PIANO TECHNICIANS
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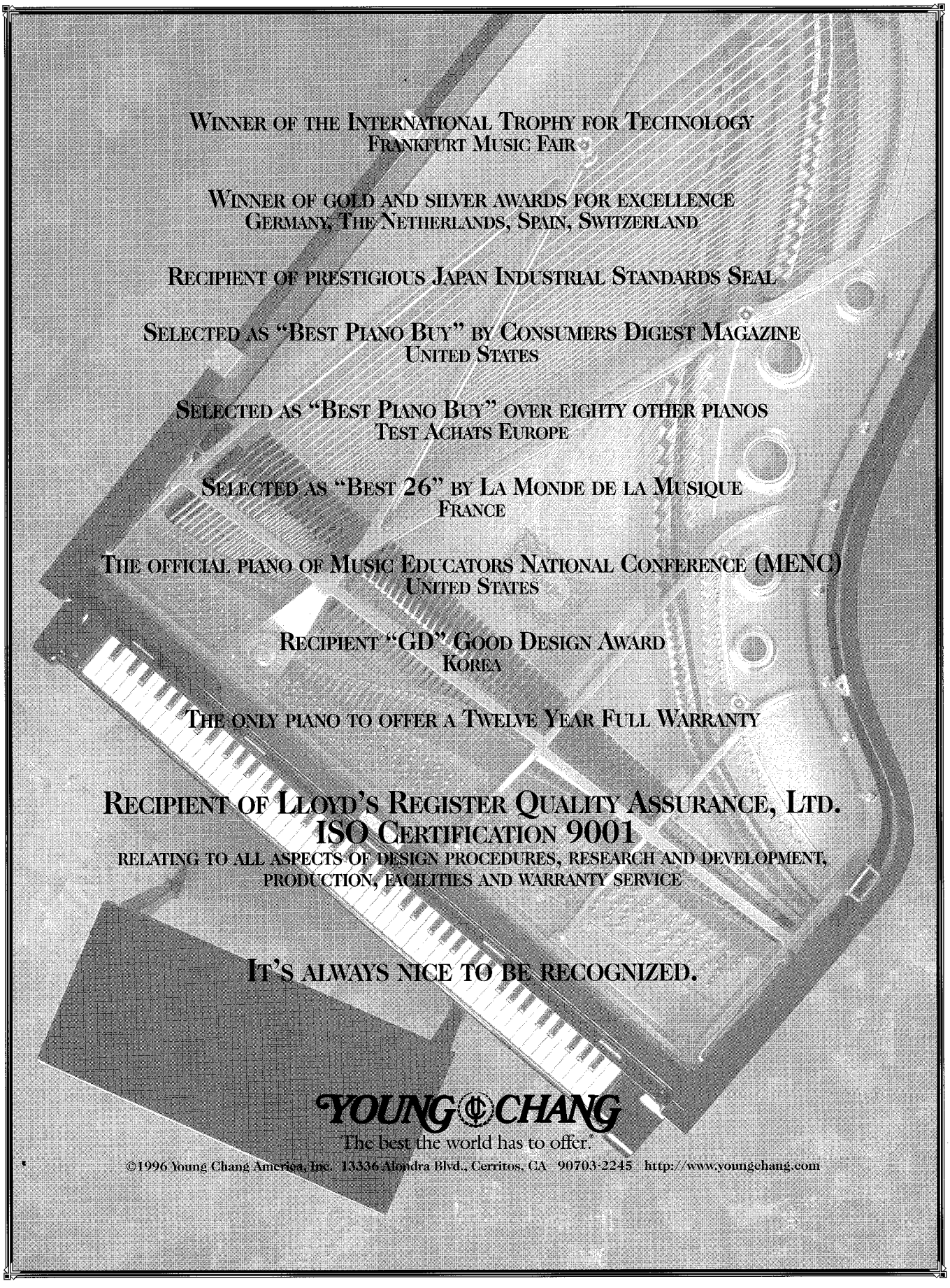

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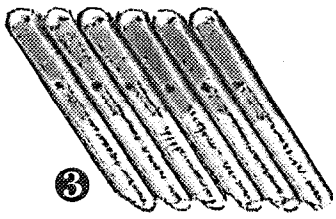

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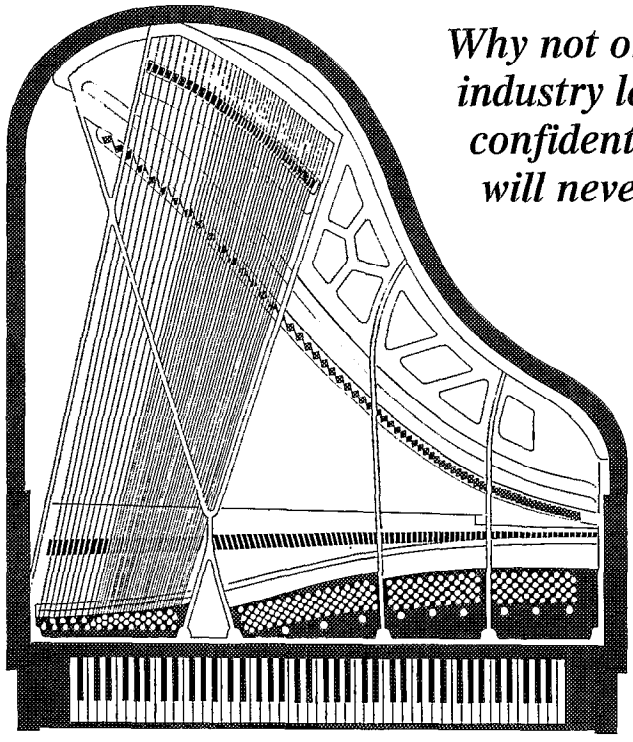

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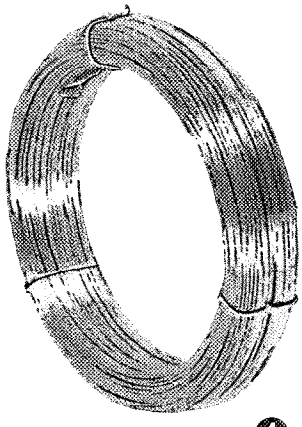

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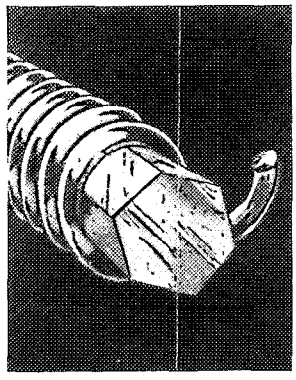

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Editorial Perspective

Tuning: It's What We Do

Steve Brady, RPT
***Journal* Editor**

It's my great pleasure to welcome you to another special "theme" issue of the *Journal*. This time the emphasis is on that most essential of skills, tuning. As much as we might love other aspects of piano work, most of us depend on tuning for the greater part of our livelihood. I've tried in this issue to provide something of practical interest to aurally and electronically oriented tuners alike.

In the aftermath of the Great Chicago Tune-off, some discussion on the Internet listserv "pianotech" centered around the observed phenomenon that a single string of a unison will vibrate at a slightly higher frequency than that emitted by all three strings together. The differences noted were in very small amounts, varying from a tenth of a cent to several hundredths of a cent. At one point, a list member posted a very eloquent plea, which I quote from here:

> *"After reading all those letters about the finest tunings with 10ths and 100ths of cents and much more or less, I began to wonder about the value of all this nit-(cent)picking related to everyday's tuning practice .... I just can't help thinking about one of the Steinway grands at the conservatory I worked on today: I did some regulation and voicing on this instrument; a complete tuning was not really necessary because it had recently been tuned and it sounded good enough, just a few tones here and there. After having done some voicing, I consulted the piano teacher about his personal taste and wishes. He started to play some heavenly music and afterwards gave me further instructions. What struck me at the moment, was that although the instrument had been pounded on already for a couple of days, and it was self-evident the tuning could not be 100 percent, the result of his music making was rich, sweet and quite satisfying. ... I started to ask myself: are we not making too much of all these micro-beats, partials and sounds? If the basic structure of a tuning is healthy and in balance and the instrument is beautiful, what more could you wish for? Rich is rich ..."*

Of course, I have to agree with his point that tuning, important as it is, remains only a part of the total piano experience, both for the listener and the player. I've demonstrated in my convention classes that if the tuning is in reasonable shape, a real live pianist will usually notice something else, like voicing or regulation problems, rather than the few strings which might be out of tune. Piano technicians in general are probably better tuners than they are regulators, voicers, and it is certainly important that technicians learn to evaluate and treat the "whole piano" rather than simply assuming that "tuning" always means "Tuning."

But having said that, it's also critical that we continue to "push the envelope" on improving tuning skills. There will always be room for the theorist, the speculator, and most importantly, the researcher in our field. We still don't know exactly how good a tuning can be, or, for that matter, what constitutes a really great tuning. With that in mind, and towards that knowledge, I invite you to enjoy this special issue.

Please submit tuning and technical articles, queries, tips, etc., to me:
Steve Brady, Journal Editor
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FEATURES

COVER ART

With weapons drawn, Virgil Smith, left, and Jim Coleman Sr. get ready to settle the great debate, aural vs. electronic tuning. *See the results beginning on Page 16.*

COLUMNS & COMMENTS

DEPARTMENTS

IN ADDITION

PIANO TECHNICIANS **Journal**

Volume 40 • Number 1 • January 1997

New Year — New Goals

PTG President
Marshall B. Hawkins, RPT

First of all let me begin by saying I hope all of you experienced a wonderful New Year's celebration. I also hope you began by setting short-term, intermediate and long-range goals for the year. If you began by setting reasonable goals which you can be sure to successfully complete within the immediate future, you're in good shape with the enthusiasm received from the success of those fresh victories and you will no doubt be ready to set newer and higher goals.

Speaking of higher goals ... it was 40 years ago this year that the Piano Technicians Guild began. Allow me to strongly encourage each and every one of our members to revisit the March, 1996 *Journal* Supplement and read once again "Laying The Bearings —Thirty-nine Years of Growth and Change." This I believe to be tremendously important in order to fully assimilate and appreciate the significance of the 40th Anniversary Celebration which will be a part of this year's Convention & Institute.

Not only will the institute offer many, many classes designed for our continued enlightenment, but the area of Orlando, Florida hosts a variety of activities that will thrill and entertain all members of your family and friends as well. As the months proceed you will read more about the Institute and the surrounding activities also, but it is important that you start planning right away.

Now that we are into the new year let your hopes, not your doubts, set your goals. But no matter what the goal, it is absolutely vital that you have an inextinguishable spark within to be converted into a flame of burning desire. If you are like most, it will be necessary to decide upon a plan which will only be complete when you have returned home from the 40th Annual Convention & Institute. I would urge you to avail yourself of as much information as you can get from Orlando concerning the activities there. Although articles will be sure to be in the *Journal* through the months leading up to July I would suggest the "Early Bird Gets the Worm" philosophy for planning purposes. I am led to believe that the earlier you get started planning for Orlando the better off you are going to be.

This is a very special year in many ways. In addition to the great institute planned for our educational benefit, you will be a part of this history-making 40th year celebration. It is always very important to stay in touch with the past because if it were not for the efforts of those who came before us we would not have anything to build on. For many it will be their first opportunity to combine a great vacation with family or friends during the 25th Anniversary of Disney World. There are also many other wonderful activities in the immediate area which really should not be missed. So you see it is very important as you go about planning the work you will take on during the coming months to be very focused as to where you want to be financially at specific points along the way.

In 1987 the attendance goal for our 30th year anniversary celebration at the Toronto Convention was 1200. Would it be unreasonable for all of PTG to focus on exceeding the attendance in Toronto for the 30th year anniversary celebration by collectively working toward an 1197 in attendance in 1997 for our 40th anniversary celebration in Orlando?

The 2nd GPA
Dublin International
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Dublin, Ireland
All Six Prize Winners selected Kawai.

The 42nd ARD International
Music Competition
Munich, Germany
First Prize Winner selected Kawai.

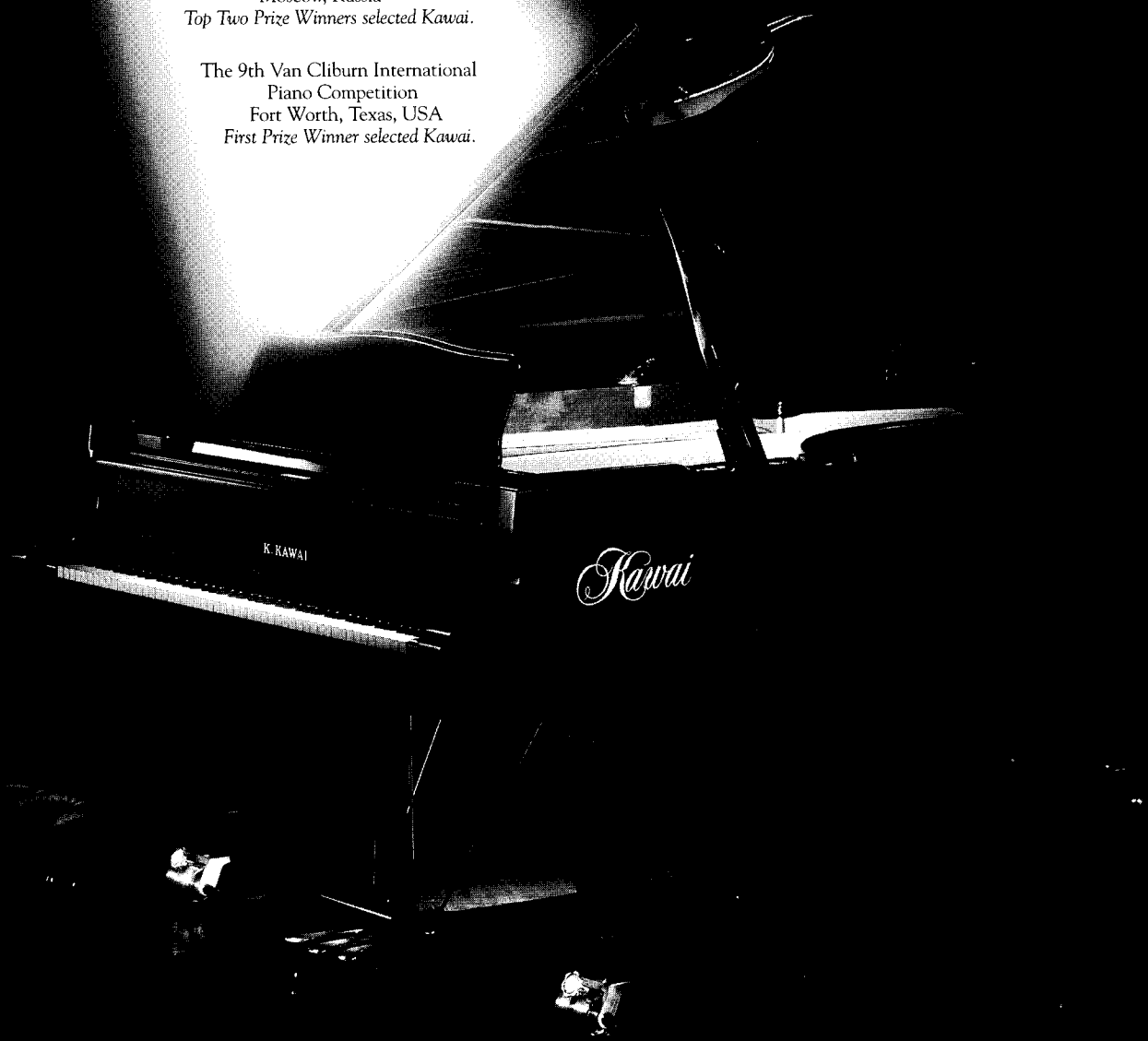
The 45th Ferruccio Busoni
International Piano Competition
Bolzano, Italy
First Prize Winner selected Kawai.

The 11th Santander
International Piano Competition
Santander, Spain
First Prize Winner selected Kawai.

The 2nd Hamamatsu
International Piano Competition
Hamamatsu, Japan
First Prize Winner selected Kawai.

The 10th International
Tchaikovsky Competition
Moscow, Russia
Top Two Prize Winners selected Kawai.

The 9th Van Cliburn International
Piano Competition
Fort Worth, Texas, USA
First Prize Winner selected Kawai.



It's becoming a familiar refrain.

Leakproof Oiler

Here's a great addition to any tool kit. This oiler is guaranteed to be leakproof, and the brass spout has a twisting flow control on the tip. Lubricants, solvents and other chemicals useful in piano service can be applied with great precision and control. Made in England, the oiler can also be used with dry lubricants such as graphite powder. The oiler comes in two configurations, one with a long, bent spout as shown in Figure 1, and the other with a short, straight spout. It's available from Jensen Tools, at 1-800-426-1194. Jensen's web page can be found at http://www.jensentools.com. The catalog numbers are 182-212 (2.5"), and 182-512 (5.5"), and the price is $9.95 for each.

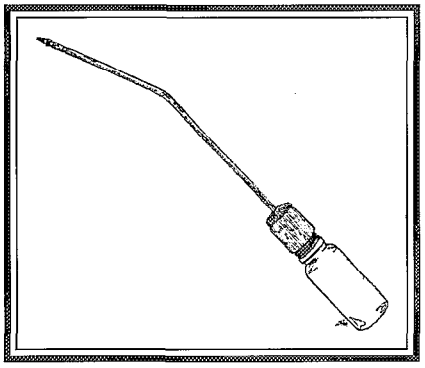


Figure 1 — Leakproof 5.5" oiler from Jensen Tools.

— Susan Willanger, RPT
Seattle Chapter

Mystery Ringing

I was called to service a piano because one note was ringing — F#-4. I played that note and there it was, loud and clear. I immediately put a finger on the associated string; no change! On closer listening I observed that the ringing was an octave higher. Aha! I played the octave higher and it too rang but not nearly so loudly. Curious. (The piano had not yet been tuned.) I damped that string; no change! Even more curious.

I then started damping groups of strings one hand-width at a time while I hammered on the first note that I had played. Finally the ringing stopped when I covered the lowest octave. The ringing was due to a poorly seating damper of D1. The ringing was the twentieth partial of that note, D-1, being excited by the second partial of F#-4. Low bass strings that are not tubby have many strong and high partials. Good bass damping is necessary for a clean sounding middle.

I retuned the bass note a hair. The slightest shift of note stopped the ringing. Bass note high partials have to be quite close to the exciting frequency to sound off. I then readjusted the damper to stop the ringing.

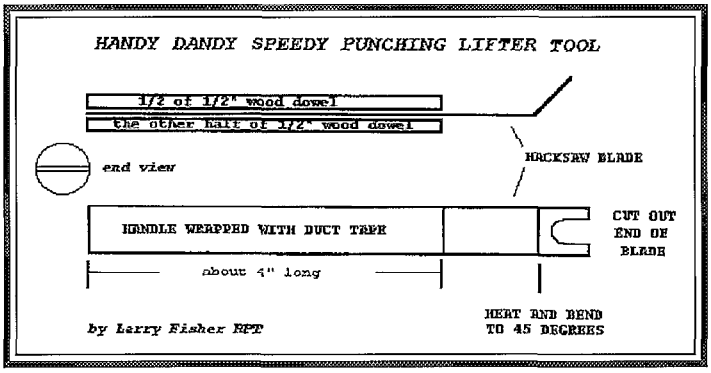
There were also some other steps to this frustrating episode but they are not relevant to my point so they were not included in this story.

— Chris Day
Boston Chapter

Punching Tool

I recently was leveling the keyboard on an old upright piano made about 1933 or so, and found the felt balance-rail punchings had a rubber (?) layer attached to the underside of them. They were in really good shape, considering most of the time these things are moth eaten or mouse eaten.

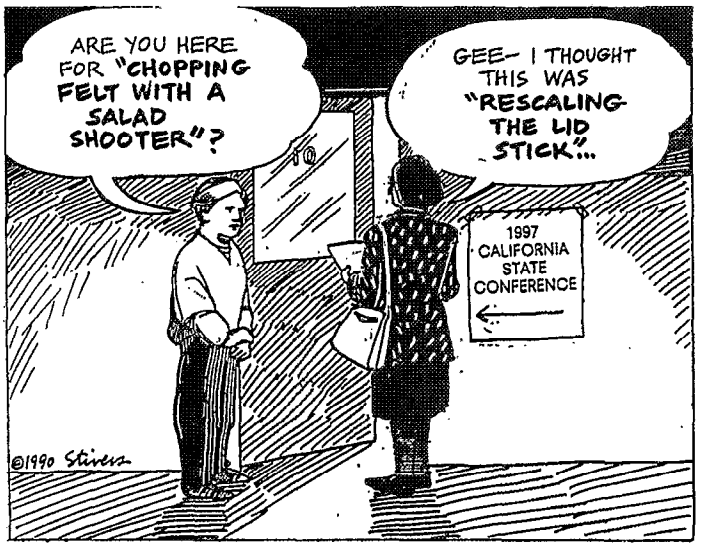
As I started my task of lifting the felt balance-rail punching off to add the proper-sized paper punching under it, I noticed that my usual method of using 8" long tweezers to remover the felt punching wasn't going to perform very well. The rubber layer of the felt punching really held its ground on that balance-rail pin. I found it difficult to get the punching to lift enough to get my tweezers under the little dickens.



I had to come up with a better method because this was indeed going to take too long. I found an old hacksaw blade and my Dremel Moto-Tool, and put a cut-off disk in the Dremel. I first cut out the hole on the end of the blade so now I had a two-pronged fork. I then scored the middle of the blade so I could break it in two at that point. I went to the grinder and ground off the hacksaw teeth and then cut a 4" piece of 1/2" dowel in half lengthwise, so I now had two half rounds, 4" long. These I taped to the blade with duct tape, and heated up the forked end with a small torch so I could bend it about an inch back from the end to a 45-degree angle. One of the tines of the fork broke off during the process, but this actually worked out to my favor. I filed the tip of the remaining tine a bit (as if to sharpen the inside edge and tip) to facilitate the insertion of the tine under each punching. With one tine missing, this makes the tool easier to use, because to get the tine to go under the punching, a stroking or sawing motion is used, causing the punching to spin slightly, and with proper technique the tine slips under the punching and with an upward motion the punching is lifted off the balance-rail pin. I never had to remove the neighboring key to get the tool in and get the job done.

