PIANO TECHNICIANS

Journal

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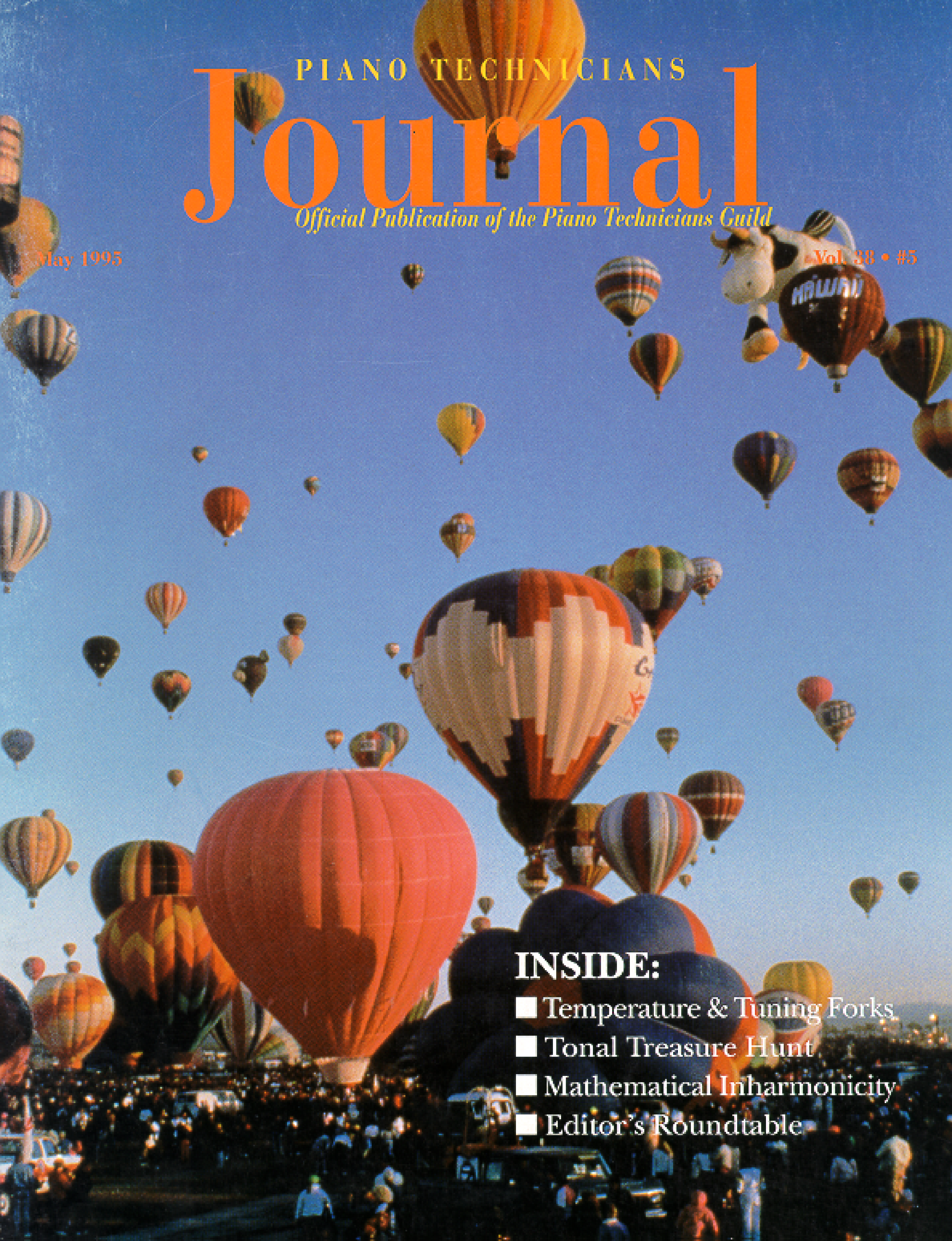

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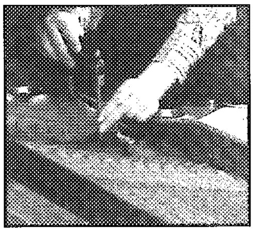

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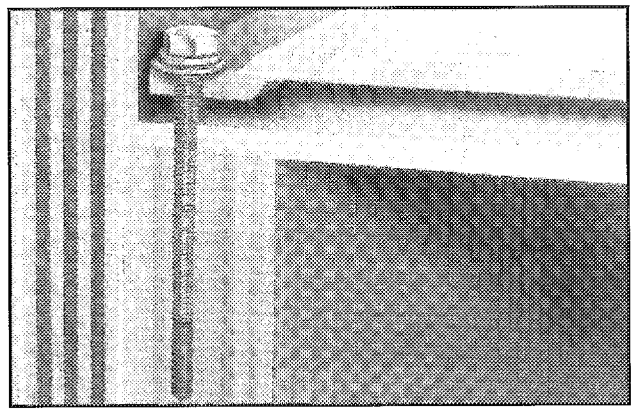

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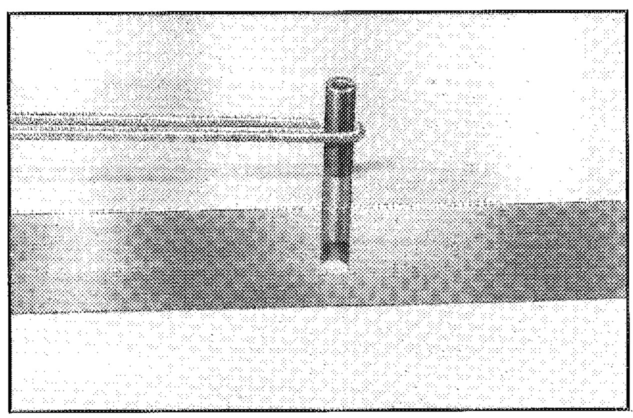

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PIANO TECHNICIANS
Journal
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Editorial Perspective

Dogma vs. Reality

When training new technicians, I try, where possible, to teach them more than one way to do things. Sure, I could teach them the method I most often use and leave it at that, but I hate to have them develop the attitude that there is only one right way. More valuable, I think, is the notion that we need to have a variety of tools in our kit instead of just one tool. Each job, like tuning, or regulating repetition springs, requires a special tool or set of tools. The more different tools — read: ways of doing a particular job — you have in your bag, the better you can adapt to each different situation.

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

For example, a student asks: "What is the best way to remove key bushings?" My reply goes something like this: "It depends on the situation. If the keys are healthy, and I suspect that animal hide glue was used to glue the bushings in, I will probably steam the bushings out. If the keys seem fragile or the ivories are starting to come loose, I'll use a more conservative approach like carefully soaking the bushings out. It takes more time, but it's the best way to do it under the circumstances. If I suspect the bushings were installed using this certain type of glue which seems impervious to soaking and steaming, I'll try to remove the bushings with dry heat instead."

