# Tuning Unisons

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2/15/2016

This presentation is a condensed version of Yuri's all-day class to be taught at the WestPAC conference. Participation is welcome. The issue is not specifically unisons: it is tuning stability. Space can be added to the sound to make it three-dimensional. As there are people who are color-blind, there are also face-blind people: there are those who cannot recognize faces, including their own. There may also be people who are unison-blind, where the perception of a pure unison is different in every person's brain. The focus today will be on tuning stability. If you can tune one string solidly, duplicate that three times. There are so many ways to do the same thing, but there is always a better way.

**Prepping for a Solid Tuning**

We always shoot or prep for a solid tuning. There are problems beyond our skills, such as structural (soundboards, plates), environmental conditions (temperature, humidity, level floor), parts of the piano (loose tuning pins, pin-block screws, nose bolts, cracked bridges). Deal with these issues before attempting to do a solid tuning.

**Tug-of-War**

There is a tug-of-war in a piano. Primarily our concern is the speaking length of the string, but when elastic forces try to stabilize along the entire length of the string we have two competing sides: the pin and the string. There are many tug-points: the tuning pin, the rest felt, the V-bar, the speaking length, the bridge, and the hitch pin. The main saboteurs are the V-bar and the string felt at the one end, and the two forces on the tuning pin: lean and rotation. Our job is to assure that no one wins: we want to bring everything to a point of balance.

We must know what the resistant forces are doing so we can neutralize them. When we reach the balance point we reach the point of stability. To be successful at producing a stable tuning, there must be no guess work. How do we know what all the forces are doing? The piano should tell us what's going on so there will be no guess-work. To do this we need the right tool, we need pin-reading skill, and good pin-moving skill.

**Tuning Lever Skills**

Prep for a stable tuning, understand the tug of war between the string and the pin, and know how to use a tuning lever. A good way to train a student is to place your hand on top of the student's hand to feel what the student is doing so it can be corrected. The student also places a hand on the instructor's hand.

- *Locking on the pin.* We know that the inside walls of a tuning lever tip are not perfectly fit to the facets of the tuning pin. If they were, we would have trouble removing the hammer from the pin. There is always a little bit of play. In order to fully control the pin and to read what's going on, we need a solid connection between the hammer tip and the tuning pin.
- *Hammer position on the pin.* Yuri recommends tilting the hammer tip so that the points of contact are at the bottom on the pin where the string comes out, and at the top on the back side of the pin: the hammer tip is leaning towards the string. Press down on the hammer handle always, enough to be always in contact with the pin. You should be able to feel that the tuning tip is touching the opposite side of the pin. Yuri has gone through lots of tuning

tips. The tuning tip should sit snugly, not touching the string and not at the top tip of the pin. Set the hammer tip on the pin and let it slide down as far as it will go.

- *Hammer position to the string.* The best position for the hammer is parallel to the string. Locate the hammer as close to this direction as possible. It doesn't matter whether the hammer is slightly left or right.
- *Hand position.* Considering simple mechanics, what we are trying to do is to use leverage. The longer the handle, the more leverage we have and the less we have to work to move the pin. The shorter the handle, the harder we have to work. A long handle that flexes and impairs reading the pin accurately. Also, it is sometimes awkward to work a long handle and to make it fit in some areas. Why hold the hammer handle in the middle? The length is wasted. Hold the hammer handle by the ball on the end.
- *Read the balance point.* Place the tuning hammer onto the pin and lock it on. Then read the pin. Allow our brains to establish the correlation between the pitch of the string as we manipulate the lever. The first movement is to flex the pin simply by pushing the lever down to cause the pitch to go down audibly. Push back and up to allow the brain to establish the pitch with the perceived fulcrum. The pulling force of the torsion and flag-poling of the pin should equal the tension of the V-bar, speaking length and bridge.
- *Adjust the balance point*. By flexing the pin, we know physically where the balance point is; however, our ear tells us the pitch is flat. We turn the pin and then check the balance point again. This time, check torsion and flag poling. By pulling the pin horizontally and vertically at the same time in arc in a climbing plane, we are checking stability.
- *Pin block compression.* The tuning pin is already compressed in the front of the pin-block, so the hole is already elongated in an oblong. Flag-poling does not do any more damage. There are some pin-blocks that are so soft that they feel mushy, and those pianos will not stay in tune.
- *Minimizing string breaking.* A lot of times the string will bond to a friction point and the string will start moving without releasing tension. Each time tension is felt, there will be a click when the bonding is released. Sometimes there will be metal fusion between two different materials. Molecules will blend together. An initial movement of loosening the string will break this bond.
- *Temperature.* Sometimes the balance point will be sharp, due to sudden temperature changes. The longest part of the string changes in dimension more than the short part of the string due to temperature changes. When the forces become unequal, the string will tend to equalize so that the tight section pulls to the looser, but the next section may not have moved. The string tension is out of balance. Instead of moving the pin at all, flex the pin back and forth to bring the string back to the balance point.
- *Impact hammer.* An impact hammer cannot read the pin. However, if the V-bar portion is overstressed even though the speaking length is flat, when we tune it tighter the string could break. We can't feel this tension with an impact hammer.
- *Information from initial reading* .We get information where the balance point is.
    - We reduce the possibility of breaking a string.
    - We can determine how much effort is required to turn the pin. If we change the tension of the lowest unwound part of the scale, there will be a greater pitch change with less amount of turning, which is not so in the higher notes.
    - Reading tells us how much we need to turn the pin.