— Larry Fisher, RPT
Portland, OR Chapter

Continued on Page 10



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Letters

An Ethical Analysis

I commend Sid Stone's writing about ethics plus your insight in publishing the same. Also the controversy this raised is interesting. Ethics, like tone quality, is highly subjective, no two people observe the same.

Here's a general question: can one admire another whose ethics are entirely different from one's own? If not, consider tolerance as a part of this ethical question.

I tuned a spinet for a lady who began apologizing as soon as I entered the door, "I didn't intend to buy this piano, but the salesman talked me into it." She paid about double what the spinet was worth (my opinion). I sympathized silently, no comment out loud, but also admired the salesman for skills I do not possess.

I tuned the piano carefully, gathered my tools hurriedly, and left after one comment, "this piano has a surprisingly good tone." Later I thought, "the salesman earns his keep by cultivating social graces, I earn mine by being a bit antisocial." We both may engage in "little white lies" from time to time.

The salesman sells twice under two entirely different circumstances. The first is friendly, the second is defensive when the customer calls to complain about being taken. We have a formidable test for our skills. Probably no salesman could pass our test, but I challenge any technician to pass tests the salesman encounters on a daily basis.

— Ken Churchill, RPT
Orange County Chapter

Tips, Tools & Techniques

Continued from Page 8

TT&T Tuning the m3-M6 Octave

The m3-M6 is one of the commonly used octave tests for notes below the temperament. It is usually referred to in the above manner and, while observing other tuners in action, it is usually played in that order, first the minor third then the major sixth. It seems to be instinctive to play the lower third first, partly because it contains the note of interest.

The low minor third tends to be very muddy. I suspect that many of the higher partials nearly coincide to give unwanted fast beats which just confuse the listener. (I have sorted out a damper problem where a ringing was due to the twentieth partial of D1, so don't assume that partials above #8 cannot be heard just because you don't use them.) In addition, the low minor third includes one note that may not be properly tuned so the beat may not be at the expected speed, even if you are sure where to expect it.

I find it much easier if the major sixth is played first. Both notes have been tuned so that the beats are in the right place. It is a clearer sound so that it is easier to focus on the beat rate and memorize it. Now, when the minor third is played, look for beats at a similar rate. Ignore the other noise. If you have a good memory for beats it may not be necessary to repeat the major sixth while you make adjustments to the octave tuning.

— Chris Day
Boston Chapter

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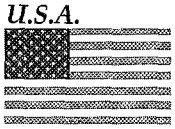

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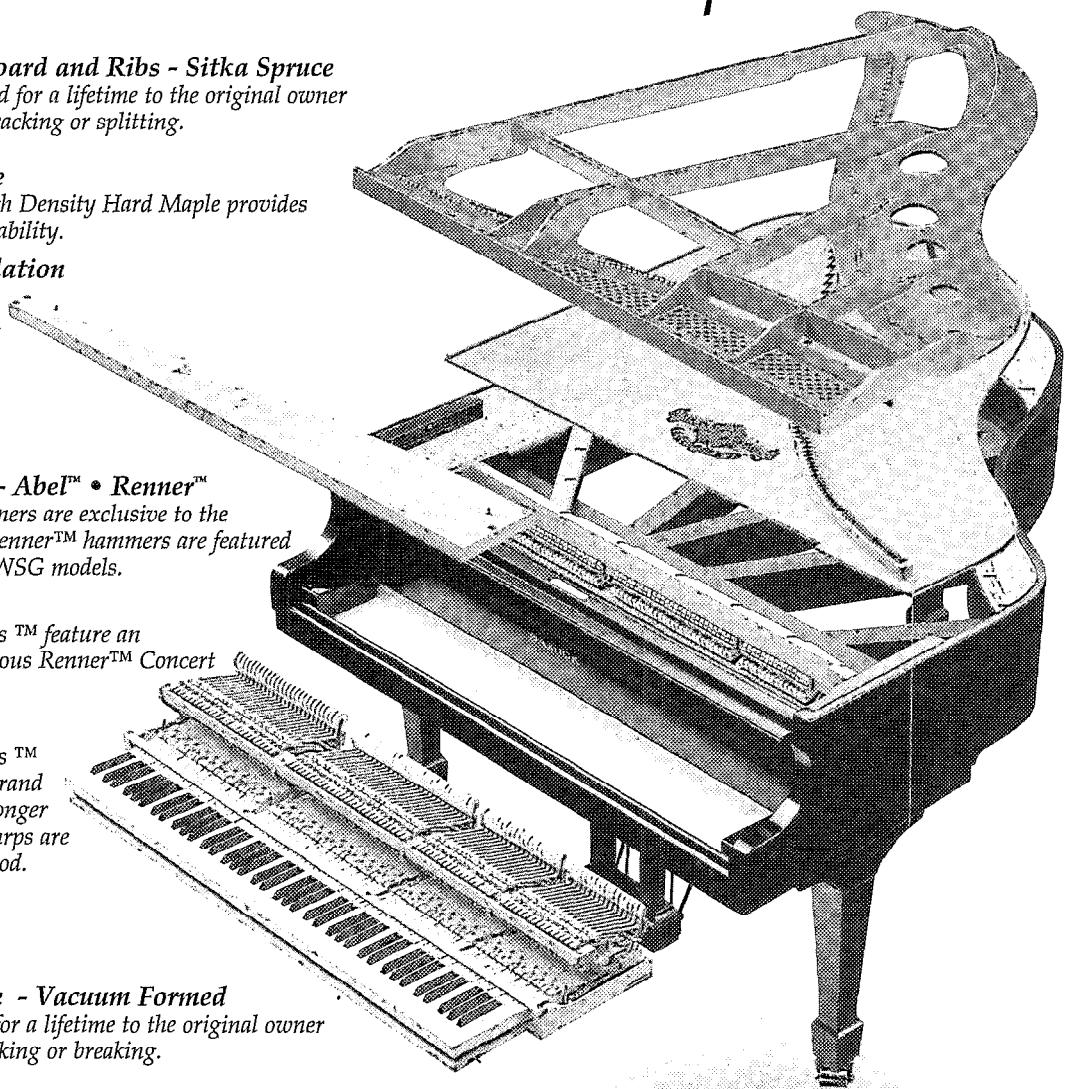

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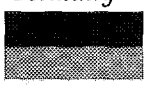

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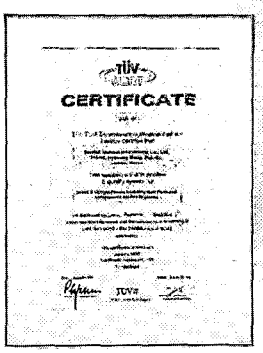

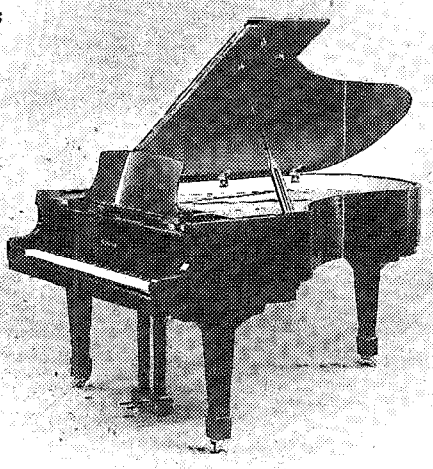

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Q & A

Q: Comegen Termites & Pianos

I am presently serving the instruments from the "Carlos Gomes Foundation," the biggest conservatory in the country (Brazil). Due to the climatic conditions — we're in the middle of the rain forest — problems with termites are a constant here. I have, for many years, been employing 'methyl bromide' quite successfully, but of late, as a side effect, there has appeared an astonishingly severe corrosion on metal parts, especially on the strings.

The core of the matter is I'm calling out for help: what are you people doing to eliminate termites without damaging the instruments? I'd be extremely grateful for any help you could provide me with, including possible e-addresses from other technicians.

I do hope you can, in any way, help me.

—Jose Kalmus

A: Benjamin Treuhaft, Berkeley, CA

I have a project to stock Cuba with old U.S. pianos, and have met a couple of comegen. Oxygen starvation using nitrogen or some other inert gas seems best. The Getty Conservation Institute in LA says their Ageless™ oxygen scavenger would be ineffectual at the volume of a piano. Here is what I know so far.

Comegen Eradication, Cuban Pianos

After reading reports from two Canadian museums and from the Getty Conservation Institute's Shin Maekawa, it seems as though if you hate comegen, oxygen-starvation is the way to go. Shin will be able to tell us which gas method is better, carbon dioxide or nitrogen.

What, by the way, are comegen — those wood-eating Cuban pests — scientifically or otherwise? I think they are what we call carpenter ants. It's important to know the actual name when dealing with researchers, to make sure we're all on the same bug before investing lots of money.

The Canadian museums, before switching to carbon-dioxide, used to use freezer-trucks, which are rented at $35/day in Canada. Articles (mostly clothing) infested with what I think are clothes moths, were left in 20' trucks for seven days. (What would the effect be on comegen? On piano soundboards? Would seven days be enough? Are there such trucks in Cuba, to use while we are setting up gas methods?)

The Nitrogen Method

Make a bag of oxygen-impermeable plastic big enough to contain an upright piano, and another for a grand. The upright bag should be 67" tall (height of tall upright + 7" dolly + a few inches for floor padding), 67" long (to fit a very long upright) and 30" deep. The grand bag, into which a piano on a spider-dolly could be rolled without removing the legs and lyre, should be 50" tall, 67" wide, and 9'6" long (in case of Imperial Grands). The bag is made of Filmpak 1193, manufactured by Ludlow Laminating and Coating Division, Homer, La. 71040, phone: (318) 927-2531, and there are several distributors in the U.S. It costs about $5/square meter. (Please, someone, do the math for the cost of the square footage of Filmpak needed, and for the bag's volume while you're at it.)

The bag is sealed at the edges with a tacking iron with heat control, available from photo equipment stores for about $70. The bag is reusable. (What is the best method for opening and sealing the front door?) A heavy tarpaulin or a cloth-edged platform would protect the floor of the bag from dolly wheels. The bag is hung on a framework of PVC plastic pipe.

Obtain cylinder of nitrogen, liquid or gas (liquid is cheaper—Shin guesses the cost per piano is about $12 — but I am not sure about the effect on the environment in the bag of the coldness of the liquid nitrogen. Shin says you have to guard against icing up of the fittings with liquid). You need eight times the volume of the bag to completely flush the air and fill with nitrogen. Industrial grade high-pressure nitrogen cylinders, 8,600 liters (size T or L) rent in the U.S. for $6 per month and cost about $35 to fill. Liquid nitrogen, 160 liter (99,000 gaseous nitrogen liters) is $60 to fill and $30/month.

Between the bag and the cylinder you set up a gadget to humidify the nitrogen; it's very important not to dry out the piano suddenly. It consists of a jar of water, a dry jar, and a dry jar with an RH sensor, into which the tubes from the cylinder go: one into the water to bubble up wet nitrogen. The flows of each jar are regulated until what comes out of the sensor jar and into the bag is about the same relative humidity as the surrounding air. (I am not sure of the cost of this simple set-up but I think it is under $200.)

The humidified nitrogen is introduced into the bag and the air evacuated from the other side. Into the bag is introduced Ageless Eyes™, a Mitsubishi product, very cheap (Shin thinks Mitsubishi would donate it if asked; apparently it has a short shelf-life and should not be ordered in huge quantity), which is some kind of chemical indicator that lets you know if the oxygen level goes above the critical .1 percent level.

The tube-hole and evacuation hole in the bag are sealed and the piano sits for three to six days. (Exact time seems possible to ascertain from Shin once we know the real name of the comegen.)

The comegen become tremendously and permanently dead, and the piano is checked again every few years.

The Carbon Dioxide Method

Same bag (but does it have to be quite so impermeable?). Instead of 99 percent evacuation, oxygen only has to be 80 percent gone. (Should be cheaper, therefore.) Same PVC frame.

Carbon dioxide cylinders cost about the same as nitrogen, but I would guess you need much less per piano because of the less stringent evacuation requirements. Piano has to be left in 3 weeks. Humidity is not so crucial, according to the Canadians.

All this considered, if the Cubans can get nitrogen, it seems to be safe, cheap enough, quick, and more thorough than the carbon dioxide method. If they cannot, a nitrogen

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generator costs $20,000, and may be worth it.

The nitrogen set-up is portable, assuming the framework comes apart and sets up easily. There is some question about the portability of the carbon dioxide set-up.

I think the investment would be (now it would help if I had math skills) $150 per bag, plus $75 per plastic framework, plus $350 for the jars and fittings and miscellaneous unforeseen stuff, so a five-bag project would cost about $1,500. If it costs another $15 per piano in nitrogen, the total cost per piano would be $30 if you did 100 instruments. Less if you did more.

Q: Grinders/Sharpeners

I'm interested in getting feedback from owners and users of the water-type grinder/sharpeners. Grizzly, Makita, Delta, and Tormek make them, among others. I'm particularly interested if anyone has purchased the Tormek 2004 and what their experience has been. I want something fast, easy, reliable and suited for a variety of sharpening requirements. My primary need is to sharpen chisels and I believe the rounded bevel acquired from a vertical wheel is superior to the flat bevel from a conventional flat stone. The speeds of most shop grinders are too fast and always put the metal temper at risk. I'm tired of fooling with them. Any thoughts about this subject of sharpening?

— Clark Foerster RPT
Santa Barbara, CA Chapter

A: Ed Bordeleau, RPT

I bought a Tormek motorized water stone last year after looking at a lot of different machines and getting tired of always reaching for a chisel and finding a dull or nicked edge (seems the boys in the shop wouldn't sharpen it if they could just reach into the drawer and find another sharp one — at the end of the week I had a drawer full of dull chisels — and plane blades, and knives ...). The Tormek is simple to set up, works fast, and produces a good edge — a real no-brainer to use. Because of the hollow grind, you can touch up the edge several times on a flat (Japanese style) water stone before putting it back on the wheel. And now my workers sharpen their own chisels instead of leaving me to do it!

A: Newton Hunt, RPT

I have a motorized water stone but use it little now. There is a student who is making an African marimba and has asked many questions which I answered freely. He also is replacing the key covers on his Winter spinet because the old ones are coming off. I got him a set of keytops and new plastic elbows and showed him how they work. His comment is that everything went as I explained, it was easy because of my explanations and he is delighted with his work. He also sharpens anything.

He always asks me if I want anything sharpened; chisels, scissors, scrapers, plane irons, knives, etc. I haven't had to sharpen anything for about two years.

I purchased a flat diamond sharpening plate and use that to get the basic job done and then use several grades of sharpening stones to get to the final scalpel-honing stone. I learned how to do nice chisel sharpening from Joel and Priscilla Rappaport several years ago.

Using a grinding stone to cut a concave bevel is to make further sharpening easier. It contributes nothing to its usefulness.

For a beginner I would recommend using the Veritus sharpening tools, the anglesetter and the wide roller tool holder. This is simple, quick, accurate, cost-effective and a very nicely fabricated set of tools.

Having *sharp* tools makes using them a joy.

One additional note about hollow grinding. If you take a piece of sponge and hot glue it to the back of a chisel and then keep it wet it will absorb heat well and help prevent detempering the metal.

Q: Whacky Hammers

What causes a section of grand hammers to bounce around when you strike a note hard? I thought it would be the studs setting, so I adjusted them but nothing happened.

— Ben Treuhaft

A: Pat Poulson, RPT

It sounds to me like glide bolts up too high, or possibly loose frame screws or action brackets.

A: Jim Coleman, Sr., RPT

Sometimes when the back rail is not bedded, the hammers will dance when one key is played firmly. To check the bedding of the backrail, insert a long screwdriver between the strings until the tip contacts the backrail, bump the handle of the screwdriver with your hand, listening for a knock. A knocking sound indicates a poorly bedded backrail.

A: Bob Davis, RPT

Assuming the action to be bedded front, center and back, and that the stackscrews are tight, one possibility is flexing of the hammer rail. There's quite a bit of torque on it as the inertia of the hammer and shank resist the upward motion of the jack, particularly with heavy hammers, and some rails are more limber than others.

The Great Chicago Tune-off

By Steve Brady, RPT
Journal Editor

Over its nearly 200-year history, Chicago has acquired a reputation for excitement. Not only is it Sinatra's kind of town, it's home to a first-rate symphony orchestra, a world-class art museum, and, of course, "Da Bulls." Since the great fire of 1875, Chicago's ascendance from cow-town to cosmopolitan behemoth has never been more in evidence than at the Great Chicago Tune-off.

Two Kawai KX-5 grand pianos await the Tune-off.

An air of anticipation filled the upper room at Kurt Saphir's piano store in suburban Wilmette, Ill., on Oct. 15. For many, it was the realization of an old dream: to compare electronic and aural tunings on an equal footing. The participants (or should I say gladiators?) were both acknowledged masters of the tuning craft. In the electronic corner stood Jim Coleman Sr., recent recipient of the Golden Hammer award and long known as a concert tuner, piano designer and teacher of piano technology. His aural counterpart, Virgil Smith, weighed in with a reputation as an expert tuner and concert technician, one who continues to fly across the country to service pianos for die-hard customers, and who, like Jim, volunteers freely to educate fellow technicians. All those in attendance as observers also functioned as the judges for the event. These attendees were mainly technicians, but some pianists were present as well.

The tuning competition was designed to be a double-blind preference test, meaning that neither the listeners nor the administrators of the study would know which piano had been tuned by which tuner. In addition, to account for the possibility of preferences being linked to one piano or the other (rather than to one tuner or the other), the format included having the tuners switch pianos for a second round of tuning and listening.

Going into the contest, each of the tuners predicted a tuning preference, one way or the other, of no more than 60 percent to 40 percent. Virgil Smith said, "My main goal is to establish as legitimate a tuning process which doesn't use partials, but listens to the whole sound of each note. Also, I want to relate machine tuning with aural tuning, exploring the relationships and benefits of each approach. I don't expect to see a big preference either way, because, frankly, Jim and I tend to favor about the same amount of octave stretch." Jim Coleman said his main purpose in participating was "to show that an experienced tuner can produce, relying almost completely on an electronic tuning device, a tuning at least the equal of an aural tuning produced by a skilled aural tuner. I'd be very surprised if the preference leans either way by more than a few percentage points."

The stated goals and expectations, then, revolved around establishing legitimacy for a somewhat unusual approach to aural tuning (tuning without partials), and for the use of electronic tuning aids *vis a vis* aural tuning. That being the case, one wonders if perhaps both Jim and Virgil might not have been better served by comparing their respective tunings to a more "usual" aural tuning, i.e., one where the tuner *does* claim to use partials in the conventional way. Organizers of future tuning contests might want to consider that approach. (Speaking of future tuning contests, a "rematch" of the Great Chicago Tune-Off is in the works, to be held at the convention in Orlando next July, according to Assistant Institute Director Paul Olsen).

Other questions surrounded this event like mosquitoes buzzing around a campfire. Does Virgil *really* tune without using partials? Is there a beat in a fourth, fifth, or any other

Virgil Smith, left, tunes for the Tune-off.

Jim Coleman Sr., above, demonstrates the Reyburn CyberTuner and the Sanderson Accu-Tuner during a break between sessions.

interval which is slightly slower than the slowest beat predicted by a coincidence of partials? If there is, is *that* beat produced by all the partials sounding simultaneously? Is it possible, as Virgil claims, to tune beatless single, double, and triple octaves all at the same time? And finally, does one string of a unison, sounding alone, produce a higher frequency than all three strings sounding together, as Virgil has claimed? Many in the room hoped that these questions would be answered once and for all.

The day before the event Jim and Virgil arrived at the store to meet their pianos, a pair of new 6'6" Kawai KX-5 grands. They tuned them and prepared the regulation and voicing to make the two pianos as exactly alike as possible. On the morning of the event, each tuner tuned one piano for the first preference test, to be held at 1:00 p.m.

As listeners entered the room, they were given a "score sheet" on which to record their preferences. The two pianos were arranged in the front of the room with keyboards facing the audience, and angled in towards the middle of the front row. To begin the testing, a pianist played the same classical selection first on the left piano, then on the right. Another pianist then played a pair of jazz standards, beginning with the first piece on the right piano and following on the left, then playing the second piece left piano first, right piano second. This continued until some seven pieces had been played by five pianists. The listeners, meanwhile, were to record their tuning preferences for each piece. 35 listeners returned score sheets for tallying.

"Most of all, the Tune-off was inspirational. To see two veterans continuing to "push the envelope" in the quest for knowledge gives all of us reason to do the same. It was a celebration of the art and science of tuning. It was a great step in the direction of helping us to understand what makes a tuning good."

Immediately following the preference test, all listeners were invited to stay and observe the retunings. Virgil went through the second tuning (on the piano Jim had tuned in the morning) in front of a very quiet and attentive audience, explaining what he was listening to and why. He tuned strictly by ear, demonstrating at one point a beat (on a perfect fourth) he terms "slightly slower" than the slowest beat produced by coincident partials. After Virgil's tuning, Jim worked over Virgil's morning piano using a Reyburn CyberTuner/Mac Powerbook plus a Sanderson Accu-Tuner. He tuned unisons as he went, proceeding down through the tenor first, then from the treble break to the top, then down through the bass. A shameless show-off, he stopped once or twice to demonstrate a beautiful progression of 10ths or 17ths, quipping, "and I got these for free!"

Following the afternoon tunings, we all went out for dinner. We then returned for the second preference test, which was held in conjunction with a chapter meeting. The second test was longer, with 11 pieces or fragments being played, and was attended by a larger audience. 48 score sheets were returned at the evening session.