Something in human nature seems to draw us toward single, simple, black-and-white explanations for things. The trouble with simplistic answers is that real-world problems are rarely solved by them. Things tend to be deeper and more complex than they might first appear to be. When a person adopts a dogma about something, the act is often accompanied by a firm and resonant slamming sound, the sound of a mind being closed.

My own prejudice, which some might call "dogmatic," is that we should weigh the evidence continually, and be ready at all times to learn the new way of doing an old thing, to add the new tool to our kit, or a new technique to our repertoire. Most importantly, I think we need to strive to understand the underlying nature of things rather than learning a handful of remedies by rote. Many years ago, a wise mentor told me that some piano technicians have ten years of experience, while others have one year of experience repeated 10 times. It seems to me that an open mind is the key to learning from experience.

■ ■ ■

Our lead article this month is probably the most thorough single article ever published in the *Journal*. Jim Ellis has done a superb job of investigating one of our most basic tools, the tuning fork. I think his article is destined to become a classic point of reference in our field.

■ ■ ■

In this issue, we introduce Dan Franklin, who has written a short series of articles on his experiences with the duplex scale. Dan is a new member of PTG, but an old hand at piano work. I hope you enjoy the articles and, knowing that this topic is controversial, I encourage your responses.

■ ■ ■

The *PTJ* Limerick Contest is officially open. Send your entries to me:
Steve Brady, RPT
Journal Editor
205 McGraw Street
Seattle, WA 98109, or
E-Mail: sbrady@u.washington.edu, or
Fax: (206) 285-7610.

A limerick, as you probably know, consists of five lines in this form:

A clever young tuner from Wales
Had a natural system of scales:
"I tune all the flats
To the purring of cats;
For the sharps I just pull on their tails."

You may enter as many limericks as you wish. Our deadline will be July 1, 1995. The decision of the judges will be final, and no amount of whining will change our minds. What? The prize? Oh, yes. The three best limericks will be published in the *Journal*, and the winning limericyst will receive a $50 credit towards piano tools or supplies at the supply company of his or her choice. Well, alrighty then.

PIANO TECHNICIANS

Journal

Volume 38 • Number 4 • April 1995

COLUMNS & COMMENTS

DEPARTMENTS

IN ADDITION

FEATURES

PACE
Professionals Advance through Continuing Education
LESSON PLAN

1995 Albuquerque Convention Preview

COVER ART

Albuquerque International Balloon Fiesta — Near-perfect flying conditions make Albuquerque the "Balloon Capital of the World" and site of the world's largest ballooning event, the International Balloon Fiesta. Albuquerque is also the site of this year's annual convention where PTG members can make their technical and business skills soar. Photo by Terry Moore, Albuquerque, N.M.

Associate Voting Rights On The Agenda

By now all chapters should have received their Agenda books for the 38th Annual Council to be held in Albuquerque, N.M., in July. Again this year, delegates will be voting on issues that significantly affects what PTG is and how it serves you, its member.

The following is a sampling of the issues on this year's Council agenda:

The Bylaws Committee report for this year contains 17 separate proposals for action. These bylaw issues vary widely in their importance and impact. I will briefly summarize a few of them.

PTG President
Leon Speir, RPT

ALTERNATE DELEGATE SEATING: Currently, the bylaws allow for only one alternate to be seated with a delegate in Council. Adoption of this proposal will allow two delegates to be seated.

ASSOCIATE VOTING RIGHTS: Four separate proposals are offered to deal with the right of Associates to vote:

- Charlotte Chapter Proposal: This proposal says that chapters can allow Associate members to vote on chapter issues. It prohibits Associates from voting on the selection of council delegates or on issues that are decided by council. If this proposal is adopted, Associate members who are granted the right to vote will become limited franchised members. Associates whose chapters do not grant the right to vote will be non-franchised members.
- South Central Pennsylvania Chapter Proposal: This proposal says that chapters can allow Associate members to vote on chapter issues. It prohibits Associates from voting on council delegates or any matters concerning issues decided by Council. Associate members will be non-franchised members if this proposal is adopted.
- Bylaws Committee Proposal (1st): — This proposal says that chapters can allow Associate members the right to vote on issues such as chapter projects and activities. It prohibits Associates from voting on chapter officers, delegates to Council, chapter bylaws, or any matter concerning issues to be decided by Council. Associate members will be limited franchised members if this proposal is adopted.
- Bylaws Committee Proposal (2nd): — This proposal says that Associate members may not vote on chapter or council issues. They are allowed to chair chapter committees except the examination and nominating committee and may vote in the committee. They may hold chapter office except president and vice-president. Associate members will be non-franchised members if this proposal is adopted.

TUNING EXAM ORDER — The Examinations and Test Standards Committee proposes that persons taking the tuning exam with an electronic tuning device (ETD) should be required to take the aural portion of the exam before the electronic portion. This will leave to the discretion of the examiner whether to continue with the electronic portion. Adoption of this proposal could save time for both the examiner and the examinee since many will not proceed with the electronic portion of the exam if they fail the aural part.

PTG ANNUAL DUES — Bylaws proposal number seven changes the way the dues amount is set each year by Council. This proposal will allow Council to evaluate programs and set dues amounts based on spending priorities.

The Council this year will evaluate a *Resolution on Education Goals.* This resolution and report outlines PTG's current educational programs and proposes an active Council discussion of long term goals for PTG. Action on this resolution will provide leaders and administrators with guidance in planning for the future.

Many other issues contained in the Council Agenda book will be acted on. I urge all of you to carefully study all the proposals and evaluate their impact on PTG. The future of PTG is in your hands!

Publisher's note: because incorrect information was provided to President Speir, figures on Registered Piano Technician reclassifications in his April 1994 President's Message were in error. A total of 70 reclassifications in 1994 included eight members who were reclassified from RPT to Sustaining membership. The Associate-to-RPT figure should have been 62, still more than 26 percent above the 1993 total. In addition, there were 13 reclassifications in the first quarter of 1995, exactly the same as the first quarter of 1994.

Industry News

Steinway, Selmer Announce Merger

The Selmer Company, Inc. and Steinway Musical Properties, Inc., (SMP) announced April 18 that the companies entered into a binding merger agreement. SMP is the owner of Steinway & Sons, and Selmer is a renowned maker of band and orchestra instruments. The company resulting from the merger will be the largest of its type in the United States, with annual sales of nearly $250 million.

