill – tuning and voicing – can be developed. At first we may barely hear it, but over time we pay attention to it. By following certain steps we can develop each skill. Begin by gaining the confidence at least to start. Do a little voicing after each tuning.

We can develop our acuity to hear. The average non-skilled person can hear. For quite a number of years Keith was a Baldwin dealer. He took on dealership when there was no music store in the area, so he ended up being a full-service dealership. Baldwin had many makes of pianos, including the Baldwin Fun Machine. Keith was in a mill town. In town the main industry was paper making, outside of town there was dairy farming and loggers. There was no four-year music school.

Keith and his wife won a prize from Baldwin for a sales contest. To make it fair, the dealers were divided into ten groups. Keith was in Group J, but was the best in that group. At the time there were the lower levels of Howard, spinet and console, then the Acrosonic, and then the Hamilton. Most sales were in the lower range. However, Keith sold mostly the high-quality products. Most companies did not invest much into good spinets. Keith sold mostly Acrosonics to the foundry workers, the paper workers and the dairy farmers. How did he do it? He allowed the natural process to happen by their hearing ability. When people would come in, he would start by demonstrating how a really high quality piano should be, and then he would progressively show them the lower brands. According to the customers' budgets, they could afford the level they could. He would start with a grand piano, and would work his way down to the increasingly lower qualities. As he went down and they heard the comparison to the grand, it was obvious. He would also point out what to feel in the action – "you see, this repeats and this doesn't." People would invariably choose the higher quality once they understood the differences. The point is that people can hear. In other words, voicing is not for the elite: it is for everybody.

Perfection is a goal: it is never an achievement.

How do we explain things? "I want it to bark when I twist its tail" was one customer's request. Why is voicing necessary? Voicing is one big compromise. There are so many factors, we must make a decision which to optimize. There are design limitations, material limitations, material variations, and assembly variations. Because Steinways are hand-made, they vary, so you have to try out each one. Voicing is a process that is never done once. It is interactive. We evaluate results and adapt. It is multi-dimensional, and not just stabbing hammers.
Voicing is an iterative (repetitive) process with several elements:

- Technician skills and ear
- Tools/materials/techniques
- Owner/user needs
- Piano capabilities

There are a lot of other factors that contribute to piano tone, and we need to know them all.

- Use
    - Venue
    - Player
    - Music to be played
- Strings
    - Termination
        - Bad agraffe?
        - Flex string?
        - Loose bridge pins?
    - Level
        - String-leveling hook made from a bass string
        - Wire hook on a wooden dowel
        - Feel the three strings with your finger: un-level strings cause a sound
- Soundboard
    - Stiffness
    - Compliance
    - Age
- Scale
    - Typical scale is 52mm (about 2") for speaking length of top note 88
    - Most pianos start at 88 and lengthen by a multiplier
    - This measurement gives you a clue about the scale of any given piano.
- Regulation
    - Before needling, examine the adjustments
    - Jack escapement
        - For example, if the let-off is early, we lose power and the hammer will not strike as hard
        - Hammers must let off close to the strings.
    - Key/hammer travel
    - Action centers
    - Shank material
    - Glue joints
        - It may be slightly loose even if don't hear the click
    - Loose screws

        - Tighter screws can bring the volume up
    - Bridge
        - Touching plate strut?
        - Unglued from soundboard?
- Hammers
    - The piano hammer is a nonlinear spring (Daniel Russell, 1997 on internet)
    - Hammers are not soft or hard: they need to have bounce like a rubber ball.
    - Spring creates rebound

Keith showed us a hammer "spring," made of a metal loop attached to a wooden tail on a shank. The hammer flexes with pressure, the sides are a pad, and it returns back to its original shape when released. If we think of a hammer as a spring, it determines how we think about it. Nonlinear means that the more we compress, the more resistant the hammer becomes. An additional amount of compression will not correspond to the amount of energy input.

Hammers also work as dampers. Hammers not only spontaneously excite harmonics, but they also block out excess harmonics. This happens partly from its being a spring and partly from the padding. Dwell time and surface area will significantly affect the amount of harmonics created. The first job of the hammer is to excite the energy, and the second part is to damp the excess excited energy. In other words, a hammer is a partial damper.

"Snubbing" is a spring term. Imagine a coiled spring. Push down on a coil spring, maybe 25 lb. for every inch of compression, until the spring is at 50 pounds of compression. Now place a plate on the top of the spring and tighten nuts onto the bolts at this point. You can add 5 pounds, 20 pounds, forty pounds of weight on the plate and it will not move; it won't move until more than fifty pounds of weight are on the plate.