The Final Score

After the score sheets were all tallied, the voting favored Jim Coleman's tuning by about a 10 percent margin. It was interesting to note that the results were very similar in both the afternoon and the evening testing, which means that the voting followed the tuner and not the piano. The actual raw vote totals were as follows:

Afternoon Session:		
Left (Coleman):	84	43%
Right (Smith):	70	36%
Undecided:	42	21%
Total Votes Cast:	*196*	
Evening Session:		
Left (Smith):	168	36%
Right (Coleman):	222	47%
Undecided:	78	17%
Total Votes Cast:	*468*	
Combined Vote:		
Coleman:	306	46%
Smith:	238	36%
Undecided:	120	18%
Total Votes Cast:	*664*	

Not all the listeners understood that they were to cast one vote for each selection played; some of them cast one vote per performer instead. That's why the numbers of votes cast don't equal the number of participants times the number of selections played.

What it Was Not

The Tune-Off was not a scientific test as we had hoped it would be. Although advertised as "double-blind," it was not. Because the two pianos had different finishes (one high polish and one satin ebony), it was impossible to keep the identity of the tuner a secret from the tuners themselves or from anyone else who happened to observe the tuning process, as many people did before the second round.

"As a listener and voter, I found myself switching my preference depending on the repertoire being played. I wasn't alone in this. As one participant wrote: 'Both tunings gave me goose bumps during the playing of different passages.'"

Score sheets were filled out haphazardly by many

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The Great Chicago Tune-off

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participants, possibly indicating that not enough emphasis was given to instructions prior to the preference testing. Although the instructions on the sheet stated quite plainly that a preference ("Left," Right," or "Undecided") should be marked after each musical selection, many people marked less frequently, thus making rigorous analysis of the voting difficult.

Both pianos were new and, therefore, relatively unstable. This caused unisons to drift for both tuners, and the unisons were, I'm sure, a factor in the voting. Although we were trying to listen for octave and temperament tuning, it was difficult to ignore a loose unison when everything else sounded so similar. Likewise, the voicing and innate character of the two instruments intruded to some extent in judging the tuning. For these reasons, having the tuners switch pianos between rounds was a wise move indeed.

Responses were also probably skewed by the seating position of each listener in the room. A listening test of three concert grands on a stage in Seattle last year demonstrated dramatically that listeners sitting in the middle of the hall tended to react, in their perceptions of tone and power, exactly opposite those sitting on the sides.

One final deterrent to getting a really scientific response to the tunings was the length of many of the musical selections. As Jim Coleman pointed out, it works much better when a brief passage of only a few bars is played first on one piano, then the other, and then possibly the same passage played on both pianos again. What we had instead was mostly complete compositions, which gave the ear time enough to adjust to the piano and forget what was distinctive about the tuning.

What it Was

Most of all, the Tune-off was inspirational. To see two veterans continuing to "push the envelope" in the quest for knowledge gives all of us reason to do the same. It was a celebration of the art and science of tuning. It was a great step in the direction of helping us to understand what makes a tuning good.

The preference testing demonstrated, despite lacking airtight scientific rigor, a small but consistent preference for the electronically-aided tuning of Jim Coleman. This preference even survived a switch in pianos and a partial change in audience. However, it should be noted, that the "undecided" vote in each round was more than large enough to close the gap between the two tunings. One could say that in the combined voting, for instance, 54 percent of the votes were either pro-Smith or neutral.

As a listener and voter, I found myself switching my preference depending on the repertoire being played. I wasn't alone in this. As one participant wrote: "Both tunings gave me goose bumps during the playing of different passages."

What Does it Prove?

The most salient conclusion this writer draws from the Tune-off is that electronic tuning, when done by a capable tuner, can indeed hold its own before a very critical audience of listeners. Most of us who use the machines already knew that.

The Tune-off also established, perhaps unintentionally, that tunings which satisfy, nay, *please* the ear can have much sharper trebles than many of us might have imagined. Indeed, it may have proven that a top-flight concert tuning *should* have a treble much sharper than one with the minimal stretch specified for the PTG tuning exam. Both Jim and Virgil use a considerable (and very similar) amount of stretch in their treble octaves, and yet there were times while listening (subjectively) to both tunings when I would have liked even slightly more stretch in the mid-treble.

Another unintentional point made by the tune-off was that laser-tight unisons are not necessarily the best for all kinds of repertoire. A respondent called one tuning "too sanitary for this piece," but later preferred the same tuning as "cleaner" for another selection.

And finally, those mosquitoes. Does a single string of a unison, sounding alone, give off a higher pitch than the three strings sounding together? See the article in this issue written jointly by Jim and Virgil. Can one tune single, double, and triple octaves to be pure simultaneously? Perhaps not technically, but *for musical purposes*, it seems possible to come close enough that the difference is academic. Does Virgil really tune without using partials? I have no idea. But I do know this: the tuning Virgil Smith produced was beautiful enough to give you goose bumps, and so was Jim Coleman's.

Aural and Visual Tuning Techniques

By James Coleman, Sr., RPT, and Virgil E. Smith, RPT, & M.Mus.

Virgil:

The electronic tuning device has made a tremendous contribution to the tuning field in recent years. It has enabled beginning tuners to acquire enough skill to do an acceptable tuning in much less time, it has actually shortened the time necessary to do an acceptable tuning, it has reduced the stress factor in tuning, it makes pitch raising much easier, it makes tuning easier when the noise level is a problem, and much more.

Even though the electronic machine is a very versatile and capable instrument, all the experts urge the use of the ear in connection with it for best results. But they never say how the ear should be used. They do not say whether one should listen to matching partials as the machine does, or to the whole sound as the ear hears naturally in tuning. The purpose of this article is to consider the various aural and visual tuning techniques available, classify them, and determine which techniques are best and most appropriate for each tuning situation. I am most grateful that Jim Coleman Sr., who knows so much more than I do about machine tuning techniques, is willing to share that knowledge in this article.

Both the ear and the machine have strengths and weaknesses. The machine can do things the ear cannot do, and the ear can do things the machine cannot do. It is important that we understand these differences so that we can utilize the techniques that compliment the strengths of each approach, and also what techniques can best deal with the weaknesses of each.

One of the important differences between the machine and the ear is that the machine hears in tiny increments, the ear hears naturally the sound as a whole; the machine hears one partial at a time, the ear hears all the partials of a note together as one sound and pitch; the machine hears the fundamental pitch without the influence of partials, the ear hears the fundamental pitch influenced by the partials, and because of inharmonicity the pitch that the ear hears is higher than the pitch the machine reads. Obviously what the ear hears must be the final consideration.

Much research since the 50s concerning partials and their relationships has brought about a whole new concept of tuning, that of matching partials of the same pitch between two different notes. This was a necessary approach for visual tuning, but aural tuners appropriated the technique hoping that it would lead to more accurate aural tuning. In order to tune aurally by matching coincident partials it was necessary to train the ear to hear separate partials, and many did, and were able to do successful aural tuning with the method. For some time this was presented as the only legitimate approach to successful aural tuning, and techniques possible with the ear listening naturally to the one whole sound for each note were completely ignored, in fact many experts claimed they were impossible. However, today many aural tuners, even fine concert tuners, are tuning with the ear listening naturally to the whole sound, and not using partials at all.

The main point of confusion and misunderstanding regarding the two approaches to aural tuning is what the ear is able to hear when listening to two notes sounding together. Many feel that the ear can only hear beats between two notes or two partials sounding close to the same pitch, no more than a few hertz apart. This would mean that any beats heard slow enough to count had to come from matching partials, since the number of beats difference between two different pitches would be so great that the ear could not possibly hear or count them. However, the ear, without being trained to hear separate partials, *is* able to hear beats slow enough to count between two pitches when listening naturally to the whole sound. The ear that hears all the partials of one note sounding together as one pitch hears all the partials of two notes sounding together as one sound, an interval containing two distinct pitches. If the interval is tuned to an exact mathematical ratio the ear will hear no beats when listening to the whole sound, but if it is not tuned to an exact mathematical ratio the ear will hear the number of beats that interval is tuned flat or sharp to its pure form.

It is true then that the ear can hear beats in two different ways: 1) by listening naturally to the two notes sounding together, and 2) between sets of matching partials when the ear has been trained to do so. This can be confusing to beginning tuners attempting to learn to hear beats, for they may have difficulty distinguishing between beats between the two whole sounds and beats between matching partials. The difference is that one set of beats involves two different pitches, and the other involves relatively the same pitch. Some will contend there is no difference — we are hearing the same beat in two different ways, if this is true why train the ear to hear beats between matching partials when the ear can hear the beats by just listening naturally? The fact that they are different beats is easily proved: 1) the lower pitch of the interval could not be involved in the beating if it was a matching partial beating, 2) the beat between the notes of the fourth and fifth is slightly slower than the beat between their matching partials, and 3) the beat in an interval with the unisons tuned will change speed when one of the strings of the unison is raised or lowered, this because the beat involves all the partials, not just one set.

Since it is possible to hear beats aurally in two different ways, it is then possible to have two different approaches to aural tuning: 1) by matching coincident partials as one must do when working with the machine, which I choose to call "visual tuning techniques," and 2) dealing only with beats between whole sounds as the ear hears them naturally, which I choose to call "aural tuning techniques." Tuners should be aware of both approaches, and feel free to use any technique from either that will improve their tuning. It would seem that it would be difficult to equal or improve on machine tuning using the same techniques the machine must use, and that using the whole resources of the ear rather than limiting it to one partial at a time, would have a greater potential for improving on machine tuning, and doing a superior aural tuning. Jim will deal with "visual techniques" for both aural and visual tuning, since he has had such vast experience in both, and I have had none in either technique. I will deal with aural techniques for aural

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tuning.

Aural Tuning with Aural Techniques — A superior aural tuning is possible using only aural tuning techniques. All the beats necessary for aural tuning can be heard by listening to the two notes of the interval as the ear hears them naturally. Even the beats in the tuning checks such as the tenth and seventeenth can be heard by listening to the interval naturally; what we are actually hearing is the number of beats that interval is expanded or contracted from its pure form.

Unison Tuning — The most important phase of tuning is the unison. Without accurate unisons no tuning can be great. The unison must sound beatless to the ear, but there is some question as to whether all three strings tuned to the exact same frequency produces the best sound. In fact research has shown that the best-sounding unisons do not have all three strings tuned to the exact same frequency. The ear is the guide in producing the beatless unison with the best sound.

Temperament Tuning — A completely accurate temperament is essential for a top quality tuning, and is possible by listening to one basic pitch for each note. Beats heard when playing intervals are the number of beats that interval is expanded or contracted from its pure form. Major thirds, major sixths, and minor thirds should gradually increase in speed as they ascend, and fourths and fifths should beat the same speed. The amount the fourth is faster than the fifth with a common top or bottom note should be the same throughout. The properly stretched temperament octave will determine the speed of the beats in the temperament. The temperament is not completely accurate until all the intervals meet the above requirements.

Octave Tuning — The greatest difference between visual and aural tuning techniques is apparent when tuning octaves. Whereas visual techniques involve discovering which set of matching partials makes the best octave, aural techniques are not concerned with matching partials at all, only eliminating the beat between the two notes of the octave. Since only one set of matching partials can be beatless in a tuned octave, it is strictly true that no octave is really beatless. However, it is possible to eliminate the beat that occurs between the two pitches of the octave so that the octave sounds beatless to the ear when listening to it as one whole sound. There is an area around that absolutely beatless point where the octave sounds acceptable with a slight beat or roll, which makes the use of tuning checks necessary to ensure the best octave throughout. My favorite check is the fourth-fifth with a common top note above the temperament, and a common bottom note below the temperament. If the temperament is accurate, the fourth the same amount faster than the fifth throughout will ensure the best octave, and result in a very fine tuning. The octave is too narrow if they are closer to the same speed, and too wide if there is too great a difference. Thirds, tenths, and seventeenths are also excellent checks. They must increase in speed as they ascend, and decrease in speed as they descend, the tenth being faster than the third with a common bottom note, and the seventeenth faster than the tenth with a common bottom note.

Just below the temperament it is a real challenge to have beatless octaves and a consistent slowing of the beat speeds of all the intervals involved. The minor third can be helpful for as low as the beats can be heard. It should beat faster than the major third with a common bottom note, and slower than the major sixth built on its top note. When beats in the minor third can no longer be heard, parallel tenths can take over. At this low in the keyboard the beat of the tenth is so slow that there is little noticeable change in the beat speed as the tenth descends. A slower or faster tenth indicates a need to correct the octave. The same is true with the seventeenth which will take over when the tenth becomes hard to hear, and be the important check until the lowest note of the piano.

In addition to beatless single octaves, a well tuned piano should have all the notes with the same letter name correctly aligned throughout. This means that all the double, triple, and quadruple octaves should be beatless as well when listening to the whole sound of each note. This is only possible when every octave is stretched so that it is still beatless to the ear when listening naturally after the unison is tuned. One octave left even slightly flat will result in all the octaves above that being flat, and not lining up with the rest. The fact that above the temperament one string of a three-string unison gives off a higher pitch than the three strings sounding together, must be compensated for by tuning the single string enough sharp so that the octave is correct when the unison is tuned.

Tuning the notes of the top octave can be a problem. If the octaves below the top octave are tuned correctly there need not be a conflict between the melodic and harmonic demands of the tuning in the upper octaves. If all the lower octaves with the same letter name are properly aligned, there will be a point where that top note seems to pop into place. The pitch will sound correct, yet it will be beatless with the other octaves. A technique I find helpful is to tune the note sharp enough to hear a definite beat in the octave, then lower it until the loud part of the beat sounds continuously. The same brilliant, beatless sound will be heard when the note is played with the other notes below with the same letter name. If all the octaves do not line up, check for slippage and correct it.

If when the unison is tuned it is determined that the octave is slightly flat or sharp, it can be corrected by working with the unison rather than tuning the octave again. Mute out one string of the unison, move one of the remaining sounding strings in the direction necessary to improve the octave, just enough to hear a slight change in the unison. Tune the other sounding string to match and check the octave. Repeat if necessary until the octave is correct, then tune the third string to the other two. This is much easier and more accurate than retuning the octave which may not be as correct as the previous tuning.

One advantage with tuning with aural techniques is that it is so easy to check for errors or changes that can take place during the tuning. Aural tuning checks can reveal any problem instantly. The results outlined above are only possible on a good piano; obviously compromises are necessary when dealing with an inferior instrument.

Jim:

The very first piano recording which I have seen with a credit given to the piano technician bears Virgil Smith's name. This recording was done by Dick Anthony and was titled "Keyboard Musings." Mr. Anthony thanks Virgil for the especially fine tuning done for their recording. I was already impressed with the sound of the

piano before I read the record jacket. This recording was done back in the 60s.

Since then, Virgil and I have had lunch together a number of times at PTG conventions. Often our conversation came around to discussions of tuning techniques. Many things we agreed upon right off the bat. A few things, we agreed to disagree upon agreeably. One of these things is the idea that tuning by partials is a method which came about when electronic tuning came on the scene. I remember reading Dr. William Braid White's book before we were aware of electronic tuning devices. In his later editions, he does describe the Stroboconn and its possible use in piano tuning; but, his earlier illustrations of matching partials as being the source for the beats which we hear is unmistakable. Another thing which I strongly disagreed with Virgil about was his contention that a single string has a sharper sound than its full unison. I began doing serious experiments to disprove this theory. One day I happened to be using the new Reyburn CyberTuner™, which has a very sensitive display, and to my surprise after carefully tuning all three strings of a unison with extreme accuracy, I discovered that Virgil was right and I was wrong. Well ... sometimes. It appears that the greatest difference is in the area of the center of the soundboard. The tenor section does not show this, neither does the high treble. It graduates somewhere between A4 and C6 on the pianos which I have measured.

The ramifications of Virgil's discovery are that we must tune the octaves above the temperament section even a little sharper than we would normally expect to do. My friend Brent Fischer (of Arizona State University) says to push the octave as far as possible (right on the edge) so that it still sounds good. Virgil has developed a technique where after he has tuned an octave along with its unisons, he then sneaks one string up just a fraction of a beat and then retunes the other strings to it. The full octave still sounds good, but if only one string of the unison is compared, say in a tenth or seventeenth test, the single string will definitely show a faster beat than the full unison. I had great difficulty in hearing this at first, especially if the unison was not absolutely perfect, because I could still hear the individual strings of the unison going at the same speed as when only one was sounding. Since we must always tune the first string of an octave unison by itself, the electronics-using tuner can just program in an extra .3 or .4 cents stretch in this area, and then check the octave after the unison is solid. Another method which is more analogous to what the aural tuner does is to allow a slight drift in the sharp direction on the pitch display. Experience will eventually dictate how much drift to allow in each section of the piano. When we rule out any settling of the strings, what causes this change of pitch between a single string and the full unison?

I have thought a lot about this. Having played in a symphony orchestra many years ago, I knew that even if several string players played out of tune, the net aggregate effect was that there was a unified pitch, a blending of all into one pitch. But why does an electronic machine also show a slight difference of pitch when all three strings are going? I was familiar with phase shift and its effect. I was also familiar with the fact that a piano string produces a transient effect where energy and amplitude undulate back and forth between various partials of a tone. At the bridge there is a forced coupling. It may be that the bridge does a little subtracting when one string goes slightly out of phase with the others. And since the bridge and board move more in the center, we see this effect more in that area.

I believe Virgil is right when he says we should listen to the whole sound. The more information we have coming in, the better decisions we will be able to make. This is especially true in the bass section and in the high treble. No matter how carefully we tune a bass octave on a small piano by ear or machine, the lower note will always sound sharp at its root pitch. The explanation for this is that every contiguous pair of partials will produce a difference tone which is approximately the pitch of the fundamental. However, due to the fact of inharmonicity, the higher up the partial ladder you go, the greater is the difference tone. All of these add together just like the 30 violins in a symphony to produce the effect of one pitch, but one which is sharper than the real fundamental. For this reason, we have learned to tune the bass flatter and flatter as we go down the scale to help compensate for this mismatch in pitch and partials. However, we have learned by experience that we can do this only so far because certain matching partials will really begin to howl if we take this principle to the extreme. So we need to not only consider the pitch as a whole, but also watch the limitations of the prominent partials.

When it comes to tuning the treble, we have many ways to judge the proper amount of stretch. For example; when tuning C7, whether we tune aurally or by machine, we have several checks to show that we have balanced properly. Playing the fourth and fifth below is one check. Playing the seventeenth (Ab4-C7) in parallel fashion with the neighbors below lets us know if we are in a good relationship. The next series of tests involves playing successively these notes: C6, F5, C5, F4, C4 and F3. These can be played with the C7, or if one uses a machine set on C7, one can see if there is a good balance in the display as each of these is played separately. At this time, my personal preference is to get a good balance between the F5 (octave fifth) and the F4 (double octave fifth) in respect to C7. What this does is to make sure that the C5-C7 double octave is on the wide side so that the C4-C7 triple octave will not sound so flat. This is a compromise which gives the piano a better overall sound. I have on occasions tuned pure triple octaves, but this will always be at the expense of a busy single octave (C6-C7). Yes, I know that Virgil claims that single, double, triple and sometimes quadruple octaves can be tuned pure, but I just can't hear what he hears, and besides, screaming partials just do not disappear. I will say that what he does sure sounds good. And, after all, isn't that the only thing that counts?

In the area of the temperament, I have one more disagreement with Virgil. He claims that he can hear the beat of the fundamentals of a fourth or fifth and that he tunes those intervals listening only to the basic pitches as they relate to each other. I really have difficulty with this position for several reasons. My brother, who recently retired from working with NASA in the area of vibration testing, has explained to me that any sound can be checked by a Fourier analysis whereby the complex sound is broken up into its many sine wave components.

If this is true (and I believe it is), each piano tone is made up of an infinite series of sine waves, starting with the fundamental, the octave partial, the octave fifth, the double octave, etc. These are numbered as modes or partials from one to infinity. Now since the second partial and the third partial are a fifth apart, and since there is inharmonicity involved in piano strings, this fifth is not a perfect 3:2 ratio

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Aural and Visual Tuning Techniques

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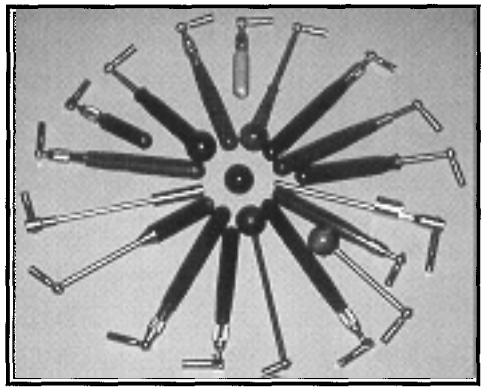
and therefore a beat should be heard. We don't hear this beat. I do not believe there is a beat between the fundamentals of two tones a fifth apart, except for the difference tone which occurs an octave lower than the lower note. I believe that it is imperative that we listen to the lowest co-incident partials of any interval when we are making judgments about tempering. Unless we are conscious about where we are listening, we could get faked out into making judgments based on the second coincident partials instead, which usually beat about twice the speed of the first coincident partials. It is okay to listen to the second pair of partials in flavoring our judgment as long as we realize that that is what we are doing. Quite often in tuning an F3 to C4, we hear a slower beat and a faster beat. This shows the difference between the 3:2 and 6:4 relationships. In tuning a tempered third, one can often hear the second set of coincident partials (the 10:8 beat rate) in addition to the normal first coincident partials (the 5:4 beat rate). The Coleman Beat Rate Locator™ can be of great help to the novice who is having difficulty hearing beats at all. Inventronics Inc. has a Beat Rater™ which enables one to learn the faster beat rates of the thirds and their relationships to one another.

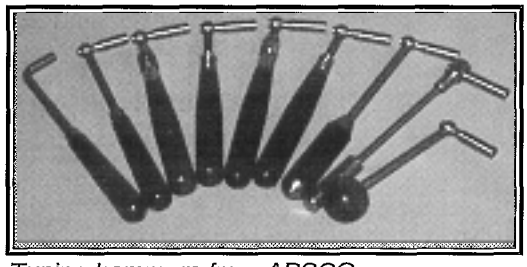
Rick Baldassin's excellent book *On Pitch* has a section which shows the best partials to watch which limit stretching in the various areas of the piano. Those of us who have helped set standards of tuning have been using our ears. We listen to the overall sound. We analyze what balance of partials gives us the best unifying of the piano. By the time this article appears in the *Journal*, Virgil and I will have had our "shoot out at the OK Corral" in Chicago. His tuning is done completely by ear using *his* principles will have been compared musically with mine which will have been done principally by machine. I would not expect the preferences to show more than a 40-60 split unless one of us gets sick. Virgil and I will still be friends because we value each other in many ways and for the contributions each has made to the better understanding of piano technology over the years.