Selmer and Steinway continue to operate as independent entities, with no changes in management, plant locations, marketing strategies or total employment. Bruce Stevens continues as president and CEO of Steinway, and Thomas Burzycki remains as president and CEO of Selmer.

On the day of the announcement, Stevens said, "I am very excited about the prospect of this merger. I believe that the resulting company will provide the requisite strength and commitment to assure that we can continue to make the best musical instruments in the world. I am thrilled that the owners of Selmer are as committed as we are to continuing the tradition of excellence. Over the years, a good many suitors have been turned away because they did not meet our criteria. It is both gratifying and reassuring that we have found such a perfect match."

Selmer's Burzycki said, "The management of Selmer is extremely pleased to be aligned with Steinway and its great history of producing the finest pianos in the world."

In the past decade, the owners of Steinway, John and Robert Birmingham, have implemented improvements in instrument quality that have met the approval of many of the world's most accomplished pianists.

Both companies have approximately 1,000 employees. The Steinway production facilities are situated in Long Island City, N.Y., and Hamburg, Germany, while Selmer has production facilities in Elkhart, Ind., Cleveland, Ohio, La Grange, Ill., and Monroe, N.C.

Selmer, which is the largest domestic manufacturer of band and orchestra instruments, produces a wide variety of brasswinds, woodwinds, stringed and percussion instruments. Many of its instruments are played by professional musicians around the world. The company's three principal operation divisions are Selmer, Ludwig/Musser, and Glaesel.

Letters

More On Hammer Installation

The article by Gerald F. Foye, *PTJ* January 1995, discusses problems associated with hammer installation that have given me many a headache. I think we can assume that we all know enough to make sure new hammers are contacting the strings at a 90 degree angle, let off is right and all strings of every unison are being struck. However, one problem I have not always been able to overcome is the range of densities in different sets of new hammers. Some are so soft I have had to "juice" them with lacquer, which goes against my grain, partly because this process is so hard to control. The best I have been able to do is to use lacquer on the back — away from the crown part. Sometimes, I have also had to lightly spray the striking surface, in the hope that it will act as a temporary hardener and breaks up as the felt compacts. To me, this seems risky at best. Removing a layer of felt may sometimes help, but not in extreme cases. Ironing is of little if any help.

More commonly I get hammers that are too hard and do not respond to a voicing pick. A needle leaves a crater and has no overall effect. They file like so many pieces of chalk. I suspect the reason for this is not tight cauls, but that they have been saturated with some chemical hardener and, as always, such a process is hard to control. Maybe the material is poor and this hardening is necessary. This is also found in new pianos. It would be better if hammers were of a density that would be somewhat hard but voiceable. Hard hammers have been the rule for so long that maybe few people remember what a good hammer sounds like.

A word of caution: never let the piano-owner hear the new hammer job until it is complete. Recently, I did this with an old customer and friend who insisted on my putting the action back in so she could give lessons. The new hammers were much too soft, and she really went into hysterics. Once before I had something like this happen, but the trouble was that I was dealing with a many-headed monster. The piano sat in a music room at a college and was used by many people. I think some of them wanted it to sound like their piano at home. Believe me, there is no way you can win in such a situation. Maybe two such flops, if indeed they were flops, in a lifetime is not so bad, but they felt pretty bad at the time.

On another subject: Brenda Dillon writes, on page 29, of the SPELLS Program, but leaves me wondering about many details such as what it is and where we can find out more about it.

Charlie Bonner, RPT
Santa Barbara Chapter

Some manufacturers improve their pianos because they have to. We do it because we want to.

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TT&T — Cleaning Sock

Why do I keep an old woolen sock in my toolbag? Certainly not for fragrance or rust-proofing my tools. Slipped down over the hand, this sock is the best thing for cleaning off a grand keybed. How often have you brushed the dust kitties and gravel off of a keybed and wished you could then run your hand over the wood without blackening your palm with fine dirt? The woolen fibers of a heavy-weight sock gently scour the grain of the wood, leaving a surface clean enough to have lunch on. Either black or white wool will show the dust well to the owner. The sock then can be shaken out off the back steps.

Bill Ballard, RPT

TT&T — A Tough Scrape

The best things in life are free, including this scraper. Go down to your local machinist and ask for any power hack-saw blades he might be ready to throw away. Generally these are 12-18" long, 1/16" thick and 1 to 1-1/4" wide — 2-1/2" if you're lucky and he has a big machine. They're made to chew through all kinds of tough steel.

Back at your shop, put the blade in a machinist vise with a 3" to 4" section gripped in the vise jaws, and neatly rap the protruding end with your stringing sledge. The brittle steel will snap off at the vise jaws and, when the other end bounces off the far wall of the shop, it will likely shatter. All fractures are usually square to the length.

Next, on your grinding wheel — this blade laughs at files — grind away the original hacksaw teeth, so they won't bite into your hand while you hold it. Then, with your water quench nearby, square up the fracture as needed. Finally, put a good hollow-ground single bevel on it.

The resulting edge won't necessarily shave your whiskers, though you could put it through your fine-sharpening routine. This edge will, however, stay sharp through all kinds of barbarous chipping of glue beads and paint finishes; situations in which an ordinary chisel or plane blade would come up serrated. You can even stretch the blade's edge a little further by reversing your hold on the blade, thus flipping directions, every now and then. But when your brutality has finally dulled the blade, one or two quick zips across the grinding wheel is all that is needed to restore the edge. Ed Trefz of Philadelphia, Pa., gave me this tip in 1980.

Bill Ballard, RPT

TT&T — Piano Protector

Our Hamburg Steinway D in the concert hall was showing too many signs of the stage hand demolition derby. We have black autobody molding on it now - around the lid edge and down the front of the arms. It works great. The self-adhesive backing bonds extremely well and damage has been cut to almost nothing. It looks nice and most people don't even know that it's there. A good auto-body supply shop will have ample selection from a flat bead to a corner wrap.

Rick Florence, RPT

TT&T — Hot Glue Tips

I use my glue pot kind of like a double boiler. Load the glue in a baby food jar, or some other small glass jar, add the appropriate amount of water to the glue and then set it in the glue pot that already has some water in it. When "cooking" the glue I cover the jar loosely with its lid, and then cover the glue pot with an old plastic coffee can lid that has a small hole cut in the center. It can cook a long time like this and never dry out. I also find it handy, while working, to have hot water from the glue pot to add to the glue (I use a straw or an eye dropper). Also, if I need to leave for a while, putting the plastic lid on the pot keeps the glue from getting a skin on top. All this keeps me from wasting glue and keeps the glue pot clean.