    - We also learn how tight the pin is so we can determine how much force we need to use to tighten it. First start with big movements, and then go less and less until you are happy with where it ends.
    - If we can move the pin in sub-cent increments, we know we are there.
- *Moving vs. Pushing and Pulling.* In the bar, the bar man can push the glass across the bar and the glass stops in front of the person. What is easier is to grab the glass, move it and set it in front of the person. Instead of pushing or pulling the pin, particularly when using a ball-end hammer, we are moving the pin into place. Hold the handle firmly and act like a robot, moving in very precise movements. In order to do this,
    - start by locking the tip on the pin firmly
    - press the hammer tip down on the pin with a firm contact
    - turn our body into a hydraulic machine and make precise movements
- *Styles.* Some tuners tune in graceful, gentle movements. Yuri prefers jerking movements in the form of firm tugs. Bumping is more like pushing, and this disturbs the position of the pin. We don't push a piano down the hill: we control it by pulling and resisting acceleration. Never take your hand off the handle. Once you get the pin moving, you need to stop it. It's not going to keep moving with inertia. When you're holding your hand on the ball of the hammer handle, act like a machine with precise movements. Know when to stop. It will take force to stop. Prepare muscles in your body to stop precisely where you want; we know this point from our initial reading. We know this in a split second without thinking.
- *Body position*. Yuri stiffens part of his body – his chest and his arm – so that everything is moving as one. Use three points of support: one leg in front, one in back, and the arm resting on the piano. Yuri tunes grand pianos standing. We don't have to flex our muscles or stiffen our bodies. The proper body position reduces fatigue.
- *Back-checks.* When installing back-checks, we know exactly how far to insert the wire into the key stick, and we do it the same every time. Likewise with tuning, with our arm and body stiff, we know where to go and when to stop.
- *Tight pins.* When the tuning pin is too tight, instead of locking the hammer tip onto the pin, we also can apply more tuning hammer forces, which will compensate dipping into the pin block. Push the hammer away from the string while also pushing the handle down. This works on tight pins as well as on light pins that are jumpy.
- *Final reading.* Once you move the pin, there is a final reading.
    - The lighter the tuning hammer is, the better the reading will be.
    - The stiffer the hammer, the more information.
    - Longer handles provide more information
- *Test blows.* Test blows send a shock wave along the string to equalize tension. There is a lot of friction in the bass. Sometimes with new pianos you can hear cracking in the back when tuning the bass because the bridge pins are offset. The diameter of the pin increases the zig-zag and produces enormous friction. It's almost like grabbing the bridge and pulling it. Less friction is better. As we move toward the upper treble, the balance point may drift after the test blow. Don't pound too hard when tuning the top treble.
- *Variety of tuning hammers.* The higher the back tail of the hammer is to the point at the pin, the easier it is to flag pole.
    - Yuri's favorite hammer is Fujam because it is stiff and light weight. It may not look as pretty, but it provides excellent pin readings.
    - Don't get hammers with threaded joints because they always have flex.

    - Reyburn has a carbon fiber shaft, with a wooden handle with a ball on the end.
    - Joe Goss's Mother Goose hammer is a shank with a ball on one end and the tip on the other is solid and simple.
    - Impact hammers don't give pin readings but are good for stiff pins; the test blows determine the tension, instead of flag-poling. All movements are jerks and cannot move gently because they are always impact.
    - The C-Hammer is hard to feel and to flag-pole. You need two hands to move from pin to pin. It is a long handle for better readings.
- *Jumping pins.* For pianos that don't move as you tighten the pin and then suddenly the pitch jumps too sharp, or vice versa, this is a case for determining the reading of the pin first. Bracket the pulls from extreme to fine. The brain learns and knows how far to move the pin.