Tuning Hammers

By David Severance, RPT
Inland Pacific Northwest Chapter



Of all the tools we use as piano technicians, certainly the one we use the most is the tuning hammer. It would make sense to be sure the one you use completely suits you. Fortunately, more than ever before, a large variety of tuning hammers is available to the piano technician. From the very inexpensive "gooseneck" style to the custom levers of Keith Bowman, something is for sale that should fit your taste and pocket book. In preparing this article I had the privilege of trying out many tuning hammers over the course of several months, and I have come to the conclusion that one is not enough. I found that I liked different hammers for different pianos or applications. I also found that I liked to switch hammers occasionally to change my hand position and reduce stress. Several types of tuning hammers are available now that were not available when I entered the business, such as the impact hammer, the ball end hammer and the "speed" hammer. All of these tools have their uses and proponents, and what will work for one technician may not work for another. Because of this, I do not try to rate these tools in any way except to offer my personal observations and opinions.



Tuning hammers from APSCO.

The Makers

In 1992 American Piano Supply Co. purchased the assets of Tuner's Supply Co. of Somerville, Massachusetts. Included in the acquisition were the production equipment and the rights to use the well-known "Hale" name. APSCO stocks a large selection of tuning hammers (including the Hale) that they manufacture at their tool-making facility in Clifton, N.J. The Hale tuning hammer is available with or without the extension feature and with either a rosewood or nylon handle. APSCO also manufactures a less expensive "gooseneck" hammer that is available with a star, square or oblong tip. You can also purchase the same handle and shaft with a removable head and tip. The APSCO lines of tuning hammers also include an impact tuning hammer, a ball-handle hammer and the Hale speed hammer. A good selection of heads and tips is also available for Hale and APSCO hammers.

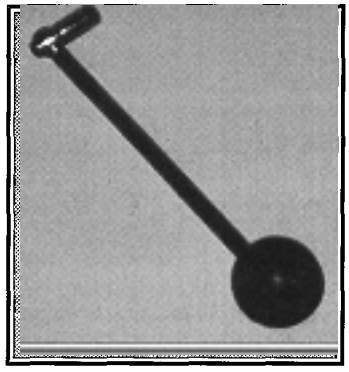
Charles Huether, RPT, manufactures a tuning hammer he calls the WonderWand. The WonderWand is a ball-handled tuning lever that comes with an extra-short, 7/8-inch, 15-degree head and medium tip. The handle, a two-inch diameter wooden ball, attaches to an eight-inch steel shaft threaded on one end to accept a head. Pianotek Supply Co. imports a rosewood-handled Japanese tuning hammer that the Japanese tool company Watanabe manufactures. It is available in both extension and non-extension versions. I have only seen the non-extension version.

Keith Bowman, RPT, manufactures custom tuning hammers exclusively for Renner USA . Keith makes the handles from domestic and tropical wood species and each one is unique.

Schaff Piano Supply Co. sells a large selection of tuning hammers. The extension models are available in either the round headed version or the more familiar Schaff square head. The shafts on the extension models are all hexagon shaped and threaded on both ends in case the technician damages one end. Schaff designed model #18 for use in piano factories. The tip will withstand the pounding required to set tuning pin height. A mini-extension lever is available in both nylon and wooden handles. Schaff also supplies an impact tuning lever that has a sliding weight on the shaft. The model T-1 is a Yamaha non-extension tuning lever.

Extension Hammers

Of the extension tuning hammers, the Schaff model 21 is my favorite. The hex shaft slips in and out of the collet very smoothly. The head and shaft are made of stainless steel. The tips are plated tool steel. The fit and finish of the Schaff tuning hammers are very nice. The heads and tips are fabricated by a CNC (computer numerical control) machine, a very expensive production milling machine. This accounts for the accuracy and uniformity of the threads. I like the feel of the Hale extension models, probably because that is what I have used for 22 years, but the machining was not as consistent as with the Schaff tools. I had trouble getting the shaft in and out of the collet on one of the extension models and lubrication and cleaning did not help.



Huether WonderWand.

Ball-Handle Hammers

Every technician should own a ball-handle tuning hammer. For me, they work best on uprights. Although I personally would not want to use one exclusively, they offer the hand a different position and, at least for me, alleviate stress. Order the APSCO version with the extra-short head. It is similar to the Huether model but has a shorter shaft. I personally like a longer shaft much better. If you want to try the ball handle

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Tuning Hammers

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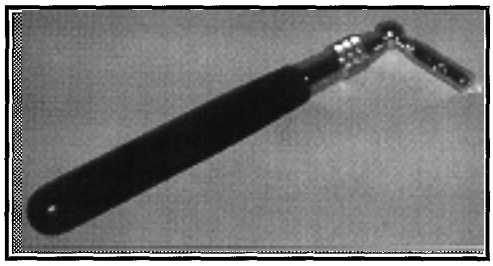
concept on a shoe string you may want to consider the Tuning Hammer Ball. It's available from Mayer Gluzman Piano Service, 6062 Anne Dr., West Bloomfield, Mich, 48322, (810) 661-1781. The Tuning Hammer Ball is a finished two-inch diameter wooden ball drilled to accept most handles with the use of the included shim. It sells for $14.95 including shipping and handling. I have used it and it works very well.



Pianotek tuning hammer.

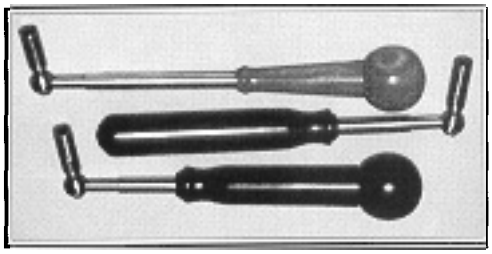
Non-Extension Hammers

Of the non-extension hammers, I recommend the Hale model 16222, with one reservation. The ferrule at the base of the handle has a lip that makes it uncomfortable to grip when lifting the hammer on and off the tuning pins. Fortunately, the technician can easily grind off this lip. Other than that one minor concern, I find the 16222 to be an excellent and reasonably priced non-extension tuning hammer. The Watanabe tuning hammer from Pianotek and the Yamaha tuning hammer from Schaff are both very well made and would be good but more expensive choices for non-extension tuning hammers. Interestingly enough, both tools appear to be extension tuning hammers and have what appears to be a chuck. Upon closer inspection the chuck is a solid piece of steel milled to look like a chuck. Yamaha and Watanabe appar-

Company	Cat#	Length*	Weight	Shaft D.	Handle D.	Handle	Shaft	Comments	Price
American Piano Supply Co.	16231A	12"	10.6 oz.	7/16"	Tapered	Mahogany	Tool Steel	B, C	$9
242 South Parkway	16229A	11 1/4"	7.4 oz.	7/16"	Tapered	Mahogany	Tool Steel	D	$16
Clifton, NJ 07014	16222A	11 1/5"	14.1 oz.	7/16"	1.25"	Nylon	Tool Steel	D	$34.25
Fax (201) 777-0481	16222B	11"	13.2 oz.	7/16"	1.25"	Rosewood	Tool Steel	D	$49.25
Phone (800) 457-4266	16221A	11 1/4"	10.8 oz.	7/16"	1.25"	Nylon	Tool Steel	A, D	$56
	16221B	10 7/8"	9.8 oz.	7/16"	1.25"	Rosewood	Tool Steel	A, D	$76
	16458	11 3/4"	27.8oz.	7/16"	1.3"	Nylon	Tool Steel	D	$40
	16456	11 5/8"	18.1 oz.	7/16"	.875"	Tool Steel	Tool Steel	E	$60
	16457	8"	6.2 oz.	3/8"	2"	Birch	Tool Steel	F	$24
Charles Huether		10 7/8"	7.9 oz.	7/16"	2"	Birch	Tool Steel	F	$65
34 Jacklin Court									
Clifton, NJ 07012									
Phone (201) 473-1341									
Mayer Gluzman						Birch		G	$16
6062 Anne Dr.									
W. Blumfield, MI 48322									
Pianotek Supply Co.	TH-1	11"	14.1 oz.		1.225"	Rosewood		D	$79
401 W. Marshall Ave.	TH-1 E					Rosewood		A, D	$120
Ferndale, MI 48220									
Phone (800) 347-3854									
Fax (810) 545-0408									
Renner USA		11"	12.2 oz.	1/2"	Tapered/Ball	Cocobolo	Stainless Steel	D, H, M	$200
P. O. Box 1223		10 1/5"	15.1 oz.	1/2"	Tapered/Ball	Ebony	Stainless steel	D, H, M	$200
Weston, CT 06883		10.5	13.2 oz.	1/2"	1.275"	Cocobolo	Stainless Steel	D, H, M	$200
Phone (203) 221-7500									
Fax (203) 454-7866									
Schaff Piano Supply Co.	21	11 3/8"	14.7 oz.	7/16"	1.235"	Rosewood	Stainless Steel	A, D, I	$94.21
451 Oakwood Rd.	21C	9 1/4"	13.1 oz.	7/16"	1.18"	Rosewood	Stainless Steel	A, D, I	$84.55
Lake Zurich, IL 60046	16	12"	14.5 oz.	7/16"	1.13"	Nylon	Chrome Plated Steel	A, D, I	$51.92
Phone (800) 747-4266	16C	9 1/5"	12.5 oz.	7/16"	1.13"	Nylon	Chrome Plated Steel	A, D, I	$50.58
Fax (847) 438-4615	18	13 1/2"	16.2 oz.	7/16"	1.27"	PVC Plastic	Chrome Plated Steel	J, K	$28.75
	20M	6 3/4"	8.4 oz.	7/16"	1.125"	Birch	Chrome Plated Steel	A, D, I	$42.92
	16M	6 3/4"	"9.6 oz.	7/16"	1.13"	Nylon	Chrome Plated Steel	A, D, I	$44.07
	66	11 1/5"	21.4 oz.	7/16"	0.435"	Steel	Chrome Plated Steel	E, L	$82.80
	T-1	11 1/4"	13.9 oz.		1.215"	Rosewood		D	$77.57

A Extension lever
B Gooseneck
C Head and tip not interchangeable
D Head and tip are interchangeable
E Impact tuning hammer
F Ball handle tuning hammer
G Ball handle
H Custom tuning lever
I Hex shaft
J Factory style tuning hammer
K Tip interchageable
L Weight adjustable
M Head and tip not included

ently design these tools for the technician who wants to look as if he has an extension hammer but cannot afford one. Go figure. For the beginner or for a spare tuning hammer, consider the APSCO model 16229A. It has a removable head and tip and sells for $16. The model 16231A is the "gooseneck" version of the same tool and sells for $ 9.



Custom-made Renner tuning hammers

Impact Hammers

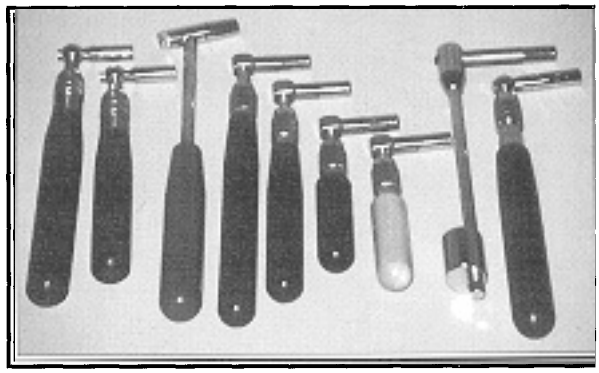
I really have no preference with respect to the two impact tuning hammers I examined. The adjustable weight on the Schaff impact hammer may be important to some technicians, but I would probably put it at the far end of the lever and leave it there. I own the Francis Mehaffey style impact tuning lever, but I rarely use it. I have had technicians tell me that this tool is unsurpassed for lowering pitch.

The Ultimate Tuning Hammer

Keith Bowman's tuning levers are really in a class by themselves. The wood and finish are simply beautiful. The Bowman/Renner handles and shafts are true works of art. The shafts are 1/2-inch stainless steel and the handles are exotic and highly figured hardwoods. Although I understand Keith is working with Lloyd Meyer of Renner USA to get heads and tips manufactured for them in Germany, Keith currently threads the shafts to accept APSCO or Hale heads. I would recommend trying several of Keith's hammers at one of the next conventions. I prefer the combination ball handle with the thin tapered body. The design allows the technician a great amount of flexibility in hand position that, for me, relieves stress.

Or, Roll Your Own

For those of you who like to make your own tools this is what you need to know. All the tuning hammer levers, including the Japanese tools, use the same thread. It is a standard 1/8-inch tapered pipe thread. The threads have a 3/4-inch-per-foot taper and 27 threads per inch. Then why don't Hale heads fit on Schaff levers and vice versa, you may ask? Actually, due to some inconsistencies in machining tolerances, they sometimes do. However, the reason they are not normally interchangeable is that Schaff levers thread farther down the taper. So normally, but not always, the shaft bottoms out in the head before the threads catch. Conversely, Hale levers will only catch the first few threads in the Schaff head before it tightens up leaving a weak joint. 7/16-inch cold-rolled steel bar stock is available at most steel distributors available very inexpensively. You can purchase hardwood balls in most hobby and craft shops or you can order them from Woodworker's



Tuning hammers available from Schaff.

Supply Co. (800) 645-9292. Woodworker's Supply Co. also sells spindle-turning blanks of various exotic hardwoods for the handles. All the tips except for the Yamaha tip are a 25/64" x 30 machine thread and are interchangeable with some exceptions due to inconsistencies in machining tolerances.

Reyburn CyberTuner™
Innovations in Visual Tuning

By Kent Swafford, RPT
Kansas City Chapter

As computers have become simultaneously more powerful and more affordable, professionals have begun to carry their "offices" with them in the form of notebook computers, keeping customer and financial data at their fingertips throughout their daily travels. CyberTuner™, designed for the professional piano technician, is a new visual tuning device (VTD) in software. CyberTuner™ is cool, definitely fun, and is giving piano technicians a unique opportunity to make a portable computer an integral part of their workdays. With CyberTuner™, one can tune a piano with a stock Macintosh™ computer (See Photo).

Reyburn CyberTuner™ in use.

Exploiting the built-in digital audio recording capability of newer Macintosh™ Powerbooks™, CyberTuner™ requires no expansion cards or other equipment beyond the computer itself. To some, integrating a visual tuning device into a notebook computer will seem natural and perhaps even inevitable. Wonderful new capabilities are possible in a visual tuning device that can take advantage of the speed and processing power of a modern computer. Reyburn CyberTuner™ (RCT), by Dean Reyburn, RPT, brings some genuine innovations to visual tuning. The program is the result of years of development effort and is a remarkable accomplishment.

Comparisons to the Sanderson Accu-Tuner™ (SAT) will be unavoidable. As the author of the August, 1994 *Journal* article entitled "Frequently Asked Accu-Tuner Questions," I believe the Accu-Tuner™ is a very fine VTD worthy of the praise it has received from among the finest piano technicians. The SAT's compact, durable design and its proven performance are just as good as they ever were, which is very good indeed. Dean Reyburn has created a new visual tuning device which is, in my opinion, clearly worthy of a place alongside the Accu-Tuner™. Happily, CyberTuner™ is compatible in a number of ways with the Accu-Tuner™, and can actually enhance the usefulness of an SAT.

The SAT remains unsurpassed as a "dedicated" VTD, that is, a device designed from the start to be for musical instrument tuning only. Compared with using a dedicated device, the drawbacks of using an off-the-shelf computer, even a small notebook, as a visual tuning device are few, but notable. There are some vertical pianos with no place on which to put a notebook computer, in which case one may need to place it to one side of the piano's keyboard. Power management will be more complex with a notebook VTD than with an SAT which can tune many pianos on a single charge of its batteries. Notebook computers can run on batteries, but only for a limited time. A charge of the standard notebook battery should easily last through any single RCT tuning and perhaps through as many as three fast tunings, but a charge may not last through two difficult tunings. Powerbook batteries can be recharged while the notebook is in use, and can apparently be fully recharged in the time it takes to do a tuning. Therefore, a conservative approach might be to plug the notebook into AC during every second tuning. Others might choose to be less conservative and plug in only when absolutely necessary. Additional batteries are available, including ones with higher capacity than the standard ones. Batteries being rather expensive, one might just decide to plug into AC on most tunings and save the battery for a tuning where no AC is available.

The benefits of using a personal computer as a VTD are many. As long as the computer program is still in development, revisions to the program can be easily obtained through email or on floppy disk. An almost unlimited number of tuning records can be stored on the notebook's hard drive with complete, automatically alphabetized names, allowing tunings to be easily recognized and loaded back into the program at any time in the future, with no need for an external printed directory. The notebook will run any other computer application available, so the piano technician can use his "visual tuning device" to do anything else a computer can do. I am writing this article on my "VTD."

Reyburn CyberTuner™ consists of several integrated program "modules" which perform the different functions necessary to calculate, perform, and store tunings. The visual tuning device portion of the program with which one actually tunes is called CyberEar™ (See Figure 1).

The display portion of CyberEar™ is a spinner which not only moves clockwise to mean "sharp" and counter-clockwise to mean "flat," but the entire spinner moves toward the left of the computer screen to denote *very* flat and to the right of the screen to denote very sharp. The CyberEar™ spinner display is reli-

able throughout the scale and, in my experience thus far, is able to read *every* note with equal and remarkable clarity, even in very noisy environments.

The rotational speed of the CyberEar™ spinner is normally an indication of how many *cents* off a note is, not the more familiar one revolution per second per *beat*. To put it simply, the spinner is sped up and more sensitive in the bass and slowed down and more stable in the treble, creating a more realistic visualization of piano string frequency across the scale. The faster spinner rate in the bass is a real eye opener, showing that bass strings can be very unstable, perhaps as unstable as high treble strings. This suggests that some bass tuning problems come from unstable strings previously undiagnosed as such. CyberTuner™ may help us piano tuners train our ears to hear better for bass tuning, just as the Accu-Tuner™ has helped many of us train our ears for high treble tuning.

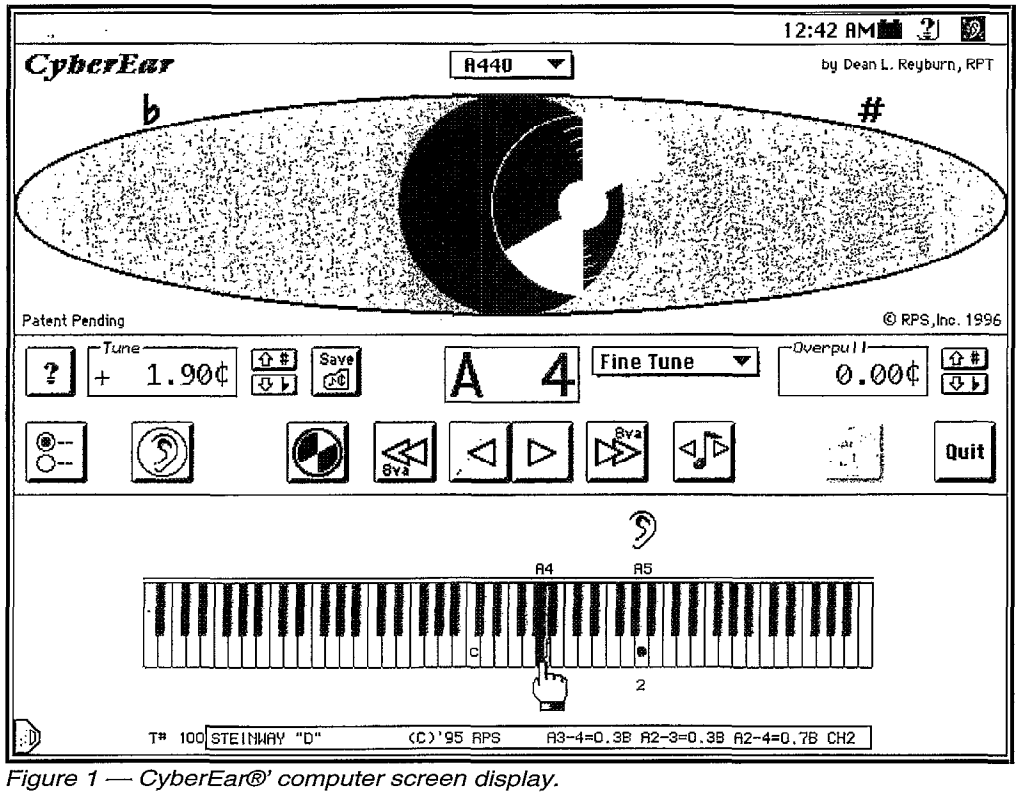


Figure 1 — CyberEar®' computer screen display.

Switching from note to note as one tunes with CyberEar™ is automatic in many instances. As long as the technician is moving up or down the keyboard in chromatic fashion, CyberEar™ will "automagically" (as Dean puts it) detect each move to the next note on the piano and switch *itself* accordingly, freeing the technician from physically switching notes on the VTD. This feature is luxurious and makes tuning from note to note smooth and seamless.

Additional and very exciting automatic functions come into play for pitch raises and lowerings. CyberEar™ does pitch corrections with speed and accuracy that is remarkable. In the pitch raise modes, each note as you come to it on the piano is automatically measured to determine its deviation (flat or sharp) from the value that the tuning record shows for that note. An over-pull amount is figured for the note, based on how far each note deviated from the tuning record value, how far the previous five notes deviated from *their* tuning record values, and where the note lies in the scale. The percentage of deviation which CyberEar™ uses to calculate the over-pull varies through the scale, being relatively small in the bass, more in the mid-range, and much more in the tenor and high treble. Once the over-pull is calculated for an individual note, CyberEar™ offsets itself so that the spinner will stop when the string has been properly over-pulled, all of this happening automatically for each note in little more than the blink of an eye.