Barbara Richmond, RPT

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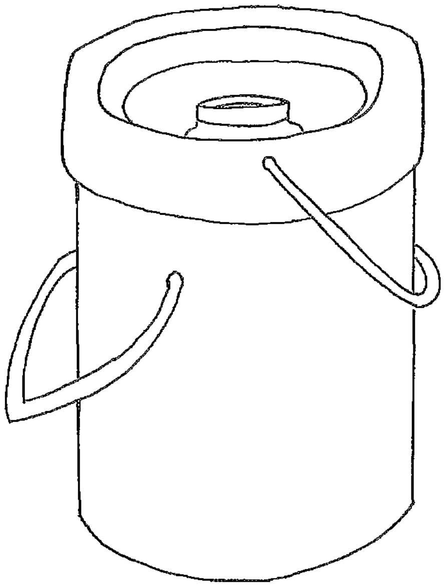
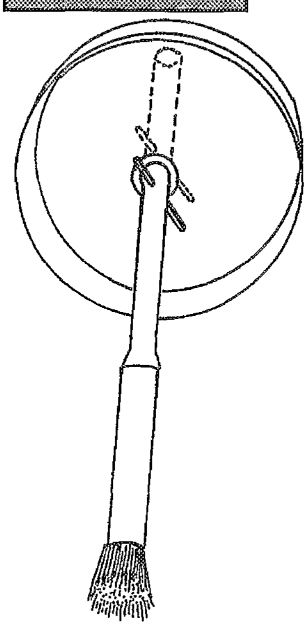
TT&T Continued From Page 10

TT&T *From Frederick Scoles*



The method Barbara describes is similar to one used by many player rebuilders. A thermostat controlled hotplate heats a large jar — peanut butter, etc. — half-filled with hot water, while the glue, contained in a small jar — baby food or jelly — is suspended in the larger jar. It is very inexpensive, and sometimes hotplates which need only minor repairs — frayed cords or cannibalized parts — are available for the asking from local college chemistry or physics departments.

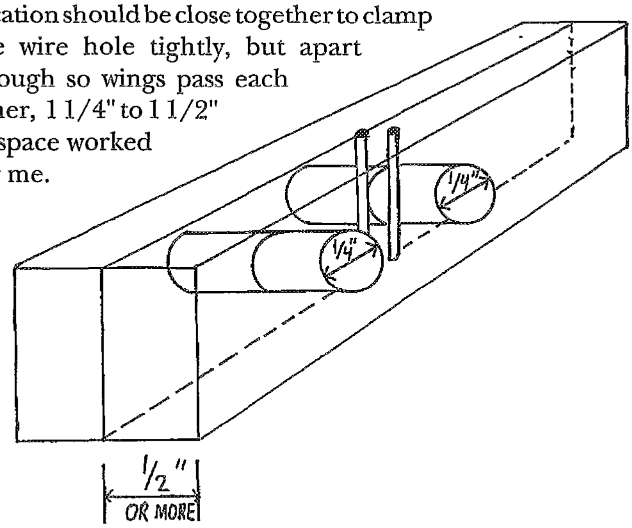
TT&T *From Newton Hunt, RPT*



I buy quantities of little brushes with metal handles. I drill two holes in the handle for a press fit of center pins. The holes are located so the upper pin allows the brush to just brush the bottom of a baby food jar and the lower pin allows the lid of the jar to be lifted with the brush so it stays put with the brush.

TT&T *Improved Loop-Making Tool*

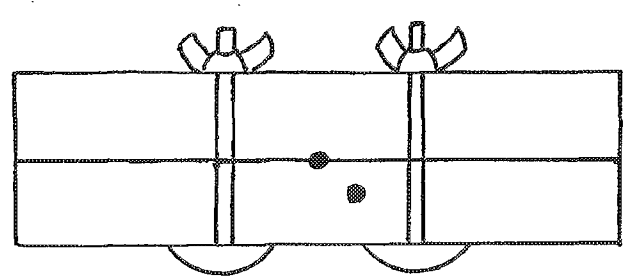
This tool is a variation on the one that Bill Spurlock described in the PACE series for forming hitch loops, giving credit where credit is due. Variations in dimension are not critical so long as the two pieces of hardwood — I used maple — fit flat and tight. The carriage bolt/wing-nut location should be close together to clamp the wire hole tightly, but apart enough so wings pass each other, 1 1/4" to 1 1/2" of space worked for me.



I used a short piece of bass string core wire clamped in position to place an "impression" into each block, *then* drilled it out further while clamped, using a 1/16" drill bit to deepen the impression.

Usage #1: Tighten wing nuts to form hitch loops from plain wire per Spurlock's PACE lesson.

Usage #2: For bass strings broken at front bridge pin — the reason that started all of this. The Technical Source Book detailed on pages V.14, 16 and 17 — with figure 20 — a "double splice across bridge." OK, this proves it can be done, but, being an Associate yet, I'd be in trouble if I tried that.

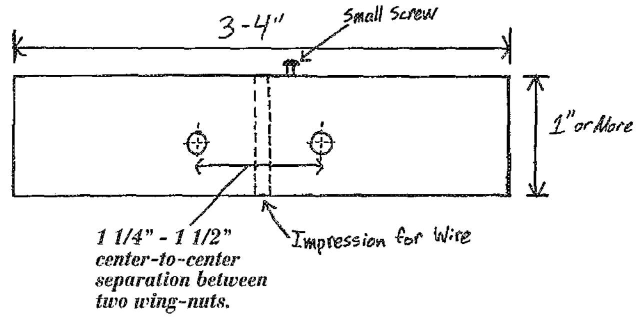


Here's how I did it.

Measure from point of break to hitch pin and add four to five inches for the length of new wire needed. Select a size of wire one half size larger than the original. Remove some copper wrapping as needed. Perform wire splice — easier now than later — and pull up as tight as possible. I used a vise-grip at the end of the wire splice to pull on. Loosen tuning pin two turns to give it enough slack to pull spliced wire down around hitch pin — 90 degrees worth — to determine required length. The splice will likely contact bridge cap — be careful or provide protection against scratching. The process of tuning pin and hitch pin fitting will account for and compensate the lengthening of the string as the splice and hitch loop tighten up.

Remove the splice wire from the hitch pin and finish the 90 degree bend to the required 270 degrees with plenty of tail. Note which direction the bass string wrapping goes. You'll want that hitch loop tail to be wrapped such that it will contact the plate, particularly if you put twists into the string to quiet a noisy wrapping.

Loosen the wing nuts, spread the wood pieces, and insert, tail first, the loop. Tighten wing nuts. The tool should spin freely on wire. Hold loop with pliers and *turn the tool.* Turn in the same direction as the copper coils, for four or



more turns with tail ending at the underside of loop, cut the tail down as needed. Loosen wing nuts to remove tool. The PACE version would be captive and one would have to sacrifice it to complete the repair. Install loop on hitch pin, pull up the slack, seat the string on the bridge, etc., as usual.