One of the things that causes snubbing in a hammer is the molding itself. The better hammers have more felt between the end of the hammer and the striking point. A Kimball Whitney has hardly any felt between the striking point and the end of the molding. Keith showed us a hammer with the top end cut off by a band saw. The corners from this cut cause snubbing. Hammer shaping is not about rounding off the top: it's about finding the new hammer that is inside, like finding the new Russian doll inside the bigger one.

Keith passed around an unusual hammer. Push your fingernail into the underfelt of a hammer and feel if it is soft and squishy or hard. This Classical West, patented by Peter Clark in CA, made by Isaac, uses a synthetic elastomer for the underfelt. These hammers have a 50% failure rate because the underfelt doesn't cooperate. This hammer is an attempt to eliminate snubbing from the underfelt. Premium quality felt doesn't work with this underfelt, because it is so hard to press. The felt does not want to flex. Put the glue on the felt and leave it in the press for eight hours. With this hammer you won't get the break-up sound where the tone deteriorates after hard playing.

Start shaping hammers on the shoulders to get in to the new hammer that is inside. Using a pneumatic hand-held belt sander, Keith filed one hammer in front of us. He also uses this tool for resetting plate bolts in Steinways, V-bars, and sanding small spaces. The tool is called DinaFile by DinaBraid USA Co. The belts are available from McMaster Car, Woodcrafter, Granger, and Stewart McDonald Luthiers Wholesaler. This is a 3/8 belt.

Snubbing will happen if the felt is not flexible or too flexible. Old hammers are not super heavy, and they are flexible. They get lots of volume. Keith replaced the action in the piano so we could hear the difference between the original hammers and the newly filed hammer. Now

the shaped hammer has flex because the corners aren't holding it on, which creates a fundamental. The corners create a high partial. Any hammer when it strikes the string will have a flat surface at the moment of contact. The strike point contacts first, then the corners come up and contact the string. How they flex determines how high a harmonic ratio will occur. Removing the corners is what makes the difference.

When should hammers be replaced instead of shaped? For a home with a beginning student and a family with a low budget, shape the hammers. We are not removing the striking point: we are removing the corners and coming up to the existing striking point. The wear comes from playing the piano, not from shaping the hammers. Removing felt does not significantly alter the weight of the hammer. To remove hammer weight, removing wood makes a bigger difference. Pianists don't care about a specified down touch-weight. If you change the pianists' out-put for something pleasing, they are happy it sounds better, not because of the certain resistance of the keys. At what point do you make the decision to replace car tires? With new tires, as with new hammers, you notice the difference in performance and handling.

Our craft has a lot of lore and recipes. Follow a recipe and the food will turn out not too bad. However, a knowledgeable cook might add a little more beyond the recipe and make something exquisite. The accumulation of knowledge continually increases our abilities. The more experience we have and the more shared knowledge we glean, the more able we are to make things even finer.

When we needle hammers we must think what we are trying to accomplish. Push down on the strike point of the hammer and the shoulders go out. Does it also widen? Probably not. Based on hammer construction and how hammers work, what would lead us to sticking needles into the felt? Are we simply doing what we were taught from previous generations and are doing simply what they told us?

Keith does laminer's voicing: following the grains of the laminations. There are two ways: (1) in from the sides, or (2) angel-shot needling, which Steinway calls "pinning down the tone." Needle shallow at the top and deeper at 3:00 and 9:00. There is a zone of effectiveness wherein the felt needs to be worked. Instead of penetrating the zone of uselessness, why not go directly to where the most effect occurs: needle from the side. We can get some improvement of tone, needle into the corners of a flattened unfiled hammer.

Keith side-needled two to three pokes all the way through the sides of each hammer, under each of the string lines. Radial needling can destroy the hammer; this technique deconstructs the felt. By side-needling, nothing bad happens to the hammer or to the tone, the results are noticeable, the process is quick, and the felt is not damaged. Needle under the end of the string marks, and in the corners. If that is not enough, go down and in towards the center. Start around 11:00 and 1:00, then possibly go down to 3;00 and 9:00. This is quick and it makes a difference. Voicing is like tuning: it will change because gradually the specs that were created in the felt fibers will compress. If you keep up, it will stay better.

Mass times velocity squared is impact. Velocity is an order of magnitude more than mass is. Energy transfer is related to MxV2 divided by 2 minus V is rebound. A piano hammer that has more rebound is more energy efficient than a hammer with less rebound. This factor ties in with touch weight. If you have a more efficient hammer the touch is different because the hammer doesn't have to be accelerated to a higher velocity. Energy transfer from the finger to the string is influenced by rebound.