The portion of CyberTuner™ which takes measurements from a piano and then calculates the proper pitch for each note is called Chameleon 2™. CyberTuner™ dramatically increases the amount of data taken from each piano. The original stretch calculator used only one measurement of just one note of a piano. FAC™, the tuning calculator built into recent Accu-Tuners™, improved matters by taking measurements of three notes of each piano. Chameleon 2™ measures as many as 21 partials, four partials each from A1, A2, A3, and A4; three partials from A5; and, optionally, two partials from A6. Because Chameleon 2™ collects so much data from the bottom to the top of the scale, Chameleon 2™ tunings will be more accurately "customized" for individual pianos.

The procedure for collecting the data which Chameleon 2™ needs to calculate its tunings is automated, freeing the technician from any "measuring." The procedure takes two minutes and requires a somewhat quieter environment than does CyberEar™. The program prompts the technician to play the notes that it needs, digitally records each one, and then analyzes the recording, separating out the individual partials *as they sounded simultaneously*. All measurements are done internally, so the technician has no direct contact with the data collected. However, the piano technician has an unprecedented control over the amount of stretch calculated into the tunings because Chameleon 2™ has ten gradations of general stretch levels, called "octave tuning styles," from which to choose (See Figure 2).

Before CyberTuner™, if one attempted to control the general stretch level by using stretch numbers higher or lower than measured, one ran the risk of introducing beat rate inconsistencies at those places in the scale where the VTD changed the partial being used. Chameleon 2™ has been specifically designed to calculate wide or narrow tunings as the user chooses, and so minimizes such errors.

The concept of octave tuning styles was one of the more difficult parts of Reyburn CyberTuner™ for me to understand. (You might say it was a *stretch* for me.) Although the octave is in reality a tempered interval in piano tuning, we usually say that we tune "clean" sounding octaves. I had not previously been accustomed to thinking about the specific speed of beat rates in octaves. But Cha-

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Reyburn CyberTuner®

Innovations in Visual Tuning

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meleon 2™ actually calculates and predicts the beat rates to the nearest tenth of a beat per second for certain octaves in its tunings! This "virtual direct-interval tuning," as Dean calls it, is possible because of the multiple partials measured for each note. The screen displays beat rate predictions for the A2-A3 octave, the A3-A4 octave, and A2-A4 double octave. If one does not like the predicted beat rates, with a few mouse clicks one can have Chameleon 2™ calculate a wider or narrower tuning. No measurements must be repeated; only the computer's calculations, which take less than a second, must be repeated.

This ability to calculate slightly wider or narrower tunings is useful for all pianos but is particularly valuable on small pianos with high inharmonicity. On these pianos, two contiguous single octaves just don't "fit" very well into a double-octave. Commonly, if octaves on these pianos were stretched, the double octaves would be too wide and would beat noticeably. *It is a genuine advancement in visual tuning to be able to calculate successively wider or narrower tunings until a suitable compromise is reached between the single and double octaves.*

I am very excited about the accuracy of Chameleon 2™ tunings because of the specific way I like to use visual tuning devices. A VTD should provide a good overall framework for a tuning by properly adjusting for the inharmonicity of the piano, taking into consideration the general level of inharmonicity, the change in inharmonicity through the scale, and my stretching preferences. This visual tuning is a *macro*-tuning, if you will, fitting a tuning to the piano accurately across the scale, creating a uniform stretch throughout. Final refinement, or *micro*-tuning, can take place aurally. Since the visual tuning arranges one partial from each note into a uniformly smooth curve, the anomalies present in the macro-tuning can be assumed to be the result of inconsistencies in inharmonicity. These anomalies would show themselves as uneven beat rates across scaling breaks or uneven beat rates on "maverick" notes, such as notes that exhibit negative inharmonicity. After smoothing out these anomalies as much as possible, the resulting tuning may be superior because the tuning will have taken into consideration all three aspects of inharmonicity, that is, general level, change through the scale, and inconsistency.

Chameleon 2™ has the flexibility to calculate its tunings so that the notes from A0 to G#1 can be tuned from their sixth, seventh, or eighth partials. Similar flexibility is available in the tenor by providing the option to tune A2 through G#4 from *either* the third or fourth partials, and special mention must be made here of Chameleon 2™'s ability to tune well in the piano's tenor section as a result.

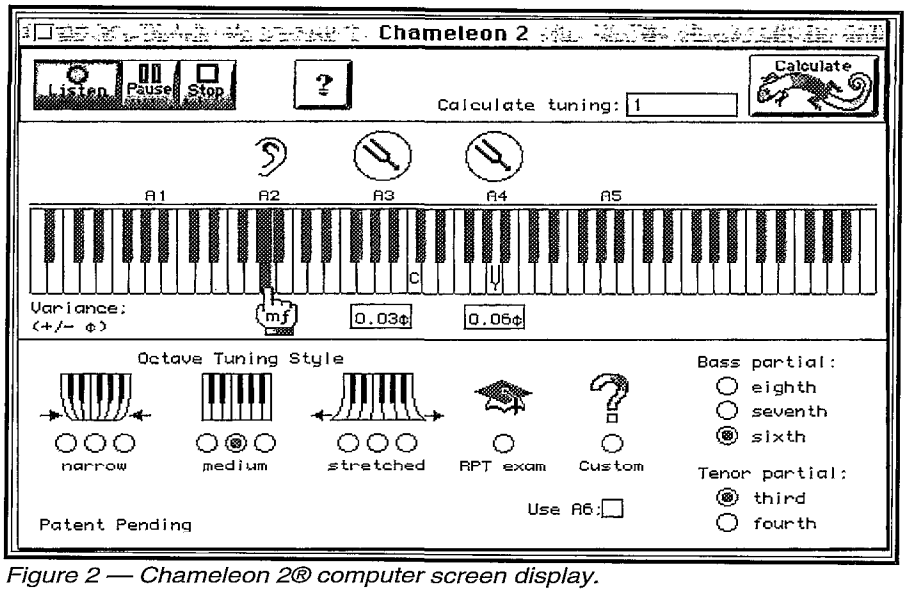

Figure 2 — Chameleon 2® computer screen display.

The tenor area and the break between plain-wire and wound strings provide unique tuning challenges. VTDs must make "assumptions" about the amounts of inharmonicity a piano will have across its scale, but tenor strings sometimes conform particularly poorly to the assumptions. Generally, inharmonicity decreases as one moves down through the piano's plain-wire strings. On some pianos, however, as one moves down the scale into the tenor's lower plain-wire strings, the inharmonicity actually increases instead. It is common, particularly in small pianos, for the lowest plain-wire strings to be shorter than would be ideal, resulting in their inharmonicity being higher than ideal. Visual tuning devices commonly tune from the fourth partials in the tenor. When a VTD tunes the fourth partials to a uniform curve, notes with inharmonicity higher than expected will end up with first, second, and third partials that are too flat, with fifth partials too sharp, and with only fourth partials tuned "right." Intervals formed above notes like this will exhibit some very "wrong" beat rates. Flat second partials will form 2:1 octaves that are wide, even though the 4:2 octaves may be correct. The major thirds may be slow. So, in order to tune these notes that, because of high inharmonicity, measure both too sharp *and* too flat, depending on which intervals are checked, compromise is in order, but the solution will be different for different pianos, both because scales differ so widely from piano to piano, and because of the new flexibility of CyberTuner™. On well-scaled pianos, it will make little difference whether notes in the tenor are tuned from their third or fourth partials. However, many piano scales are imperfect, and I am convinced that tuning the lower plain-wire strings from the third partial will *by itself* provide a big improvement in the tunings of many pianos. When a VTD tunes a note with unusually high inharmonicity from the third partial instead of the fourth, the first and second partials will be less flat, the third partial will be "right," and the fourth and fifth partials will be sharp. This means the 2:1 octave, while still wide, will be less so, and the 4:2 octave will be a bit narrower than if it had been tuned from the fourth partial. *In other words, a VTD using the third partial to tune plain-wire tenor strings which have unusually high inharmonicity should provide a better compromise (than tuning from the fourth partial), by automatically splitting the inharmonicity-induced error between the 2:1 and 4:2 octaves.* After all, a VTD that is tuning the lower plain-wire strings with the fourth partial will tune the 4:2 octaves just fine, but will put the entire error caused by unexpectedly high inharmonicity on the 2:1 octave. Third partial tuning tends to produce clean fifths and octaves at the expense of the major thirds which will slow down on the lowest plain-wire strings;

still, this may be the best compromise possible.

It is common for the highest wound string of the tenor to have significantly lower inharmonicity than the lowest plain-wire string right beside it. Tuning a string with unexpectedly *low* inharmonicity, as happens when tuning the highest wound strings of some pianos, is the *other* tenor tuning problem. Tuning these notes from the third partial would cause the fourth partial to be unexpectedly flat, making the major thirds formed above such notes to be too fast. An extra tuning record can be prepared by Chameleon 2™ in less than five seconds. Perhaps the beat rates of such pianos could best be smoothed out across the tenor break by preparing two tuning records and tuning up through the wound strings above A2 with a tuning calculated to use the fourth partial, switching at the break to a tuning calculated to tune the plain-wire tenor strings from the third partial. This new dual-record RCT procedure appears to have clear advantages, especially on the lowest plain-wire strings, over the dual-page SAT technique that I used regularly for years to tune through the tenor break. RCT provides many new possibilities, including tuning with one partial and checking with another.

While it has certainly been fun and exciting to learn how to use a new visual tuning device, it has been a challenge, too, because of all the new possibilities that are built into RCT. The best techniques for tuning with CyberTuner™ will have to evolve over time.

The Sanderson Accu-Tuner™ is perfectly capable of storing tunings calculated by Chameleon 2™ which use the third, seventh, or eighth partials. Chameleon 2™ tunings are compatible with the Accu-Tuner™ and can be sent from CyberTuner™ directly to a MIDI-equipped Accu-Tuner™, or entered manually into an SAT with no MIDI capability. It is worth noting the extraordinary foresight of Dr. Al Sanderson, developer of the Accu-Tuner™. Because of the flexibility of the SAT's memory pages, and because of the SAT's use of the MIDI standard, the Accu-Tuner™ is now compatible with both a computer and a computer program not even dreamed of well over a decade ago when the SAT was originally developed.

Using a VTD and tuning from A0 up through the scale chromatically and tuning unisons on the way, yields very stable tunings. However, there can be good reasons for not wanting to tune chromatically. CyberEar™ allows the tuner to program CyberEar™ to step through any note sequence desired. Students using CyberTuner™ as an aid in learning aural tuning would want CyberEar™ to tune through an aural temperament sequence. Experienced tuners might want to step through an aural temperament sequence when learning CyberTuner™ to get a feel for the various levels of stretch available in Chameleon 2™. And finally, one can imagine experienced users of CyberTuner™ using a short aural sequence at the beginning of each tuning to make sure the Chameleon 2™ tuning is indeed appropriate for the piano in front of them.

There is more. Pianalyzer™ is another function of CyberTuner™, and it measures the pitch and relative amplitude (loudness) of each partial in the partial series of any note on the piano. Pianalyzer™ demonstrates the increase in inharmonicity as one goes up the partial series of "normal" notes, and easily documents the fact that notes with negative inharmonicity are relatively common. Besides being very neat, this function should be useful in voicing, education and research.

I began using CyberTuner™ in March, 1996, and now use CyberTuner™ on a daily basis. There have been no disappointments; CyberTuner™ is "for real" and is advancing the state of the art in visual tuning devices.

Many thanks to Mitch Kiel, RPT, David Lamoreaux, RPT, Carl Lieberman, RPT, Dean Reyburn, RPT, and Don Rose, RPT, who all assisted in the preparation of this article.

Your Friend, the Unison

By Bill Ballard, RPT
New Hampshire Chapter

We piano tuners work in an environment rich with tones and vibratos. The unison, of course is the basic building block, the atom of this world. In this article, I will discuss the primacy of unisons in our tuning. I will also discuss the large extent to which interval tuning is another form of unison tuning. This connection between unison and interval is in the interval's coincidental partials, those partials common to the harmonic series of both notes. The ability to handle partial tones then, is fundamental to our work (though not necessarily required).

With this in mind, I will present several ear training exercises, designed to stretch our ability to work with individual partials. These exercises will put us in fine shape for the fun part of unison tuning, what I call pitch shimming. Except for a brief hint by Virgil Smith in his "Better & More Stable Tunings" (*PTJ* Feb., 1995), this latter technique has not been well documented in these pages, and I hope that this article will be the start of such observations. You'll find shimming pitch equally useful in a workaday acoustic pitch-raising or in polishing up your finest concert tuning. The unison itself is a miracle when you consider that all possible frequencies are present, however faint, in the motion of the string. If you've never done more with a unison than just freeze it and forget it, come and find out what this unit of sound will do for you.

The Unison

Webster's College Dictionary has three pertinent definitions. A unison is "identical in pitch." Musicians in rehearsal know "identical pitch" when they hear it. We typically hear it up in the seventh octave. However the implication is that there is only one tone or frequency involved. The unison is also "the interval of the perfect prime" which also reminds us that when the tones issuing from a pair of vibrating strings are brought into unison (third definition: "the state of being so tuned or sounded"), the partial tones of both harmonic series are involved.

If you've never done more with a unison than just freeze it and forget it, come and find out what this unit of sound will do for you.

The unison, of course, needs no introduction. It's our bread and butter. There may be plenty of ideas about what is actually happening during the course of a tuning, but the basic facts remain. The tuning hammer is our main tool for moving wire and the unison is our main tool for gauging adjustments of pitch. The importance of the unison is pervasive. The sound of a waveform on a single string of course is made up of a chorus of partial tones. Intervals are defined by these shared and coincidental partials. Just as all politics is local, all interval tuning is unison tuning. The sinuousness of a fifth, the insistence of a fourth, these are all periodic undulations of sound pressure by unisons of coincidental partial tones, moving or still. Whether we shape the sound of the interval or meter its beat rates, it's the coincidental partials in which we perceive and temper the interval.

At some point in our tuning pattern (even if only at the very end) we will be working with unmuted intervals. When such intervals are tuned, the stillness of the coincidental partial unisons involved is essential. Once movement in a unison has entered the sound of the interval, the ambiguity is maddening. Does that beat rate indicate a bad unison or a bad interval? A bad unison will quickly blur the clear ideal of the interval we're setting. We wouldn't ask a machinist to mark out his work with a wax pencil. We, too, need to work by clean, clear lines. Not to worry: the unison will be our carbide scribe, our vernier caliper, and our draftsman's dividers.

Ifs, Ands, or — Yeah, Buts

As you may gather, this is aural work. I'm an aural tuner. However, users of ETDs should be quite at home with the practical aural exercises. My aural work approaches the tuning of intervals in the same way an ETD must. We both save measurements in a memory, although I happen to be measuring beat rate speeds, instead of direct frequencies. You might call it aural retentiveness.

Not only is it aural work, but it is particularly involved with the partial tones. Some of us will hear a single note of a piano as a unified tone with a shape of parallel lines heading for the vanishing point or more likely, with recurring "bumps." Others hear a chorus of pitches and immediately begin to count individual beat rates. The techniques I offer are based on an ability to lock onto one of these partials to the exclusion of all others. The exercises will sharpen your focus on the partials. Please help yourself to "ghosting" to make an individual beat rate more prominent. In fact, as you first try these exercises, you may want to access the partials first by ghosting and later, directly. If you're really unaccustomed to hearing partials, think of living for years next to a forest, and being told that it's actually a large crowd of trees.

Just as all politics is local, all interval tuning is unison tuning.

Finally, it's based on an intuition (and policy) of mine, that a unison cannot be considered ready to participate in an interval unless at least two strings on that note have been brought into unison. Many, but not all of us tune this way, with a minimum of mutes. My own reasons for doing so have been laid out in an earlier article ("Tuning Patterns in Practice" May, 1993) in the *Journal*. ETDs (the SAT and now the RCT) have confirmed that what we hear and what can be measured at the string are not necessarily the same thing. I have decided that before I combine unmuted unisons into intervals the notes involved must have more than just

one of their strings in unison. Two is a good number. In general, the addition of the third string doesn't upset the majority formed by the first two. As you can imagine, this is all single-mute or at most paired double-mute work. (My favorite in the 3" x 3/4" rubber mute dubbed the "low-rider" for its wide contact area and low center of gravity.) Actually, the closer the piano gets, the fewer mutes I need.

The unison is important because it hones our hearing. It is also important because the stability (or restlessness) of the piano's tuning shows up very quickly in the unisons, In fact they will monitor the tuning for you, like seismographs on the hillside, while you press on with the tuning. In the end, full unisons are what we leave for the pianist. As the sound bite says, "It's the unison, stupid".

For me, the consummated unison is breathless. In one sense the "dead" unison is seized with the tension of a hunted animal, frozen with the fear that its next breath would signal its pursuer. That's breathless.

In Your Ear (and On Screen)

When all three strings of a trichord disagree (and badly), the unison is a sight to behold. Wobbling like a tornado, or better yet cartoon star Roger Rabbit, trying to save his mile-high stack of dishes, it's like New Orleans on Saturday night, or a town full of church bells all clanging at discordant pitches and separate speeds. But as you gently steer the unison into some sort of coherence, the erratic turbulence becomes the periodic pulsing of tones. With slow moving partials, you can strike the string, and the first beat rate to occur after the initial splash of sound will turn over in the highest audible partial. From there, the other partials will turn over in order from higher to lower, as if descending a staircase. In its last moments, the slow curling of the not-quite perfect unison seems still to have a noticeable syncopation, despite the long stretches of time over which these shapes occur. There's an echo of the infinite here as the closer you think you are to a still unison, the longer you have to follow the unison to confirm this.

For me, the consummated unison is breathless. In one sense the "dead" unison is seized with the tension of a hunted animal, frozen with the fear that its next breath would signal its pursuer. That's breathless. What we more often end up with however has a residual, dormant roll or curvature. It would be similar to watching a tree full of leaves on a still summer morning, and noticing as a single leaf is turned by some remarkably tiny breeze. It is as Anita Sullivan contemplated in her book *The Seventh Dragon*:

> *"... there comes a place where [the unisons] are too slow to count anymore. There they turn into a kind of swelling effect. The beats have stopped, but you have not yet found unison. By now you are far past the point of tempering. You have entered the dimension in which "pure" and "exact" are measured in some other way than by counting. Intuition takes over here." (p.94-5)*

Again, I visualize a staircase, leading upwards as high as the ear can hear, and slightly flexing or breathing. This is a unison which would slowly smile if you massaged it. (This style of finishing a unison was well presented by Chris Trivelas in his "The Sweet Spot: Beyond Matched Frequencies in Unison Tuning." (*PTJ*, March, 1996)

There is, of course, a physical basis for the unison. This world of sound pressure levels, phase and Fast Fourier Transformation of frequency data is no less intriguing. Physicists could tell us that the chances of two strings having exactly identical motion over a ten second period is similar to all of the people now in the New York City subway system at this instant being in their same exact places simultaneously at some future point. In other words, slim to none. We might explore the anomaly that the frequency of individual strings in a dead unison will measure at a higher frequency than the unison which they make up. (This is now being detected with the new Reyburn CyberTuner®.) Among the many other exotic and transient effects occurring below our perception, there's the phenomenon that the bridge/soundboard assembly will "tune" two adjacent strings into a dead unison when they approach within an few tenths of a cent of one another, literally finishing our work for us. This was mathematically predicted and verified by Gabriel Weinreich, and presented in his article "The Coupled Motions of Strings" (*Scientific American*, Jan., 1979). He refers in turn to a study by Roger Kirk of the D.H. Baldwin Co., in which discrepancies were discovered in the actual string-by-string frequencies as measured in the tuning by "the skilled tuner." This study also observes audience response to separate tunings with subtle differences in the purity of unisons. But these are the areas for other articles. It's now time for your exercises.

Operator's Manual

In our daily work, most of us are inclined simply to tune that unison and move on. However the secret to still unisons lies in the very uppermost partial you can hear. If you can zero-beat this tiniest partial, everything below that should be locked in place and beatless — in principle. While doing this, there is one ability which is well exercised. That is our ability to focus in on a single partial level (and beat rate thereon) to the exclusion of all others. This is valuable because it's also the basis of direct interval tuning.

The other thing which is sharpened during such unison-tuning is your ear's ability to work with tiny sounds. By the time you're doing unisons up in the sixth and seventh octaves using first and second partials, you'll already have worked with much smaller partials than these in the lower octaves.

We tune all day long, but if pressed to keep up with the day's appointments, we may do little more with the unison than freeze it and move on. Johann Sebastian Bach started off each day by tuning his harpsichord. Such ear training on a daily basis would benefit us tremendously. The exercises and techniques which I will present later in the article should serve excellently.

It will be valuable to consider how we hear and perceive. The prevailing wisdom about unisons is that the entire set of beats in the partials can be tuned to still, by zero beating any particular one. Ordinarily our hearing is drawn to the loudest beat-rate and this is the one which we zero-beat. Because the loudest partial is generally a low one, that will be where we set our unisons. However, the higher partials, because of their extreme sensitivity, can adjust the tuning in very fine increments. For instance, if the ninth

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partial in a unison bulges at one bps, the first partial will roll at one cycle every nine seconds. If you can pick two cycles of the first partial's beat rate you're lucky. But that's still not long enough to make any judgments about waveform periods. When it comes to finding the center of the unison, the lower and much slower partials seem clumsy by contrast.

My favorite partials are the seventh and ninth, in that order. Being odd-numbered partials, they aren't doubled by aural octave relationships and thus are easier to pick out. The third is odd but usually is doubled by the sixth, and by the time you get into the bass section will be further doubled by the twelfth. To a musician's ears, these multiples of two are all octave versions of the third partial. The fifth partial, of course, is a stand-alone odd-numbered partial but it's too low in the series for me. On a good piano, I can follow the seventh partial right up through the fourth octave.

The Ratio of Partials

In principle, the harmonic series is consistent and reliable enough for some very fine work. Take for example two strings of a trichord, and detune one of them such that the first partial beats at one bps. The second partial's beat rate will be two bps, the third, three bps, and so on for as high up as you can hear. You will notice that the actual ratios of beat rates are not strictly in whole numbers, with the seventh partial coming around for its eighth cycle at exactly the same instant as the first partial hits its second cycle. Inharmonicity (and other exotic effects) is accelerating these beat rates slightly. But as you search for them, you'll find that whatever inharmonicity may do with the relationship of partial beat rates after the first second or so, they all begin as synchronized to the first partial. This is all the material of many excellent articles, recently Jack Stebbins' "Partial Hearing: Your Greatest Asset" (*PTJ*, Aug., 1994), and Fred Tremper's "A Study in Inharmonicity" (*PTJ*, May, 1995) on the harmonic series and partial tones.