If one were to do the hitch loop and *then* the splice, I'm sure it would be harder and not easy to control the slack that would pull out of the hitch and splice. Copper wrappings pulled through an agraffe is not something a customer appreciates as art or anything else.

This sure beats trying to do a double splice now doesn't it?

Alan Hoeckelman

Q

Non-Parallel Bridge Notching

While working on an old Steinway D, in the 235000 serial number range, I noticed that the bridge notching as well as the aliquot bars from D5 to G6 were set at approximately 30 degrees diagonal to the plane of the capo d'astro bar. After having just read the roundtable article on capos I was curious as to just what the designers were shooting for. Since then I have been looking for this feature on other models of both earlier and later vintage and found the bridge notching to run roughly parallel to the capo. Amazingly, to my limited understanding of the situation, the instrument tunes wonderfully and has no outstanding mismatch of partials across the unison. If anyone has any information on this design, could they please pass it along to ease my mind? The only guess that I have even come up with is that there was an attempt to give more power to this typically weak range by adding a little more "garbage" into the tone, as some designers have tried to do with a duplex section that emphasizes uneven harmonics.

Allan Gilreath

A

From Del Fandrich, RPT

This type of bridge pinning was used on several models of Steinway and Baldwin pianos as well as a few others that don't come to mind right now.

Obviously, with the bridge pins offset this way, each individual string within a given unison group will have its own string tension and inharmonicity coefficient. Actually, all string scale parameters are affected; these are just the most noticeable. As it happens, we have a Steinway Model C in our shop in which the original bridge was pinned in this fashion, so I did some measuring to see what effect the varying lengths have on the basic string scale parameters. For an example, I chose A-61 (also known as A5). There was a difference of approximately 4 mm in length between each of the three strings in this unison, 8 mm overall. The length, tension and inharmonicity of the three individual strings in this unison are:

String Position	Frequency (in CPS)	Length (in mm)	Tension (in lbs.)	Inharmonicity Constant (B)	Inharmonicity of 4th partial
Left	880	≈ 221	175	1.5	24.2
Center	"	≈ 217	169	1.6	25.9
Right	"	≈ 213	163	1.7	27.8

This variation in length results in a tension deviation of approximately six pounds between each of the three strings, a total of 12 pounds between the right string and the left string. So there would be some discrepancy in acoustical power in each of the individual strings, but since what we hear is the acoustical sum of the three strings, the disparity is not audible. The variation in inharmonicity is also quite small and is usually only slightly audible. Ordinarily, the difference isn't great enough to cause a real tuning problem, although this may be because most tuners seem to be able to automatically compensate as they tune through these sections to get the best blend of the three strings. (At least this is true with aural tuning. I've never tried to tune one of these pianos using an electronic tuner.) In any case, the variation in inharmonicity isn't that objectionable in the real world. There is also a slight variation in the hammer strike ratio for each of the three individual strings, but it's so minor as to be inconsequential; it's measurable, but not audible.

It is significant that this feature was usually found only in the first, or lower, treble section. This is the area where designers have traditionally had the most trouble getting a satisfactory combination of power and sustain. This bridge design was an attempt to increase the "presence" of this section by making the harmonic structure of the three strings in the unison slightly inharmonic, i.e., deliberately out-of-tune. It was supposed to partially make up for the normal weakness in this range by adding a bit of controlled chaos — and I'll bet you thought chaos theory was a recent discovery! — to the sound envelope. I doubt the designers of these pianos were under any illusions that they were increasing real acoustical power by doing this. They were simply treating the symptoms of a problem they couldn't solve with the design and materials limitations of the time. And they knew it. This was simply their best effort to make the sound a bit more interesting and noticeable through this range and, hopefully, to make the effects of the real problem a little less bad. I'm reminded of the pianists who demand that their pianos be tuned to A-442 or A-444 so they can "project" over the orchestra.

So, does it work? Well, yes and no. It does add a little zing to the sound of these unisons. The question is, is this desirable? In designing the upper tenor and treble sections we're after a number of different tonal characteristics. Power and sustain are certainly important, but almost as crucial is the clarity and the purity of the tone. These pianos will never have a really pure sound through this section. Fortunately, modern design practice is capable of delivering a sound much closer to our ideal without resorting to tricks of this type.

As you suspect, good piano design practice dictates that the centerline of the three bridge pins be parallel to the capo d'astro bar. The practice of non-parallel notching in this area of the bridge was abandoned decades back by all piano

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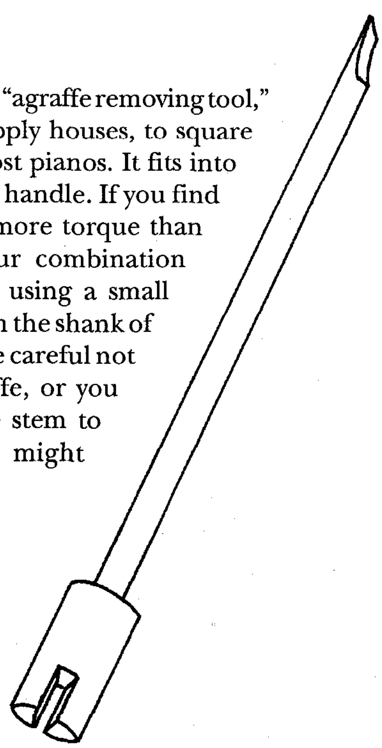
builders; at least I'm not aware of any pianos currently being built this way. When we cap bridges of this type in our rebuilding shop, we drill, notch and pin the new cap in the conventional manner, generally using the speaking length of the center string as a guide. And most of the other rebuilders I know do the same.

Q — *Squaring Agraffes*

Does anyone have an in-home method for straightening around an agraffe; something that can be done as part of a normal service call? Not so long ago I came to a small mid-grade grand where several agraffes were askew enough to make tuning the unisons a difficult matter.

Zen Reinhardt, RPT

A — *From Steve Brady, RPT*

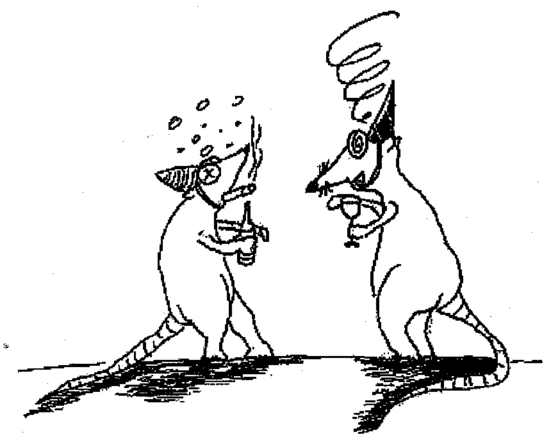


You can use an "agraffe removing tool," available from supply houses, to square the agraffes in most pianos. It fits into your combination handle. If you find you need a little more torque than you get from your combination handle alone, try using a small pair of vise-grips on the shank of the agraffe tool. Be careful not to force the agraffe, or you could weaken the stem to the point that it might eventually break.