Cut a hammer in half by splitting the molding down from the tail. Observe how much the felt opens on its own. Some hammers are extremely rigid in either direction, whereas others open

easily. One piece of felt all the way down provides more total compression. Most underfelt is junk felt, is softer and diminishes the compression. Since we can't directly measure rebound, by studying the cut hammers we can see which hammers might have more resilience. Some hammers are more dynamic, some hammers are more static. Hammer a felt block enough and it will become hard like tile. You're better off getting a hammer in the zone than a hammer that needs 18,000 needle pokes.

The Wapin Procedure deals with the orientation of the bridge pin. Moving the inclination of the bridge pin from slanted to vertical, as a general rule of thumb, will add a virtual foot to the tone. Pull the pins out, plug & re-drill, put in a Wapin, and the tone will improve. Go to www.wapin.com.

We tested some notes on a grand and found a note that decayed quickly. Keith needled in from the side, half-way between the surface and the molding, at 3:00 and 9:00. As he went up he discovered hardness. We are trying to create flexibility so the layers can move. We are un-snubbing the felt. He did six or seven pokes on the string side and the same on the key side, in about an eighth of an inch area. Sustain was increased. If you go too soft, burnish the crown slightly with sand paper.

Think about bass. We started by listening to bass. The problem with most bass is big, loud, and ugly. What we want is less harmonics and more fundamental. We want to eliminate the jangly harmonics that are far out in inharmonicity. Keith pulled the action and needled the bass hammers beneath the string lines and the strike point, about the thickness of the needle below the surface -- less than 1mm. If a note still sounds snub, needle at the 1:00 or 2:00 area to achieve more color. Poking the back side has more effect than needling the front side, if you are in a hurry to make an improvement to the tone. If you feel a hardness, do an extra poke or two. If you don't feel resistance, you're probably in the wrong place.

Keith's voicing tool is designed so that the needle bottoms out in the handle, providing more force and control in the push. Most voicing tools pinch the needle. To fit the needle to his handle, he puts the needle in backwards, measures the desired length, cuts off the needle excess, and then turns the needle around and secures it with the point outwards. He uses a #7 sharp. He gets his needles from Schaff, but sometimes from WalMart. He pulls needles out with vice grips if they break off or get stuck in the felt.

Some pianos won't get softer. The hammers don't respond. The felt seems dead. Filing and needling don't seem to make any difference. Keith found a Japanese piano and a Yamaha A1 to be unworkable.

If the hammers are too soft or quiet, like the top five on a new set of hammers, they will need to be made brighter. When adding juice, Keith uses granulated plexiglass in acetone. He has used key top and lacquer, but he likes this best. He uses one teaspoon in his 4 oz. container. Plexiglass is a little harder than key top. Lacquer continues getting harder forever; it sinks into the pours and gets harder and harder as it out-gases. Steinway works a lot with lacquer and makes it work, but in general it is too easy to add too much lacquer. Once they get hard it is difficult to get a needle in and out.

If you get a soft hammer, get a 3cc syringe, suck up the plexiglass at 2:00 and squeeze. You can see the color come up to 3:00 and just up to under the striking surface. With lacquer you have to do it all at once because it tends to seal and then you can't add more, so you end up doing too much the first time. With this you can also take a towel, dampen it with the plexiglass and dab it on top of the hammer.

With a spinet Keith uses a different tool: a small finger-held pin holder. Don't listen as you go; do a section at a time. Then go back and work on the ones that stand out. When you do things in sets your body gets accustomed to follow a pattern and you are more efficient and consistent. When you get the rhythm, go down the whole section as fast as you can; then go back and touch up the outstanding ones. Poke the needle from the outside to the middle. If that's not enough, move in to the middle a little more. If that's not enough, go deeper. We want a variation in color with a variation in volume. As you play louder it should not get dull: it should remain bright. The farther we move the string, the harder it is to move and the more it fights back. When increasing dynamic range, press the hammer as softly as possible. As we increase dynamic range, the softest we can play takes more effort to play, but it sounds better.

Discount the tonal quality and listen to the attack and the delay. How can we fix a note that is screaming at us? It may be that the soundboard is flat at that point. Keith's voicing technique works on any piano, but it will not substitute for the need of a new soundboard.

Keith works for Isaac Hammers. They sold a set of hammers to an Estonian in Brazil, where the people there knew nothing of voicing. He played a YouTube recording of the first time it was played after the hammers were hung, with no voicing. The tone was in the zone. Keith pre-hangs and sells sets of hammers. These hammers will last twice as long as other makes because they flex instead of crashing. Keith also brought voicing crystals and voicing tools.