Let's find out what happens to this family of beat speeds if we pick the seventh partial and set it at 3.5 bps, that may seem like an odd number, but you can confirm it aurally with the seconds function of your wrist watch. It will have a beat rate such that the first second (and all odd seconds thereafter) falls midway between cycles (initially, the third and fourth cycles) and the second (and all even-numbered seconds thereafter) coincides with the beginning of a cycle (initially, the eighth cycle). As the seconds tick by, they will be alternately even with or at odds with the start of these groups of three- or four-beat cycles. With the seventh partial thus set at 3.5 bps, the second partial will beat at one bps. How do we know this? The first partial's beat rate will be 1/7th of the seventh, and the second partial, double that, or one bps. For me, a well-tuned unison has the grace and beauty found in pure (mostly) mathematics. But we've got our exercises to do.

The Unison as Ear Training

The first exercise uses a bass bichord note with mismatched strings. We all know of pianos with such cockeyed bichords; here they shall remain nameless. These mismatches in harmonic series will most likely come from a poorly selected universal bass string replacement, or it can come from a piano model whose scale has changed several times since the stringing of the piano for which you're ordering a manufacturer's replacement string. Also affecting the match of harmonic series are inconsistencies of winding length and its location within the speaking length, and the tension with which the string winder feeds the wrap onto the core wire. With such a pair of mismatched strings, notice that when the majority of partials are set beatless, one or two partials are still wobbling. Tune each of these wild partials beatless by focusing on them, and notice how far out of tune this puts the partials which had been in tune with each other.

The second exercise uses a slackened string and its increased inharmonicity to provide mismatched partials. Take the bottom note in the tenor section and lower one of its strings a fifth for a unison with the note a fifth below, in the bass section. With this unison's exaggerated secondary inharmonicity, the 9:6 fifth, introduced in Dan Levitan's "Ninth Partial Intervals" (*PTJ*, Dec., 1993), is easily heard here.

The third exercise, which I call Gonzo Tuning, isolates a single partial from the seeming chaos of three out-of-tune strings. Pick a trichord note in the middle of the piano, tune the LH string 100 cents down, the center string 50 cents down and leave the RH string at pitch. Among all the audible beat rates, those coming from the combination of the LH and center string will be changing with the flow of string tension during the tuning. The other partials (from the combination of the center and RH strings will continue at fixed beat rates, while you slow to zero the moving beat rates between the partials of the LH and center strings. In fact when the LH string is beatless with the center string, that unison will not disturb the ever-beating unison between the RH string and these two. Indeed you will have the sound of two single strings out of unison. With all three strings going, pull the LH string up into a good unison with the center string. Repeat the exercise, this time halving a distance of 50 cents.

The fourth exercise is similar to what a bugler would do, practicing articulation exercises at each of the partials in his harmonic series. Take a note in the second or even third octave, and put a one bps pulse in the fundamental. With that beat rate well memorized, now duplicate it at the second partial level, then the third partial, and then on up as high as you can hear. Try this same exercise with a note in the fifth octave. The partial tones in this unison begin at what would have been second and fourth partial levels in the second and third octaves, and those are already tinier. However the process is unchanged. Once again that staircase appears, and you're now walking up it. Confirm these aimed-for one bps pulses using sympathetic excitation. "Ghosting" the partials is a dramatic way of isolating individual ones. While you're at it, why not try tuning this "ghost?"

The Unison as Measuring Tool

It turns out that the unison can be a very reliable and accurate tool for correcting interval tuning. Once you get used to it, it will be comparable a set of feeler gauge shims. Indeed a good analogy would be the following. Consider a length of steel rod which at .254", is .004" too long. To bring it down to .250", you could put a hole through a block, send the rod through that hole, and lock it into place at the point where it protruded by .004", as measured with feelers. Remove the protruding .004" with a file, and you'll have brought the rod down to .250".

The principle behind pitch shimming is equally simple, although here the beating of a unison will be our feeler gauge. Take two notes, A (the note being tuned) and B (the reference note). Assume that the interval A/B will be properly in tune when its defining coincidental partial is tuned to a beatless unison. (Once beyond the octave and fifth, the

intervals have just one defining coincidental partial.)

If note A is a trichord, its strings are Al (left hand), Ac (center, and Ar (RH). Ar may be muted, and if Ac is not in unison with Al, it should be muted. In any case, on notes A and B any strings unmuted should, at the start, form a unison. The general description of pitch shimming runs as follows. The interval A/B has a beat rate (delta frequency) which indicates an out-of-tune interval. Duplicate that beat rate among A's strings (Al, Ar and Ac) by moving one of them (for instance Al) by the amount of delta frequency, and tune the other string(s) on that note into a unison.

I'll go over this in slightly greater detail. Play the interval A/B. Memorize the beat rate at the coincidental partial involved. Move string Al in the proper direction and by the amount which will duplicate the beat rate of A/B, between the strings Al and Ac. Tune Ac in unison with Al. These two will now be in unison with B. Finally, tune Ar to the unison of Al/Ac. Notes A and B now have their coincidental partials beatless. Interval A/B is now corrected.

Whether the corrections in the following examples are 1:1 (or some other ratio) and whether the correction is being made at the first partial or some other, higher partial, the process is unchanged. An out-of-tuneness (delta frequency) is measured in the interval, and the note to be tuned will be moved by that amount, one string at a time.

Your musician's ear will be a great help here. Identifying the pitch of a particular partial is half the work of determining its partial level. Of course, you'll need a good aural grasp on the individual partials for pitch shimming. The last exercise added the skill of duplicating a beat rate stored in memory to the first skill, of focusing in on a single partial to the exclusion of all others. There's nothing unusual about duplicating beat-rates. You're probably doing it already, for example, in setting a 6:3 octave in the upper bass. You might check this octave with the minor third/major third inside test tone. When the bottom minor third beats at the same speed as the upper major third, the 6:3 octave is pure. So, instead of listening to the actual octave, you may find its tuning faster by making these two beat rates match.

I use the 1:1 correction all the time, especially for truing-up octaves. Pick, say, C4 and C3, and set C3 a grossly narrow 2:1 octave from C4. Listen to and duplicate that 2:1 octave beat rate on the second partial of one of C3's strings. Bring a second of C3's strings into unison with the first, and then finally the remaining C3 string to the unison of those two. Voila! This new unison on C3 will be beatless with C4 in that 2:1 octave relationship. (By the way, there are several octave relationships to choose from, and the choice is yours.)

Pitch shimming here does away with the requirement that both notes be sounding simultaneously for direct interval tuning.

For another 1:1 correction, try setting a perfect twelfth. In "Reconciling Sound and Numbers" (*PTJ*, Jan., 1993), I called this my "3:1 octave", and soon thereafter straightened out my language. The nice thing about the perfect twelfth is that a note tuned thus to a twelfth will fall in between a 4:2 and a 6:3 in its octave relationships. The 4:2 usually isn't wide enough to quiet down the fifths involved, and yet the 6:3 frequently puts too much width in the 4:1 relationships. Indeed, my favorite test (or taste) of the octaves in the mid-treble involves all three notes of the double octave and the fourth up from the bottom note. Using the major third as a test tone which generates major third, tenth and seventeenth and now the major sixth and twelfth beat rates, you'll find that setting the top note or double octave at a pure twelfth from that fourth above the bottom note yields the following. The 4:1 octave will be slightly wide (as is that bottom fourth). The 4:2 octave (with that middle octave note) will also be slightly wide, again because of the narrow fifth (between that middle octave note and that fourth), but for some reason not so wide that it exceeds what would be a 6:3 octave (in the top half of that double octave).

The 1:1 correction at the 3:1 level is quite simple. To tune G4 a perfect twelfth from C3, play the twelfth with open and unison-tuned strings on at least G4. Listen for the beat rate at that 3:1 level (and even test it with the major sixth/major seventeenth test). Duplicate that beat rate in the first partial of the two strings of G4, and tune out that beat rate. This twelfth is of course wider than most hands will stretch. Pitch shimming here does away with the requirement that both notes be sounding simultaneously for direct interval tuning. (Sure, there's a sostenuto, but not on every piano.)

In moving away from the variety of 1:1 corrections we will still be duplicating the beat rates, however not on the same partial level. Here the mathematical proportions come into play. For instance, duplicating a beat rate found in the interval, not at that first partial of the note being tuned but at a higher one, will modulate the partial beat rate proportionately. Duplicating that beat rate not on the first but the second will slow the speed of the first partial's beat rate by one half. There are many examples of thus modifying these beat rates fractionally.

We'll start with the 2:1 correction, which could be used for splitting a difference in beat rates in a pair of contiguous intervals, by moving the common note. The first thing to notice here is that the actual pitch whose beat rate is being adjusted is different for the upper and lower fifths. You've been doing this already, checking your temperament with the F/A-F/D-G/E-C/E sequence. The fact that we're doing it here is a function of the proportion of the correction. In a 1:1 correction our beat rate correction remains at the same partial level as the coincidental partial level where it was found in the interval. The correction is now a fractional amount and to execute this we have to move the beat rate to be matched from one partial level to another. This is commonly used in evening up a temperament's intervals. Take, for instance, contiguous 3:2 fifths, with the middle common note tuned such that the bottom fifth beats at two bps, and the top is pure. There are two ways to split that difference between the two fourths. One would be to sub-divide that two bps into one bps. This is a musicians trick, using the venerable "one-and-two-and, one ... two ..." (The mnemonic for three is "elephant", four is "rhinoceros" and five, "hippopotamus.") To split the difference by pitch shimming, take that two bps of the bottom fifth and duplicate that in the middle note's unisons not at the third partial but at the sixth. Now re-tune the other string (or strings) which was open in the unison of that middle note. Thus that third partial of the middle note in the upper contiguous pair of fifths has had its beat rate cut in half. You have now equally divided the error between those two fifths. If you had made the correction

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Your Friend, the Unison

Continued from Previous Page

on the third partial level, the two bps would simply have been transferred in total from one fifth to the other. Splitting the difference with a pair of contiguous fourths works identically.

The 3:1 correction I use every day, for setting the pitch lead in minor pitch raises/lowers. Say I discover that the first partial of A4 is five bps flat to the first partial of my tuning fork. To establish a pitch for the pitch raise tuning which is the required 33 percent above the intended A=440, I would first set the LH string of A4 dead even with the fork using the 17th below as a test tone. I would then memorize the beat rate between the center string at the original pitch and the left string at A=440 (in this example, five bps), then duplicate that beat rate at the third partial level on the center string, and finally retune the LH string to the center string's new pitch. This new pitch, as you can see, covers the distance between the original A4 and the tuning fork's pitch standard, plus an extra amount equal to 1/3 that distance. QED.

There is, of course, a wild and woolly beyond available in the many ratios between pitch level. Do you need a 14 percent correction to the pitch of a note in an interval? Find the beat rate at the second partial and duplicate it at the seventh. But now you're entering deep left field, where you'll discover that gauging these beat rates intuitively is faster than the strict measurement of beat frequencies. No matter that a different side of the brain has now taken over; the principle and process remain.

In fact in any of these corrections, the numbers are unnecessary (1:3, 3:7, etc.). What they do offer is a concise definition for your procedure, as well as a numerical gauge for the size of the correction. Also, keep in mind that any strict prescriptions for intervals will turn out to be no more than good starting places, because there is no piano which, if you really want to harmonize it, will let you do it without compromising your favorite intervals. Finally, it takes a lot more time to explain this technique than to do it. Keep your eye on the ball, and your ear on the pulses.

In Conclusion ...

Yes, the unison is quite an elaborate tool. However, I'd like to caution the readers about all these numbers. The collection of tuning checks which are based on the numerical relationships between partials is large. However, the whole process of tuning is much more than this. Ultimately what's being done to give the piano's harmony a consistent texture with the smooth contours of the lower intervals (2:1, 3:1, 3:2, 4:1, 4:2, 4:3) and a judicious animation in the higher intervals, beginning with sixths and thirds. However, unison tuning among the partials is where we begin.

If you do your pitch shimming fast enough, you'll have the two strings tuned faster than if you were moving a mute.

Some may comment that simply reaching for a mute and correcting the interval directly on single strings would be much faster than fussing with all these partial numbers. After all, what we're doing is actually just bringing in the unisons after all our interval work is done. But that correction only delivers the tuning of one string, and you can count on cleaning up the error occurring when you bring that second string into unison with the first. Do your pitch shimming fast enough, and you'll have two strings tuned without moving a mute. After all, the policy is that a unison cannot be considered ready to participate in an interval until at least two strings on that note have been done. But will the single mute work required by pitch shimming slow you down? If you do your pitch shimming fast enough, you'll have the two strings tuned faster than if you were moving a mute. (By the way, as long as you have a free fingernail, you'll never have to reach for a mute.) And in all of this unison work there is the added benefit of the ear training, in the many momentary situations that are typical of single mute work.

You will also find that the constant contact with and manipulation of unisons will only serve to strengthen your ears' focus. Mismatched bass strings, slack strings, Gonzo tuning, and the Bugler's Articulation, these are all exercises to hook you up with individual partials. Very quickly thereafter this pitch shimming, however arithmetical, will become second nature. Add to this sharpened focus, the ability of pitch shimming to clean up your tuning and you will begin to appreciate "your friend, the unison."

On the Other Hand ...

I hope that this article has given you something worth putting in your toolbox. If not, I'll be forced to reveal one of the fiercely guarded secrets of Real Piano Men: how to check over a concert tuning. Real Piano Men? As we all know, they are a dying breed. Now, any Real Man can order the Spam and cheese hoagie while the rest of us will have the spider plant quiche (thank you), but few of these are chosen to become Real Piano Men.

Mind you, I'm not saying that we all, ladies included, could, should, or ever would want to emulate Real Piano Men. Given how easy we have it in the 1990s it would be a delusion and a heartbreak. But lest we forget what it used to be like in the Good Old Days when Old World Craftsmanship was a recent immigrant, let me point out that Real Piano Men don't sit down to tune, nor do they cut their lacquer when voicing. Real Piano Men also don't use anything besides their hands to twist a bass string, and are known to cut music wire with their teeth .... You know who you are.

How does a Real Piano Man test to see that his octaves and unisons stayed true during a concert tuning? Under most circumstances, checks are a sign of shameless milque-toast weakness. But let's say that during this afternoon's tuning, he might be thinking more about repinning the set of the damper underlever flanges, always an important detail, before a concert. Our Real Piano Man depresses the sustain pedal, and pounds out a version of Tchaikovsky's "*Bells of St. Petersburg*" in tri-tone chromatic clusters. He pores over this panorama of harmonics, examining the myriad beat rates for such factors as stability and decay, sifting through the final traces of tones as they disappear from his ear canal. Wherever they may lie in across the piano's scale, any wayward partials are quickly pinpointed.

This may seem like an unlikely way of finding needles in a haystack, but fortunately for the Real Piano Man, there aren't more than two or three corrections to be found. Any questions? I thought not.

On Tuning The A3-A4 Octave

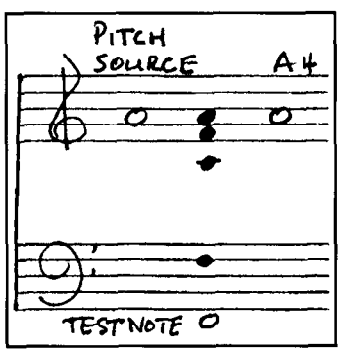
By Fred W. Tremper, RPT
Morehead State University
Bluegrass, KY Chapter

After having set A4 to the tuning fork or some other pitch source, the first step in setting a temperament is placing the A3-A4 octave. Assuming the A4 is at 440 Hz, how does one go about placing A3? How can the proper stretch be found?

The key to the problem is in the natural effect that inharmonicity has on the intervals we tune. In my article that appeared in the May 1995 *Journal*, "A Study in Inharmonicity," I commented on a phenomenon that has long been observed: that if one octave is tuned just, other octaves are either expanded or contracted; to wit:

Octave Behavior Due to Inharmonicity			
Octave	2:1	4:2	6:3
2:1	Just	Contracted	Contracted
4:2	Expanded	Just	Contracted
6:3	Expanded	Expanded	Just

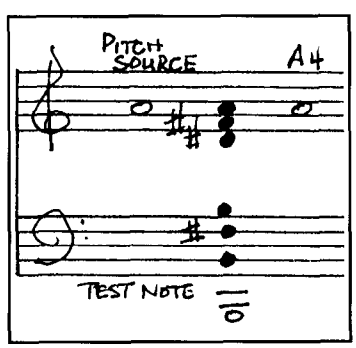
This information is the key to understanding how the A3-A4 octave can be expanded. As critical as is the proper setting of A3, the proper placement of A4 is vital, and that should be discussed first. Fortunately, there are several checks that can be used to insure proper setting.



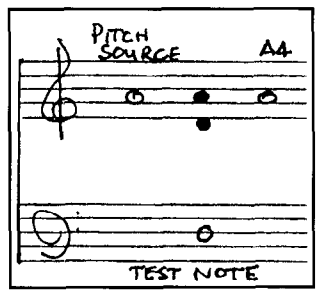
Setting A4 to the Pitch Source

The test note most often used by tuners is, perhaps, F2. The frequency of the fifth partial of F2 is very close to the frequency of the tuning fork (or another pitch source), close enough to cause beats to form when F2 and the tuning fork are sounded simultaneously. Then, when A4 is sounded at the same time as F2 and the two beat rates are identical, the A4 is at 440 Hz.

F2 is not the only test note that can be used. There are at least two others.

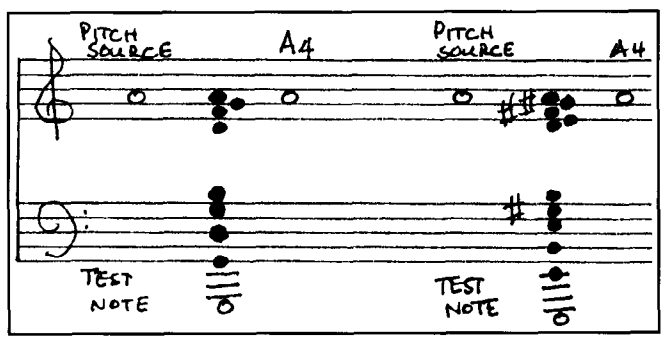


B1 as the test note is an excellent one to use. Here the seventh partial of F1 is very close to 440 Hz, close enough to cause beats to form. Again, when B1 is sounded at the same time as the pitch source and the beat rates between the two are identical, the A4 is at 440 Hz. Note that B1-A4 is an expanded interval. As such, you will most likely have to raise B1 to get readable beats.



Another test note to use is D3. To make this particular test work, D3 must be on the flat side, flat enough for beats to form when played against the pitch source. First, play the source against D3, lower D3 as necessary, and listen for the beats. Then play D3 and A4 simultaneously. When the beat rates match, A4 is at 440 Hz.

Still other test notes to use are G1 and E1, although more rarely. The partials that intersect with A4 are, respectively, the ninth and eleventh. I suspect that these test notes are better used on larger pianos, however. Note that G1-A4 is a contracted interval. As such, it will be necessary for you to lower G1 to obtain beats. The interval E1-A4 is an expanded interval. You will have to raise E1 to obtain readable beats.



We can now observe that any note can be used as a test note as long as one of its odd-numbered partials intersects with A4. It is definitely to your advantage to have so many test notes at your disposal. On any given piano, certain partials may be very strong, very weak, or can pulsate, as it were, between strong and weak. Find the test note that gives you the best reading and use it as your primary note. Any of the others can then be used to double check. Note further that none of the test notes listed above are, most likely, in your temperament octave. When you get to these notes in your tuning they can be adjusted as necessary.

Setting a Just A3-A4 Octave

Many sources suggest that the first step in tempering an interval is first to set it just and then alter the pitch of the variable note. Recall that when expanding the A3-A4 octave it is A3 that is adjusted. How much A3 is altered is dictated by the piano itself. The method I propose is first to set a just 4:2 octave. There is more than one way this can be done.

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On Tuning The A3-A4 Octave

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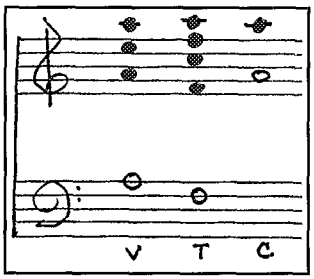
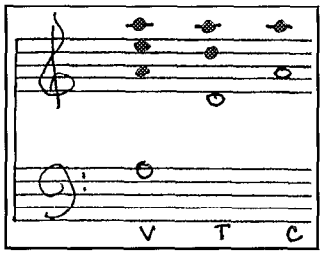


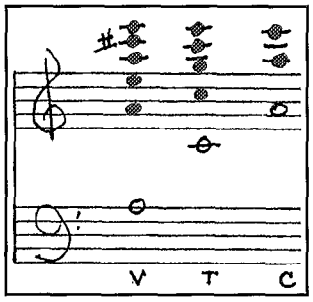
Start by tuning a just 4:2 octave. The test most often used by tuners is the M3-M10 check. The test note (T) in this check is F3. The variable (V) is A3 and the constant (C) is A4. The fifth partial of F3 and the fourth partial of A3 coincide at A5, the second partial of A4. When the beat rate of the M3 equals that of the M10, the octave is just.

The M3-M10 check is certainly a valid test, but for some it is awkward to use. It requires the M10 be played with two hands, one hand on F3-A3 and both hands on M10. The hand must then leave A4 to manipulate the tuning lever—back and forth, back and forth.

A much easier way to set a 4:2 octave is to use D4 as the test note. The advantage of using this note is that the two intervals, P4 and P5 can easily be struck with one hand and the other hand never has to leave the tuning lever.