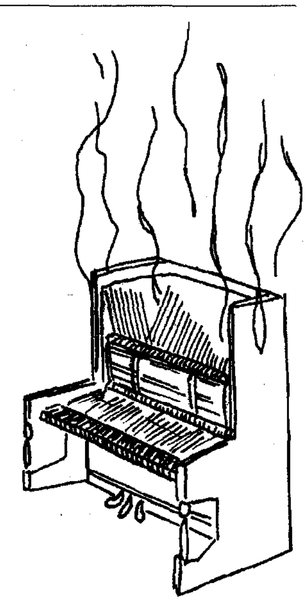
Q — *Smelly Upright*

I wonder if anyone out there has a good method for de-odorizing a smelly old upright piano. Apparently it was quite the hang-out for the mice "in crowd." Upon opening it up for the first time, I saw different-colored threads strung all over the action like streamers at a party. Lots of confetti too! Is there a way to get the mouse urine smell out of the keybed? It has soaked into the wood.

Chris Olson



A — *From Tom Seay, RPT*



Try several applications of baking soda, after a thorough cleaning of the keybed, of course. Probably won't work very well, but it's worth a try.

This is a lot of work, but you can remove the keys, remove and replace the keybed felt and balance and front rail punchings, polish the pins, sand the keybed with 220 grit paper — after a thorough cleaning — and seal the contaminated surfaces with a clear finish, such as Deft or even sanding sealer. *WARNING: USE A RESPIRATOR WHEN SANDING ANYTHING CONTAMINATED WITH URINE.* Studies have proven that this can be *VERY TOXIC* and extremely dangerous to your health! Be careful.

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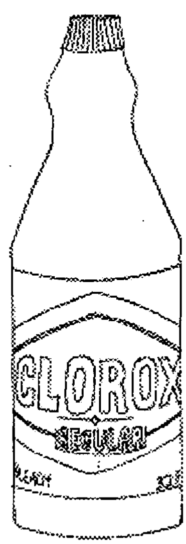
A

From Ron Torrella, RPT

Another possible option might be spraying a product called "Smells Begone" over the keybed. Some hardware stores carry this product, which is manufactured in Birmingham, Mich., by the Punati Chemical Corp. It's truly amazing stuff! Really says what it claims to do. The label says it "contains an oxidizer, non-ionic ethoxylated detergent, chelating sequestering agent, methyl salicylate and approved coloring," and the directions say "a few sprays of sage non-toxic 'Smells Begone' instantly works to eliminate most mal-odors. A few ounces added to mopping and wiping solutions, drains, etc., will freshen area and arrest foul smells. Regular applications prevent odors in kitchens, appliances, cars, boats, etc." I haven't seen the stuff outside of the Detroit area, though. Both Damman Hardware and K-Mart carry it up there.

A

From Bill Spurlock, RPT



Household bleach will kill the urine smell instantly. It can be brushed or wiped onto wood surfaces, wiped once with a dry cloth, and left to dry. If you get any on metal surfaces, be sure to clean it all off and follow up with metal polish or Protek to prevent corrosion. Check out page 8 of the December 1994 *Journal* for an item on the possible dangers of Hanta virus and mouse leavings also.

Another option for bad smells is to take the piano to a place that does clean-up after house fires. These places have ozone chambers, or can tent large items. The ozone neutralizes smoke and many other odors. I haven't had the chance to try this yet, but it is a standard treatment for removing smoke odors from furniture, etc. Look in the Yellow Pages under carpet cleaners, and look for one that advertises water and fire damage repair and odor removal.

A

From Mark Story, RPT

I have used a product that I bought from a wholesale dry-cleaning supplier called EX-IT. It is, or was — I haven't bought it for some time — manufactured by the Big D Chemical Co., Oklahoma City, Okla. I used it to treat the smoke smell in pianos that were in housefires, but it is also supposed to be effective on other stuff — use your imagination, I just ate breakfast.

I just rebushed a set of keys that were soaked in rodent urine, and they were vile! I would be cautious about working around mouse infested pianos, since the urine and feces can carry the deadly Hanta virus, and who knows what else. I examined a small grand that was much as you described. I advised the new owner to burn it. Besides being smelly, the urine is very corrosive to metal parts. There was some sort of "fur" growing on the strings and keypins. I was also convinced that all of the action centers were ruined because of the corrosion of the center pins. There was no way the job would pencil out, and I didn't think the results would be satisfactory either.

Editor's Roundtable . . .
. . . Damper Problems

By Steve Brady, RPT
Journal Editor

Dampers seem to be feared by more technicians than practically any other part of the piano. While they display an endless repertoire of annoying noises and failures to do the job they were created for, we are not always equipped to deal with them when they need help. This is probably because most of us don't do damper work every day, and don't have the easy comfort with damper work that we enjoy with jobs like tuning pianos and regulating capstans. It's even possible to be fairly adept at damper regulation, but to feel less confident about curing some of the marvelous little noises dampers can produce. These noises can be roughly divided into two classes: those that occur as the dampers leave the strings, usually as the sustaining pedal is depressed; and those that happen as the pedal or the key is released slowly, causing the damper to seat gradually on the string. Our present discussion is focused primarily on these noises, causes and prevention.

This "virtual conversation" takes place at no particular time, in a place called Cyberspace, through a covey of computer chips and a tangle of telephone lines. The discussion began among the Pianotech e-mail group, and I subsequently added input from some additional participants, then rearranged and edited all the contributions for flow and clarity.

Our participants:

Bill Ballard, RPT. *Independent tuner-technician from New Hampshire, and a former Contributing Editor of the* Journal.

David Stanwood, RPT. *Developer of the Stanwood Action, and popular convention instructor.*

Richard Davenport, RPT. *Independent rebuilder and technician to the rich and famous in the Los Angeles area.*

Ken Sloane, RPT. *Staff technician at the Oberlin Conservatory.*

Newton Hunt, RPT. *Staff technician at Rutgers University.*

Mark Story, *RPT. Staff technician at Eastern Washington University*

Darrell Fandrich, RPT. *Independent technician and co-developer of the Fandrich Vertical Action.*

Ballard: Does anybody have tricks on getting rid of damper lift noise in the trichord wedges? I was called in at a fancy recording studio, where the Yamaha C7F Disklavier had a noisy sustain pedal. The dampers in this region —16 in all — have trichords front and back, ruling out the chance of a Steinway style solution; favoring the flats over the wedges. My first idea was to replace the back wedges with flats. Mark at Yamaha said to try trimming the portion of the wedges that hang underneath the string and iron the sides of the wedges to smooth down any stray fibers that might be sticking out. Neither of these worked. The only thing that did work was the introduction of the flat pads, and that works to the extent that you leave the balance of pressure between the front and back towards the side where you begin to notice the softness of flat-pad damping. Of course, they can also pull the mikes out from under the lid, and make sure that when it comes time for the quiet passages that will show up the "heartbreak of damper emphysema," the pianist has the sense not to approach the sustain pedal as a hot-rodder would pealing out on a green light. Any ideas?

Stanwood: The surface of the wool fibers are very rough and the coefficient of friction of the wool fiber surface is very high. This makes for noise. Thinking about this, I tried reducing the coefficient of friction by putting a little Protek on my finger and then lightly rubbing the string where the trichord felt hits and the felt, too. The result was a clearly noticeable reduction in noise. I'm not sure how long the effect lasts, and I would be reluctant to load up the felt with anything more than trace amounts of additives.

Davenport: I share that concern. I don't recommend using lubricants to solve this problem. I think most of the problem is with the felt itself and with the way it's installed.

Stanwood: Perhaps a high polish of the string where the felt meets would give a permanent effect without chemicals. A Foredom tool, felt bobs, and a few grades of fine grit might be worth trying.

Sloane: Also, polishing strings with Polita might alleviate some of the problem.

Hunt: I think Polita, being aggressively abrasive, like some pianists I know, could exacerbate the problem. To polish strings under dampers, I use Flitz, available from Pianotek. I use this polish on keypins and capstans as well. Non-abrasive polishes like Flitz, or some good silver or brass polishes, leave a smooth surface; and even a little lubrication of the string itself, like Protek, may help further. I might also suggest fine-sandpapering the offending damper felts on one or two to check the results. I have had success with this method.

Sloane: The older Yamahas used trichord wedges made of felt with a vertical grain orientation. It was very easy to get positive damping with this felt initially, but it became string-cut rather quickly and was more problematic with the wheeze — I've heard the term "whoosh" used, also — when using the sustain pedal. Does your piano have the vertical grain wedge? If so, get rid of it. Yamaha can now supply you with a trichord wedge made with felt with a horizontal grain orientation. The felt has a good density — not too hard and not too soft so it damps pretty well but lasts fairly long — and also has a good shape so it fits well into the strings.

***Davenport*:** I agree. The vertical-grain wedge felt damps somewhat better, but it cuts and deforms too quickly.

***Story*:** Norm Neblett claims to have made a living replacing dampers in this setting. His theory is that the problem is with the firm felt the factories use to avoid "regulation degradation" due to compression settling. He just replaces the wedges with good felt. I don't recall him mentioning replacing wedges with blocks, but it's a thought. You're bound to give up some damping efficiency, but in this setting, it might be an acceptable compromise.

***Fandrich*:** Knowing that trichord wedges are the culprit when it comes to damper "wheeze" or "whoosh," I try to limit the number of trichord wedges to the minimum necessary for good damping. I've been surprised to find how few are really necessary. For example, I've found I only rarely need to use trichord wedges above middle C when I'm replacing damper felts. When installing trichord wedge felts, I also deepen the slit, but no more than 1/16", preventing the wedge from putting too much pressure on the middle string.

***Davenport*:** I think we all agree that the damper "whoosh" is always caused by the trichord wedge dampers. The usual problem is that the wedge felts are too narrow, with too long an angle, and extending too far beyond the strings. When installing new damper felts, you need to make sure that the wedge felts are wide enough to begin with, making a fairly high angle into the strings, and then you need to make sure that the tips don't extend too far beyond the strings. The tips of the wedges should extend no more than 1 mm beyond the strings. It helps to sand a radius on each tip as well.

***Fandrich*:** I agree with this completely. You don't want your wedge felt to be too straight; that is, too narrow at the top of the felt. Due to the different spacing of strings in different pianos, the same width of wedge felt doesn't work equally well in all pianos.

***Brady*:** In the worst cases of damper "wheeze," you may find that the too-long wedge tips have become bulbous from repeated exposure to extreme humidity swings.

These enlarged tips will actually pluck the strings as they lift, and you can hear an audible tone produced by

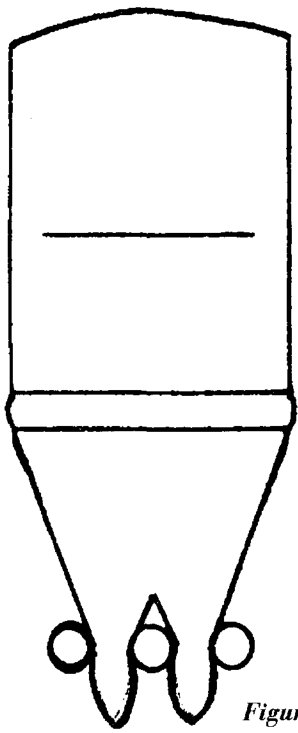


Figure 1

the pluck. As Richard has observed, it's important to keep the wedge tips trimmed close to the strings.

***Ballard*:** There are also plenty of noises to be weeded out during the time when damper felts are erasing piano tone. In fact, the process is one of shaping the end of the tone, and is complementary to the voicing work we do with hammers, shaping the beginning of the tone. The slower the pianist seeks to set the damper back down on the string, the longer we'll have to suffer whatever may be laying therein.

Within hearing range, which is all of 10 feet, the "wheeze" is the bane of studio microphones and contemplative pianists. The "oink" will, however, travel to the back of the hall. I hear the "oink" as tone disappearing into a thin wisp, or "rat-tail," of high partials. It appears to come from a matting of the fibers on the business end of a flat damper. The only thing I've found that will reduce that squelching of the sound is a light combing of the flats with some 220 sandpaper. The weight of the damper heads by themselves might even be a tad too heavy. I haven't found anything predictable about the appearance of the delayed damping of high partials, although my survey of the problem is pretty sparse due to the number of old uprights I still tune as a rural technician.

The fundamental partials are definitely gone by the time the damping goes into its rat-tail. But what is the special difficulty with the higher partials? Do the tiny wavelengths lie better in the string's horizontal — radial — mode of oscillation? Does a flat pad working horizontally miss an increasing amount of oscillation as the partial wavelengths get smaller? Is this because, with higher subdivision of the fundamental wavelength, more of the total partial strength lives out of the particular partial whose antinode is being damped?