Lower D4 until a readable beat rate is heard between A4 and D4. This gives you an expanded P5 and, consequently, a contracted P4. Then manipulate the lower note of the octave, A3, until you have equal beating. Bear in mind that the note being tuned is A3 and that the interval between A3 and D4 is a contracted P4. As with any contracted interval, the beat rate will be faster when A3 is raised and slower when it is lowered. This will give you a just 4:2 octave. You can confirm this by comparing it to the M3-M10 check described above.



The next step is to set a just 6:3 octave.

This check is set by using the m3-M6 test. This test uses C4 as its test note. If the beat rate between C4 and A4 is uncomfortable because it is beating too fast, raise C4 until you find one that is better for you. The 4:2 octave being just causes the 6:3 octave to be contracted.

To make the 6:3 octave just, lower A3 until you have equal beating between A3-C4 and C4-A4.

Setting the Expanded A3-A4 Octave

After you have established equal beating between A3-C4 and C4-A4, the A3-A4 octave then will be just and the 4:2 octave expanded. The expansion of the octave most likely will be unacceptable in that there will be considerable audible beating. Raise A3 until A3-C4 beats somewhat slower than C4-A4. The 4:2 octave is then stretched and is somewhere between a just 4:2 and a just 6:3 octave.

. At some point you will accept the beating of the 4:2 octave, knowing that it is an expanded octave. Exactly where A3 is placed depends upon the piano, the requirements of your temperament, and your own good taste.

Grand Illusions ...

The Page for Serious Cases

Customer Relations

By Joe Mehaffey

One of my customers recently accused me of scratching her piano. I said, "I *couldn't* have done that — that's an *old* scratch." She wasn't convinced, so I took a screwdriver and drew a line with it. "*That's* what a *new* scratch looks like."

Which brings me to my topic for this month — what do you do when you are fleeing from an angry client?

- Whenever you're tuning, make sure the front door is unlocked and slightly ajar. If you have to fiddle with a deadbolt, you'll *never* get away.
- When you decide to run, grab only your most important tool case. You'll need one hand free to open doors and fend off adversaries.
- What do you do if your client is catching up with you? Some people toss a chair or bicycle to trip her up. But it's easier to carry a wad of paper which is printed like a hundred-dollar bill on one side. Fold one over, and then let it fall as if by accident. Usually, your client will stop to pick it up. If not, you're dealing with a real nut case.

But never use the fake bills to buy anything. That would be totally unethical.

Joe Mehaffey and Doug McKay may be contacted c/o Mark Stivers, RPT, Sacramento Valley, CA Chapter

The Minimum Service Call

By Doug McKay

In these necessary times, a lot of your customers can't afford a full-service call. For them, I suggest a minimum service. Here it is:

1. Lift the piano lid.
2. Stare intently inside the piano. Act very serious. When the customer asks "Is something wrong?," don't answer right away. Silently count to three, then jerk to attention and say, "Did you say something?"
3. Using a spotless damp cloth, wipe the piano keys clean.
4. As you collect the check, shake the customer's hand. If this is the second visit or later, you may hug the customer.

Minimum service. It's the *least* you can do.

The Cowboy Tuners

I got my hands,
And I got my tools.
Uprights 'n' grands
Are my cows 'n' bulls.
—The Ballad of the Cowboy Tuner (1870)

When the homesteaders first came to the Great Plains in the 1860s, they brought along as much civilization as they could — including pianos. With pianos came tuners.

These tuners had the usual minor problems — inharmonicity, popping pins, upper-back pain — and one deadly problem. The cowboy.

Cowboys hated pianos, which they saw as a threat to their beloved guitars. Sometimes the cowboys chopped up the pianos; sometimes they simply shot the tuner. Many a tuner died still clutching his voicing tool.

{In the first draft of *Oklahoma!*, Oscar Hammerstein wrote the lyrics "The tuner and the cowman should be friends ...." Rogers eventually convinced him to change "tuner" to "farmer," to gain a wider audience.}

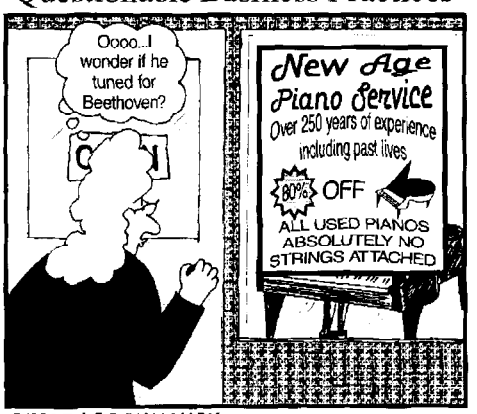
Tuners and cowboys have long since settled their differences, but the memory of the Cowboy-Tuner War lives on in folk songs.

And when I've died,
As I know I must,
Rub down my hide,
With some Teflon dust.

PIANOMAN Adventures

by Alan Hallmark

Questionable Business Practices



PTG Review

Dedicated To PTG News • Interests & Organizational Activities

PIANO TECHNICIANS GUILD

Look for Opportunities

ECONOMIC NEWS & VIEWS

We are occasionally introduced to new words, for instance, in the computer world we learned bytes, floppy disk, wildcards, modem, mouse and a host of others.

A couple of years ago I was introduced, or maybe re-introduced, to a word I had not used in a long time. The word "paradigm." One of our chapter members had invited a guest speaker to our chapter meeting and he presented a program using the word "paradigm." Since then I have seen it used in periodicals, religious news, and also in the comic strips. I believe it was the Born Loser, when asked the meaning of the word called it "two pairs of nickels."

Webster says it is: "1. A pattern, example, or model." Our guest speaker used the example of always looking for opportunities for extra income while in the home. If my memory serves me well, he was an insurance salesman While in the home he would observe if there were smoke detectors installed and working; if not, he would go to the car, bring in one or two and install them, all the time telling the customer the importance of the detectors and relaying a story or two of homes that did not have them when an emergency arose. He would always make the sale and that was extra income for his days work. I was so impressed that I thought of what I could do for extra income on each job. The idea came to me of selling more Dampp-Chaser® systems. Since I have made that commitment, opportunities pop up all over the place.

Continued on Next Page

Hands-On Got You Tight Around The Collar?

By John Ragusa, RPT Assistant Institute Director

After years of servicing pianos, many of us find it a little hard to admit that there are some aspects of piano service where we are less proficient than others — even in some areas where you might think we would all be expert. The vast majority of us spend a great deal of time tuning and administering minor repairs. But we are all faced with occasional tasks that we don't perform on a regular basis. This summer's PTG Institute in Orlando will once again offer sections in applied skills. These are hands-on seminars designed for the working technician needing some polish in any of several areas of piano service. From fixing scratches to grand damper wire bending and regulation, there is a lot here you can't afford to miss. Shop technicians can check out new procedures, and those who spend their time primarily in the field can get tutored, hands-on instruction.

We attend many classes in which we are just casual observers. But how much of this do we really carry into the field with us? After a class with a great instructor, many of us walk away with our handouts and the enthusiasm of a vivid yet passive experience and think that shortly after returning home, we're going to work on these fine new ideas. But then we see we're backed up on our service appointments and two months later we've forgotten all about that excellent class.

Technicians getting started in business will find the applied skills sessions a real window to the future of repair procedures they will encounter. Though these sessions will not replace a formal tour of education for the professional technician, they will help you to better evaluate potential learning facilities and gauge the skills you will need. You're welcome to observe or try your hand at these professionally staffed work stations.

If you hate having to experiment in the customer's home, check out our vast array of repair stations and fill in those gray areas in your expertise. This year, to accommodate those who don't want to sacrifice class time, we'll be offering an evening session from 6 to 9 p.m. on Friday. The whole section will be repeated on Sunday from 8:30 to 10 a.m. and 10:30 a.m. to noon. The experts are there to guide you and will do so gladly. After all, you have nothing to lose and much to gain.

News from Across the Nation

CHAPTER SERVICES COMMITTEE

As they used to say on Laugh-In, "What's the news across the nation, we have got the information." Well, some of the information. Items have trickled in, mostly from newsletter exchanges to me. I hope all you NL editors are sending your wares to your Chapter Services Reps so they can pass that information around. It doesn't do much good to have an information highway if you never get in your car. Of course, as you may have surmised from the December *Journal* article, submission to the *Journal* does not mean instant publication. I guess I knew that, but it didn't register. So now that I know that and you know that, we all know that some of this news may seem a bit old (I'm writing this in November for publication in January). So maybe we could get a radio station (after all, we all have radios and believe it or not, we don't all have computers, let alone on-line capabilities, Sorry Mr. Gore). So what have other chapters been up to? Here's what I have to date:

Central East Region: Quad Cities Chapter had their second successful "Piano Celebration" at 3 Malls in the Quad City area. Teachers, adults and kids played on pianos from co-operating stores. Members were on hand to show kids the insides of pianos (see previous article by CERVP Laura Kunsky). Northern Michigan chapter has initiated a Newsletter "Capstans Courageous." A chapter newsletter is an invaluable tool for chapter management, getting the word out and sharing information. The Madison Chapter is planning a Regional Seminar for April 25-17 at U of Wisconsin. Waukegan Chapter is planning a Regional for October 1997 and the Cleveland Chapter is signed on for the Ohio State Conference in October 1998. The Chicago Chapter had a "Tune Off" with Virgil Smith tuning aurally and Jim Coleman on the Accu-tuner.
Central West Region: The St. Louis Chapter volunteered to help people with the phone banks during the local public TV station's fall fund drive. In addition to aiding and abetting the local PBS, it provided exposure for the local PTG chapter. This is a great idea for public awareness of PTG and good public relations.

— Kim Fippin,
Chairman Chapter Services

Look for Opportunities

Continued from Previous Page

I suppose they were there all the time, but too often overlooked. I purchased one of those neat little gauges, the Digital Temperature & Humidity Gauge, from Pianotek. It shows the customer very quickly how high the humidity is in the piano. I then present them with Technical Bulletin #3 on Humidity Control and let the customer read it while I explain that these Dampp-Chaser products are the finest products on the American market, trouble free, long lasting, and efficient. Needless to say my Dampp-Chaser sales have increased dramatically. The most I ever sold in one day was three units, so I always carry four units with me and hope I have to make another trip some day because I ran out. I know that Ruth Brown does a better job of selling these products than I, but my education is increasing fast. Ruth presells most of her customers through the telephone and mail, which is a great idea.

Another "extra" that I have used for years is the piano cleaning service. The ladies cannot stand dust and dirt. The dust that settles on their grand soundboards and in the pedal area on the verticals drives them crazy. Once you get the instrument clean on the inside and polished on the outside you can set the cleaning schedule again in five years. They love it. I also carry plenty of polish to sell.

I guess what I am trying to say is that there are opportunities that we so often overlook that can bring us extra income so easily by just providing quality, caring service to your customers. Look for those opportunities and watch your income increase and your reputation as a caring service person reach new heights.

— Gary Neie, RPT
Chairman Economic Affairs Committee

Two New Books about the Steinways: A Comparative Review

By Wade Johnson, RPT

Two ambitious books about the 150-year history of Steinway were both published in late 1995. *Steinway & Sons,* by Richard K. Lieberman (Yale University Press, 310 pages plus notes, hardcover $34.95) contains interesting historical detail about members of the Steinway family and their times, but has as its main focus their extraordinary piano making enterprise. *The Steinway Saga,* by D.W. Fostle (Scribner & Sons, 1995, 547 pages plus notes, hardcover $35.00) deals with the piano business in more general terms, usually with less technical detail, and focuses heavily on individual members of the family — especially the founder's youngest son, William, who was a dominant force in the family, in its piano making, in other business ventures, and in the cultural, social and political life of New York and America for more than three decades, until he died at age 61 in 1896. William kept a diary for 35 years, almost his entire working life. The book quotes copiously from it, and Mr. Fostle plainly sees William as having been a most remarkable human being in a remarkable family, the most aggressive developer if not the creator of "The Steinway Legend."

This reviewer read all of the text (and many of the notes) in both books and found each of them fascinating. From the piano technician's viewpoint, I would suggest reading the Lieberman book first, and then if you thirst for more, read Fostle's book. The Lieberman book will certainly gratify your curiosity *as a technician.*

For starters, Fostle is more

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To Promote the Use of the Piano

It was a gorgeous fall day in the Midwest, and music was in the air — thanks to members of Quad Cities Chapter of the PTG. Davenport and Bettendorf, Iowa, and Rock Island and Moline, Ill., were treated to a *Piano Celebration* to honor National Piano Month. Quad Cities Chapter technicians worked together with the Iowa Music Teacher Association, Federated Music Teachers Association, Foster Family Music, Griggs Music, Simon Music and J&B Music to host several events.

A Suzuki Piano Recital was held on Sept. 15 at the Duck Creek Mall. All area pianists were invited to play at the Davenport Public Library on Sept. 14, the Vanderveer Conservatory and Theos Java Club on Sept. 21. In my humble opinion, they saved the best for last. On Saturday, Sept. 29, area pianists performed at three different shopping malls from noon until 5 p.m.

At Duck Creek, Northpark and Southpark Malls nervous beginners played while their families proudly watched. Teens, who had obviously taken years of lessons, played more challenging compositions. Teachers, adult beginners, seasoned performers and even the mayor of Bettendorf shared their love of music! One woman in her 80s played several show tunes and soon onlookers were making requests!

It was fascinating to watch the audience. Shoppers stopped and watched and listened. Mothers with babies in strollers caught a vision of what might be. Little children danced and more than one person commented: "I took lessons when I was a child, *I really wish I had never given it up.*" The music drew them in!

Quad Cities Chapter members were stationed at each location. They used action models and a partly disassembled studio piano to explain to interested children and adults how a piano works. At one location, their PTG Chapter Services award was proudly displayed. They won this award for last years *Piano Celebration.*

These piano technicians gave up their Saturday and many additional hours organizing, negotiating and tuning to make these events possible. The Quad Cities Chapter has 27 members, and like most of our chapters, only a handful are willing or able to help. Still, they managed to get the dealers and teachers in their area to *work together* to promote the use of the piano. The result of their efforts positively impacts us all.

Wanted: PTG Officer Nominations

Since the Piano Technicians Guild was set up with a democratic-representative form of self-government, "We, the people" (i.e., RPTs and Associates) *all* have a say in how it is run.

"All?" you ask.

Yes, all.

All of us, regardless of our member status, have the privilege of paying our dues, which in turn pays the expenses of our Home Office, staff, *Journal* production, travel expenses of our national officers as they represent you and me at board meetings, regional and state conferences and seminars, the annual convention, and to represent our association to the music world at other industry meetings and conferences we ask them to attend on our behalf, such as annual

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Two New Books about the Steinways: A Comparative Review

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probing when he delves into the early Steinway family history, both in Germany and in New York: in both places, he questions the "official" history (as probably proclaimed by William in furtherance of his enterprises) based on research, although the available records are fragmentary. For example (quoting Fostle); "In fact, (Heinrich Engelhard Steinweg) was the fourth of eight children, not the last of twelve; not the son of a "forester," but of a "kohlermeister" or charcoalmaker ... it was claimed that Heinrich's ancestors were, "well-known and well-to-do patricians." In truth, connected to aristocracy only by a surname meaning "stone road," his forbears lived serf-like lives in the hamlets of the Harz Mountains for at least three generations before he was born." (Heinrich could neither read nor write, so whatever he may have told his sons would have been verbal, and in German.)

In another example, Fostle, through his research demonstrates that the official Steinway story — that the family on arriving in New York lived at 199 Hester Street, but worked in various piano shops till they opened their own business on March 5, 1853 at 85 Varick Street as Steinway & Sons — is not the whole truth. He presents strong evidence that from their 1850 beginnings on Hester Street, with some help from people living and working with them at that address, the family made pianos, some for other companies and a few that may have borne the Steinway name. These are details that in no way detract from the family history, but do make it more interesting. Fostle's descriptions of living conditions in the Hester Street vicinity in New York in the 1850's, incidentally, are vivid — and not for the weak-of-stomach!

To quote Robert Cloutier, whose review of these two books appeared in the May/June 1996 issue of *Piano & Keyboard*: "Both authors re-count the tremendous success of the Steinway piano, the factory strikes, the trade wars, the competition to attract an artist following, the depression years, the war years, the German connection, and the Japanese competition (both real and imagined), but Fostle adds a thousand dead horses rotting in the streets, brothels, beer halls, and the smell of sewers, privies, and fat-rendering houses, and how all these led to sickness in the working and living environment for the factory workers and Steinway family alike. The Steinway men built instruments of intense beauty, yet suffered slow and painful deaths."

The Steinways were an amazing and gifted family, and the two authors have created books that are somewhat different, but both highly rewarding.

Wanted: PTG Officer Nominations

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NMTA and NAMM events.

We also have the privilege of giving our opinion, both verbally and in writing. We can talk personally or make telephone calls to individuals at the chapter level. We can call or write our regional vice president, or talk with them personally when they visit our local chapter or when we attend regional and state conferences. We can ask questions and voice our opinion to our national officers on the phone, in writing or in person when we attend state and regional conferences. And with the popularity of modern computers and modems, many members prefer to make contact via e-mail, or leave a message when they visit the PTG home page on the net. There are many ways in which we are both asked and encouraged to make our opinions known to those we have asked to represent us.

And all members are invited and welcome to take the Registered Piano Technician examinations and, once passed, to exercise the privilege of voting for chapter delegates to the annual Council of Delegates each July, serving as a delegate to Council, or even running for or serving in a national office; president, vice president or secretary/treasurer, or as a regional vice president.

Which brings us to the purpose of this particular article.

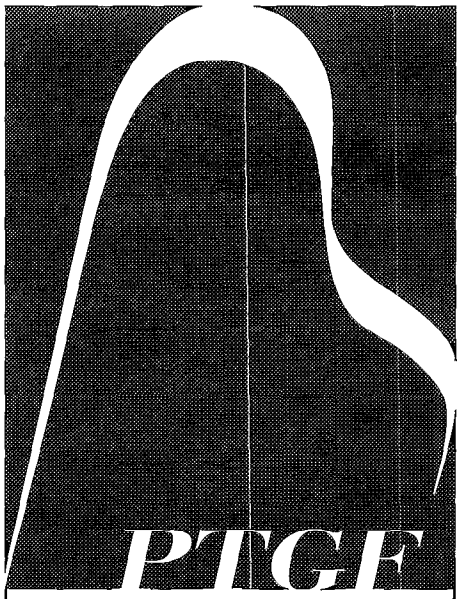
As chair of the nominations committee, it is my pleasure (well, it's a "duty" according to our bylaws, but I consider it a pleasure) to invite you to present nominations for our national offices. Our bylaws say that Chapters may submit nominations. Further, any member (meaning, of course, RPTs) in good standing may submit their own name for consideration. All nominations must be submitted by February 1, 1997, to be included in the Nominating Committee report, but nominations may be submitted after that date. (If you have further questions, see PTG Bylaws Article XI, Section D. If you still have questions, contact your regional vice president, or the PTG Home Office.)

Between February 1 and April 1, our committee will prepare a list of nominees, showing whom was nominated for president, vice president, secretary-treasurer and each of the seven regional vice presidents, and also make a committee selection (as appropriate) of a recommendation for president, vice president and secretary-treasurer. This list will be submitted to the membership (probably through the *Journal*), not less than 70 days prior to the annual Council session.

As of the writing of this article (in November), only one nomination has been received by the Nominating Committee. I suspect you have an opinion about whom you would like to see serve as our national officers next year, and you are thereby, formally, invited to present that opinion to the Nominating Committee you selected last July to handle this duty on your behalf.

You can send your nomination, in writing, directly to the Home Office, or to the Nominating Committee Chair, Randy Potter, RPT. We will acknowledge all nominations in writing. We look forward to hearing from you, and/or your chapter.

— Randy Potter, RPT
Nominating Committee Chairman



The PTG Foundation Needs Your Help!

The history of PTG and its predecessors is in danger of being lost. As part of its mission, the PTG Foundation has taken on the task of preserving that history.

The work of collecting, organizing and preserving our past must be an ongoing part of our present. Your donation of money or historical materials will allow us to continue this important work. You may also designate the PTG Foundation as the beneficiary of your PTG death benefit. Contact the Home Office for details.

Honor a mentor, friend or associate, either living or deceased, with a tax-deductible contribution. Three contribution levels have been established:

- Patron ($100 or more)
- Contributor ($50-$99)
- Supporter ($35)

To make a contribution, or for more information, contact:

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3930 Washington
Kansas City, MO 64111
(816) 753-7747

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315 MAYFIELD ROAD
GAFFNEY, SC 29340

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WASILLA, AK 99654

In Memory

Charles Richey, RPT
NORTH CENTRAL LOUISIANA

EVENTS CALENDAR

February 21-23, 1997
CALIFORNIA STATE CONVENTION
Radisson Hotel, Sacramento, CA
Contact: Yvonne Ashmore, (916)273-8800
12700 La Barr Meadows Rd, Grass Valley, CA 95949
Website address: www.dcalcoda.com/ptg/

March 14-16, 1997
PACIFIC NORTHWEST
West Coast Tyee Hotel, Olympia, WA
Contact: Mitch Kiel (360)264-5112
11326 Patsy Drive, SE, Olympia, WA 98501

April 3-6, 1997
PENNSYLVANIA STATE CONVENTION
Days Inn, State College, PA
Contact: Fred Fornwalt, (814)942-1489
1333 Logan Blvd., Altoona, PA 16602

May 1-4, 1997
NEW ENGLAND / EASTERN CANADA REGIONAL
Ramada Inn, Portland, ME
Contact: Joseph Bacica (207)846-0966
P.O. Box 1575, Portland, ME 04104

May 9 & 10, 1997
UTAH INTERMOUNTAIN SEMINAR
Snowbird Resort, Salt Lake City, UT
Contact: Judy Rapp, (801)298-7875
1151 West 400 North, W. Bountiful, UT 84087

July 17-23, 1997
PTG ANNUAL CONVENTION & TECHNICAL INSTITUTE
Twin Towers Hotel & Convention Center, Orlando, FL
Contact: PTG Home Office (816)753-7747
3930 Washington, Kansas City, MO 64111

All seminars, conferences, conventions and events listed here are approved PTG activities.

Chapters and regions wishing to have their function listed must complete a seminar request form. To obtain one of these forms, contact the PTG Home Office or your Regional Vice President.

Once approval is given and your request form reaches Home Office, your event will be listed through the month in which it is to take place.

Deadline to be included in the Events Calendar is at least 45 days before the publication date; however, once the request is approved, it will automatically be included in the next available issue.

AUXILIARY
EXCHANGE

Dedicated To Auxiliary News and Interests

New Year a New Beginning

A wonderful and sincere Happy New Year. As we look forward to the new century and the excitement that that event will bring, let us not overlook the joys of the present. We have been blessed with no major wars during the last decades, conflicts and fighting in the world, yes, but no major world conflicts such as World War II brought upon us. The majority of us members can remember those years and may we never see anything like that again. So be thankful for the blessings we have today.

I am looking forward to this new year in the Auxiliary as it could turn out to be a new beginning for us. Where are we going with this organization? What are our goals? Why are we members? What *is* our future? As you ponder all of these things, please jot down some ideas you have and send them off to our chairperson of the Reconstruction Committee, Pat Calamine.

Which leads me to my important message to you at the beginning of this New Year. There will be a questionnaire coming to all of the Registered Piano Technicians soon. Please sit down with your spouse and fill this out completely. There will be some questions about us and our organization and how it relates to the technicians. Please help your tuner/spouse fill this out and send it in promptly. Would you do this for me and for all of us. Don't let this paper sit on your desk for a "later time" and miss the deadline. It's important to our future.

Phyllis Tremper
PTGA President

Please make a commitment to attend seminars with your tuner/spouse and get involved with the family business. (See Marilyn Raudenbush's article on the Pennsylvania seminar.) You will have a very good time but above all, you will meet new friends and old who are in the same business and make *new* friends for life. That can be one of the joys of this new year. Good health to all and may this be your best year ever, both in your business and personal life.

I look forward to seeing all of you in the sunny state of Florida in July. During this holiday time when music is so plentiful and beautiful, remember to put a little music in *your* life. It is food for the soul.

Resolutions to Actions

Happy New Year! I hope you have a healthy and prosperous new year, and that this is the best year you will ever have!

Now that the holidays are behind us, it is time to start thinking about the new year's resolutions. If you are like me, there is always a list of things that did not get done last year. I would like to share a few ideas with you. I hope you can join me, and make some of the same resolutions.

- Appreciate each day, and make each day count, even January, February and March.
- Take time, to spend with friends and family. Relationships require effort. I must regularly take time to really communicate and continue to build happy and healthy relationships.
- Exercise more. Walk several times a week, even if it means the mall or treadmill.
- Finish all the projects that I started last year.
- Try to lose those extra pounds that I have been procrastinating on losing. The problem is that I lose it, and "it" finds me again.
- PTGA ... I hope you will add to your list, to become more involved

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Resolutions to Actions

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in PTGA. Support your PTG member by giving support and attending PTGA activities.

It was a very busy fall season, and the winter months will be just as busy. I work in the office of our piano business and every church and school needing an appointment. I was able to attend many Christmas programs involving my grandchildren. Each one is in a different school, and my son is a music teacher in another school. For his Christmas concert he always needs new costumes to be made. This year I made 24 toy tin soldier and ballerina costumes. He has a choir of 350 children. Every child has a part on stage and in the choir. Every child is made to feel important.

My four grandchildren are an important part of my life. Jeffery, is involved in all sports, so we attend sporting events all year. Melody, Mercy and Michelle live in the same town, so I see them more often. They are part of a group at church, called "Missionettes." It is similar to the Girl Scouts, but within their church. The girls entered the annual competition in several areas. Some of the categories are cookie making, drama, singing, instrumental and sewing. Melody, age 11, decided to try the sewing category. Of course, I was chosen to teach her to sew. She has done very well, by making a skirt and vest. It gave us a chance to spend some quality time together, and build some memories.

I interpreted several plays at the county college for deaf students. It is a real challenge to interpret, so that they enjoy the programs. The deaf enjoy Christmas, especially the parties. I hosted a large Christmas party, with lots of food, and great times.

I really do not look forward to January, February and March. Last winter we had a record amount of snow. In one day we had 33" and a total of 66" in a week. The children had a great time because they could completely disappear in the snow. My husband and I took on the challenge of insulating the attic during the blizzard of '96. Can you understand how bored we were? I have always envied those who live in Florida and miss all this excitement.

Let me remind you the Pennsylvania PTG State Conference will be April 3 - 6th, 1997, in State College, Penn. This is just after Easter so the weather will be good. An all day tour of the area has been planned, without any extra cost. There are luncheons and classes, as well as many other activities for us to do. This would make a good trip, to be able to spend time with your technician, enjoy the PTGA and get away for a few days. The hotel is one block from the Penn State University campus where some of the technical classes will be held.

At every convention the PTGA has something for everyone. The PTGA tries very hard to plan activities that you will enjoy. I wish you would consider attending. If you have any questions, please contact me. My phone is 609-825-2857 and my E-mail is Raudy88aol.com. If I don't hear from you, then I hope to see you at the State College Conference or in Orlando.

I have just one last comment. Did you pay your 1997 PTGA dues? The dues are only $15 for a year. That's a great bargain for 1997!

— Marilyn Raudenbush
PTGA Treasurer

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PIANOS - Yamaha and Kawai grands $1850 and up. 23 Steinway grands and verticals. Large quantity of used American grands from $700 up. We buy pianos. Ed's 504-542-7090.

PINBLOCK MATERIAL NOW AVAILABLE FROM GENEVA INTERNATIONAL! Geneva International Corporation, exclusive U.S. distributors of Petrof and Weinbach pianos, is pleased to announce the availability of Marion plywood pinblock material. Constructed of select hard maple, the Marion pinblock is well suited for the rebuilding technician. Call Alan Vincent at 1-800-533-2388 for pricing and more information.

New from PROTEK: Pro*lube* Spray Lubricant. Protek Pro*lube* is an advanced state polymer lubricant. Designed around the successful CLP formula, Pro*lube* is for higher friction areas like the keybed and frame, shift and sostenuto mechanisms. Great for front and balance rail keypins and anywhere you would use a spray lubricant. Provides long lasting durable lubrication with virtually NO ODOR! With the addition of Pro*lube* along with CLP and MPL-1, Protek offers safe, high tech task specific tools for every lubricating need. Ask for Pro*lube* at the supply house you do business with.

REPAIR CHIPPED IVORY IN 20 MINUTES. "AcryliKey" ivory restoration system produces a strong, color-matched, nearly invisible repair. Kit contains material enough for 50+ repairs plus pigments, mixing utensils, sanding pads, and complete instructions. $39.95 ppd. Richard Wagner, RPT; P.O. Box 1952 Lake Oswego, OR 97035 (503) 697-9254.

HELP WANTED

PIANO TECHNICIAN
Repairing, refinishing and tuning pianos, including testing components, leveling keys, replacing action parts and strings, tuning strings, polyester repair, soundboard repair, and reconditioning wooden parts. Concert preparation of pianos, including tuning to Concert Standard, Equal Temperament, and tuning with Historical Temperament (Mean Tone and Valotti). Voicing new, used and restored instruments. 2 yrs. training plus 2 yrs. experience in job. 40 hrs./wk, $22,000/yr. *Must have proof of legal authority to work in the United States. Send your resume to Iowa Department of Workforce Development,* 1000 N. Roosevelt, Burlington, IA 52601. Please refer to Job Order IA1100576. Employer paid advertisement.

SERVICES

STRAIGHT SIDES, SQUARE FRONTS and crisp notches are the benchmarks of our quality key recovering. Tops with fronts $115 plus return shipping and insurance. Call or write for free price list of our key restoration services. Yvonne Ashmore, RPT and Associates, 12700 La Barr Meadows Road, Grass Valley, CA 95949, 916-273-8800

KEY BUSHING: We use over 20 different sizes of Spurlock Precision Cauls. Send the micrometer measurement of the key pins and we will give you a perfect fit. Both rails high quality felt $85.00 or leather $95.00 plus return shipping and insurance. Write or call for free price list of our key restoration services. Yvonne Ashmore, RPT and Associates, 12700 La Barr Meadows Road, Grass Valley, CA 95949, 916-273-8800

PIANO PLATE REPAIR—The alternative to total loss or costly rebellying!! Welding of cracked or broken plates a specialty. Complete repair service offered. Call Bob Beck (RPT-New Jersey Chapter) (201)884-0404.

STEINWAY Action Frame Rails Resoldered, Replaced, and/or Repositioned. For price list write or call John Dewey Enterprises, Inc; 861 E. 2900 North Road, Penfield, IL 61862-9603, phone (217)595-5535.

SOUNDBOARDS INSTALLED, topsides rebuilt. Bridge-conformed, scale-diaphragmized boards with truly quartersawn ribs (sitka, eastern, or sugar pine). You send us the case, we'll return you a piano. Quality's the bottom line. David G. Hughes, RPT. 410-429-5060. Baltimore.

KEYBUSHING: Precision keybushing with high quality felt using Spurlock system. Both rails $85.00, return shipping included with prepaid order. Include key pin measurements for precise fit. Debra Legg Piano Service, 327 Rowena Lane, Dunedin, FL 34698, (813)734-3353.

REFINISH PIANO HARDWARE in nickel, brass, or chrome. Metal finishing specialists for over thirty years. Parts shipped back to you in 2-3 weeks. Rush jobs can be accommodated. Whitman Company, Inc. 356 South Ave., Whitman, MA 02382. Ph. 1-800-783-2433.

SENECA PIANO KEY. Quality key services at competitive prices. Sharps replaced, key bushing and the finest key recovering at any price. Write or call for price list and information on quick return of your key work. Seneca Piano Key, Ted Oberhaus, 4977 Frontenac Road, Trumansburg, NY 14886; 607-387-3095

REPLACEMENT SOUNDBOARD PANELS — North Hudson Woodcraft has been producing QUALITY soundboard blanks for over 100 years. We will custom build a spruce soundboard to your specs. Rib stock, shim stock, and quartersawn Hard Maple also available. For information and prices call: NORTH HUDSON WOODCRAFT CORP. (315)429-3105 - FAX (315)429-3479.

RESTORATION OF CARVED WORK, turnings, inlays, and marquetry, including repair of existing work and reproduction of missing pieces. Edwin Teale; 18920 Bridgeport Road; Dallas, OR 97338; 503-787-1004.

Antique Pump (Reed) Organ Restorations and Tuning. Piano & Reed Organ Shop, 125 W.S. "B" Str., Gas City, IN 46933. 317-674-4942 call evenings.

PIANO KEY SERVICE—
.075 Tops with fronts - $105.00
.095 Premium Tops with Fronts - $125.00
High Gloss Sharps (3 1/2") - $50.00
Keys Rebushed: Premium Cloth - $85.00
Custom Keys Made - Call for Price
Many other services available. Call or write for price list. FREE return freight on pre-paid orders of $75.00.
WALKER PIANO SERVICE,
554 State Route 1907, Fulton, KY 42041, 1-800-745-6819.

TRAINING

WELL-TEMPERED TUTOR. Learn to tune by ear with your Macintosh computer. Use pre-programmed temperaments or create your own. If you have trouble hearing beats, this program can isolate the beats for you. Score yourself with the PTG exam. Twenty-one historical temperaments also available. Demo disk available. Mark Anderson, RPT: 510-524-0390 (California). Great teaching tool!

NILES BRYANT OFFERS TWO HOME STUDY COURSES: Electronic Organ Servicing: Newly revised. Covers all makes and models — digital, analogue, LCT's, synthesizers, etc. Piano Technology: Tuning, regulating, repairing. Our 87th year! Free booklet; Write or call NILES BRYANT SCHOOL, Dept. G, Box 19700; Sacramento, CA 95819—(916)454-4748 (24 hrs.)

BILL GARLICK SEMINARS-Upgrade your skills at intensive six day resident seminars at Bill's home. Applications are invited for upcoming seminars in tuning, grand action regulation, historic tunings, harpsichord maintenance. Tuition includes instruction and use of facilities, private bedroom (share baths), breakfast and lunch. Write or call for information. Bill Garlick, RPT, 53 Weeks St., Blue Point, NY 11715; 516-363-7364.

THE RANDY POTTER SCHOOL OF PIANO TECHNOLOGY— Home Study programs for beginning students, associate members studying to upgrade to Registered Piano Technician, and RPT's wanting to continue their education. Tuning, repairing, regulating, voicing, apprentice training, business practices. Top instructors and materials. Call or write for information: RANDY POTTER, RPT; 61592 ORION DRIVE; BEND, OR 97702; 541-382-5411. See our ad on page 3.

VIDEOS

INSTRUCTIONAL VIDEO TAPES. Victor A. Benvenuto. Piano tuning, $50.00*; Grand Regulating, $50.00*; Grand Rebuilding, $100.00 (2)*; Key Making, $50.00*; Soundboard Replacement, $29.95*. (*Plus S/H). The Piano Shoppe, Inc., 6825 Germantown Avenue, Philadelphia, PA 19119-2113; Ph. 215-438-7038, Fax, 215-848-7426

SUPERIOR INSTRUCTIONAL TAPES ** All videos at one price, $50 @ ** Beginning Tuning, Upright Regulation, Aural and Visual Tuning, Grand Action Rebuilding, Exploring the Accu-Tuner, Grand Action Regulation, Voicing, Pinblock Installation, A to A Temperament, Baldassin-Sanderson Temperament, Bass Tuning - 3-Ways. Superior Instructional Tapes; 4 W. Del Rio Drive; Tempe, AZ 85282; Ph. 602-966-9159.

PIANOTECHNOLOGY EDUCATIONAL MATERIALS. $49.95 each reel— Vertical Piano Regulation, presented by Doug Neal. Presented by Cliff Geers: Plate & Pinblock Installation Part I, Plate & Pinblock Installation Part II, Wood Repairs, Soundboard Repair, and Grand Hammer Replacement. Add $5 per order for shipping and handling. Questions? Call 712-277-2187. Mail orders to PTEM, 3133 Summit, Sioux City, IA 51104.

WANTED

WANTED!! DEAD OR ALIVE: "Steinway uprights and grands." Call collect, Ben Knauer, 818-343-7744.

PIANOS! PIANOS! PIANOS! !!!Free phone appraisal!!! Buying all types of usable pianos. Cash or bank check on pick up. Won't hesitate on price. Call us first for fast professional service. "Steinway, Mason-Hamlin command specialty prices." Jay-Mart Wholesale, P.O. Box 21148, Cleveland, OH 44121. Call Irv Jacoby 1-800-411-2363, or collect 216-382-7600/FAX 216-382-3249.

CAN YOU HELP? Would like to contact the Tuner-Technician who worked on the Piano for the Bill Grahams Fillmore East Theatre, Greenwich Village, NY in the 60's and 70's. Please write to: J. Kirsch, 4485 Baintree, University Heights, OH 44118.

WANTED: USED PIANO TOOLS. Please send itemized list and selling price. Estate sales also welcome. Eliot Lee, 4131 E. Pinchot Ave., Phoenix, AZ 85018. (602)957-1711. Email : elee@amug.org

WANTED: TINY PIANOS such as the Wurlitzer Student Butterfly or other small types. Call collect: Doug Taylor, 607-895-6278. I'll pay shipping!

DISPLAY AD INDEX

Advertise your service in the *PTJournal* classifieds. An inexpensive and effective way to get the word out!

Call the Home Office by FEBRUARY 18 to be included in the April 97 issue.

Send your classified ad to:

PTG Home Office
3930 Washington
Kansas City, Missouri 64111.
OR FAX THE AD COPY TO:
816-531-0070.

Include your check or Visa/Mastercard number (with expiration date), along with your name and daytime phone number.

PianoDiscussions™

January 1997

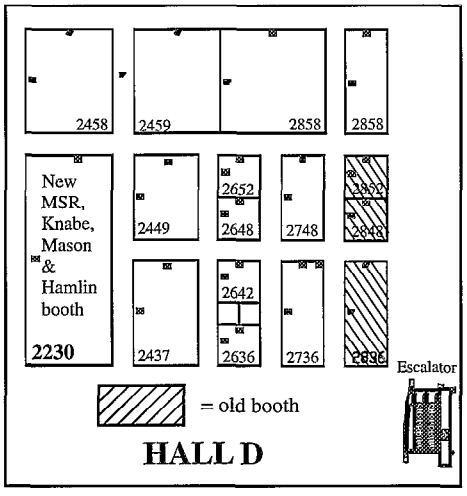
News From The World of MSR/PianoDisc, Knabe, Mason & Hamlin

What music means, and why we need it

By Dave Brubeck

We hear so much about communication in the twenty-first century. Music is not only one of the oldest, but certainly one of the best forms of communication. It defines our humanness. It speaks to us directly, heart to heart, soul to soul, when at times words do not suffice. By offering music and the other arts in the school curriculum, we are enriching the lives of the students as we endeavor to preserve our culture and our civilization. We are inculcating a sense of discipline and respect and channeling energies into forms of self-expression that have a positive social impact. It is a strange phenomenon that the student who spends hours with the arts is also the student who excels in science, math and other subjects in the academic curriculum. Rather than diminish appropriation in our schools for music and art programs, we should study carefully the reasons why there is a correlation between the arts and academic achievement. Every child, from primary through secondary school deserves the opportunity to study music.

Don't miss the '97 Cal PTG Convention, Feb. 20-23. Call Sac PTG at 916/273-8800 for convention details.



MSR, Mason & Hamlin, Knabe share new NAMM address — Booth 2230!

We've moved! Our new Winter NAMM address is **Hall D, Booth 2230.** Due to a major reconfiguration by NAMM organizers, and our desperate need for more space, we're now in part of the area previously occupied by Young Chang/Kurzweil.

The additional space will come in handy as we show off new Knabe models, plenty of PianoDisc products (including the GT-360 QuietTime) and some brand new Mason & Hamlin pianos — straight from the factory in Haverhill, Massachusetts. We'll have celebrity appearances each day, too, as some of our PianoDisc Artist Series stars drop by for a visit.

All in all, Booth 2230 promises to be a must-see spot at Winter NAMM '97. If you can't find us at first, just follow the crowd!

"Original Jukebox Vocals" are hits again — thanks to PianoDisc's newest CD

Some of the greatest hits in rock 'n roll history are hits again — thanks to PianoDisc and our newest music library release, **"Original Jukebox Vocals Volume #1" (CD 29301).**

From the CD's opening number, "Rock Around The Clock" by Bill Haley & The Comets (the song credited with starting a musical revolution) listeners are treated to some of the most popular hits of Rock's golden years. Titles include "Under The Boardwalk," "Soul Man" and "Sea Cruise."

The piano portions of each song were recorded by one of PianoDisc owners' favorite artists, Steve Merritt. "Steve's done a terrific job in adding strong piano performances to these songs without changing the sound of the originals," commented Gary Burgett, MSR/PianoDisc's president. "They're incredible, and we expect the CD to be an enormous hit!"

The recording is available in CD format only, playable on PianoCD and the PDS-128 Plus system.

Susan Etter demonstrates MSR's new Pedal Adapter System. The product was developed as a result of Ms. Etter's desire to find a way for paraplegic pianists to operate the piano sustain pedal. (See the December issue of *PianoDiscussions* for details.)

1997 Installation Training Schedule

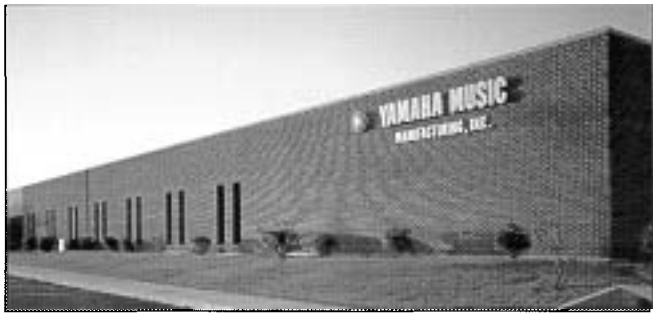
Tech Training		*Continuing Education*	
Jan 20-25	*Mar 17-22*	*Mar 24-26*	*Apr 21-23*
Apr 14-19	*May 19-24*	*Aug 18-20*	*Sep 22-24*

Tuition for the Installation and Continuing Education seminars is free, but a $50 refundable deposit is required for confirmation. The PianoDisc Continuing Education seminars are restricted to PianoDisc certified technicians in good standing. For more information, call PianoDisc at (916) 567-9999.

Tech Gazette

Yamaha Service January 1997

In this issue, and for many issues to come, Tech Gazette would like to introduce you to one of the most modern piano manufacturing facilities in the world. You may be surprised to find out that this facility, Yamaha Music Manufacturing, is located in Thomaston, GA.



In addition, Tech Gazette will introduce techniques utilized by the technicians in the facility. These tips which will be called the "YMM Tip of the Month" and can be applied by you in the field to make your job easier.

First a little history about Yamaha Music Manufacturing. YMM was founded 15 years ago. Yamaha purchased undeveloped land, bulldozed roads, designed and built the facility from the ground up. The first products built were electronic organs and professional audio speakers. Then, for a brief period of time, YMM assembled pianos that were shipped here in kit form from Japan.

In Japan there is a division which is very successful in the development, manufacturing and sales of robotic equipment. Many areas of the YMM facility utilize the sophisticated robotic machines which were developed specifically by this division for YMM. Prior to the equipment being installed at YMM, many supervisors and lead people were sent to Japan for extensive training.

Today, Yamaha Music Manufacturing is one of the most sophisticated vertical piano manufacturing facilities in the world.

In the upcoming months, Tech Gazette articles will discuss woodworking machinery that cuts piece after piece of wood to within two thousandths of an inch, another that sands complicated curves, computer controlled tool sharpeners, robotics that insert tuning pin bushings, and machines that drill holes and insert plate mounting screws with pin point accuracy.

The YMM "Tip of the Month"

With your table saw, cut two pieces of wood 12 mm square (use the height of the sharps you are setting) and about 60 mm long. Position these between the sharps on the already leveled white keys at the appropriate places to touch the end of your straightedge. This system is much faster and generally more accurate than measuring in the usual manner.

Recently, the Keyboard Division of Yamaha Corporation of America sent two video tapes to each local PTG chapter about the manufacturing processes at YMM. We hope you enjoyed them.

So, stay tuned for next month's information from Yamaha Music Manufacturing.