***Davenport*:** In my experience, the "oink" or "zip" on the slow release of the key is due either to strings not being level, the dampers contacting one side before the other or damper felts being too hard. If the problem is traced to a crusty flat felt, you can sometimes carefully remove the hard outer layer, exposing fresh soft felt. Putting thread in the trichords helps as well, and in fact, I always install thread in the trichord wedges when I'm doing a damper replacement job. Like the "whoosh," this problem can also be helped by keeping the ends of the wedges trimmed. Theoretically, the "fingers" of the wedge felts needn't extend past the midpoint of the wire's diameter. In actual practice, however, I

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Editor's Roundtable . . .

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find that you want the wedge to extend to somewhere between the bottom of the string and 1 mm past the bottom. This provides a safety margin that helps compensate for the "bounce" you see in slow-motion films of dampers seating on vibrating strings.

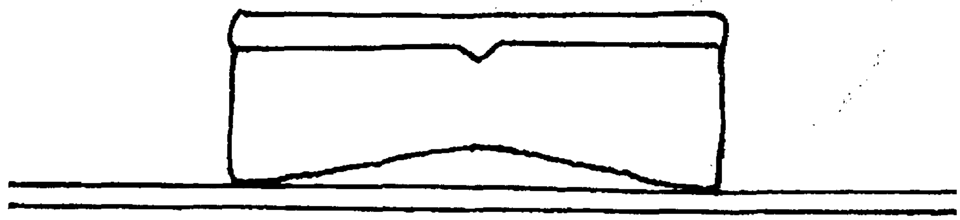
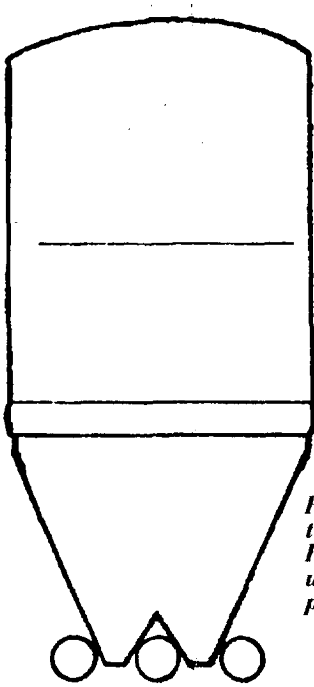


Figure 4

Sloane: Different damper felt configurations have different effects on the "oinkability" of a piano. In the area of the piano that has a wedge and a block on the damper, Bosendorfer puts the wedge in the rear. I think this helps the problem a little. I have tried it on some Steinways. Certainly two block felts as opposed to a block and a wedge or two wedges will make the "oink" less likely to occur, but poorer damping is the trade off. Also, the shape of the wedge is a factor.



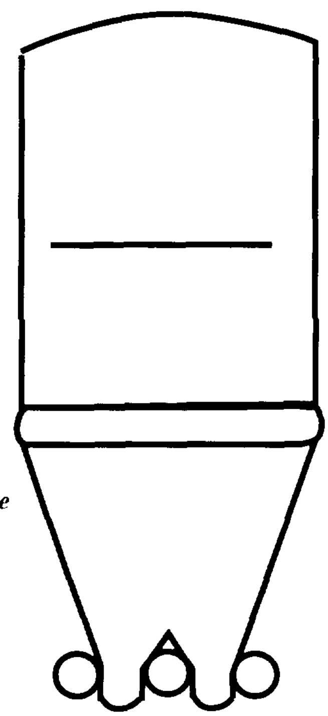


Figure 2, (Left) Wedge tips at midpoint, Figure 3, (Right) wedge tips at 1 mm past string

Brady: One thing that should be assumed in this discussion about damper noises, and particularly those noises that appear during the actual damping phase, is that the entire mechanical part of the damper system is in good shape. For instance, damper guide rail bushings need to be firm enough to prevent oscillation of the damper wire but not too tight and not hard enough to cause noises. Similarly, while the pinning of the underlever flanges must be free enough to allow prompt, positive damping, these centers must not be loose, especially when bushed with Teflon. Any tendency towards damping noise will be much worse if the damper action is in poor mechanical condition.

Sloane: An important thing to check out if you have a real bad "oinking" problem is the density and "crusting" of the felt in the wedge. This can often be caused, or at least aggravated, by the permeation of hardening agents from the hammer getting into the damper felt. I have removed wedges from real bad "oinkers" and have found the area at the string contact point to be actually sort of lumpy. A wedge in this condition can frequently be salvaged by pricking and pulling at the hard area with a needle and then carefully cutting away with scissors the crusted area you have raised.

Fandrich: I've found that using stitched flat felts can help reduce oinking a lot. In fact, I now use only stitched flats, even if I have to stitch them myself. It's not difficult to run a strip of damper felt through a sewing machine to stitch the middle with a loose lock stitch. You don't need to draw the middle in as much as you see on some new damper felts. The advantage to stitching is that the tips of the felt can contact the vibrating strings first, allowing a shock-absorbing effect instead of the all-on or all-off effect you get from flat felts. The stitched flats also help to reduce the "thump" you sometimes get when the damper pedal is released suddenly.

Brady: I agree that stitched flats can help reduce "thumping" on a quick pedal release. Other things that can help here are related to what I said earlier about the mechanical condition of the damper action. Regarding "thumping," this concept should also extend to the trapwork being firmly pinned, and every piece of felt and leather in the trap system being in good condition, particularly those felts or leathers which are impacted when the pedal is released completely.

Ballard: What makes the "oink" more pronounced in the una corda position? I've listened to the damping of all three strings of a treble trichord, by muting two immediately and then bringing the damper down on the third. It didn't point to any particular one of the three strings as the source for the oink. By the way, this test will show up the felts which can't damp simultaneously. For some reason, hearing three dampings on a note at equal volume is never as annoying as hearing 2.25 of them, the .25 is the sympathetic left string. It's like the slightly turning unison which always sounds worse in the una corda position.

Sloane: To see why the "oink" occurs more readily with the shift pedal engaged, try the following. The next time you are at a large grand piano, preferably a nine-foot, engage the shift pedal and strike some of the tenor notes. If the hammer is regulated to miss the bass side string, you can see the other two strings actually start to vibrate, because of the large amplitude of the long strings, in a vertical plane. For some reason I'm not certain of, the unstruck, bass-side string will soon start to vibrate sympathetically, but usually in a diagonal or horizontal plane. After this occurs, release the key slowly. If there is a trichord wedge on the front of the damper for the note, you can see the different directions in the amplitude of the strings trying to "shake" the damper in opposing ways, thus creating the "oink." One way to try and diminish the prominence of the "oink" is to regulate the damper so that the rear felt, if it is a block, will hit slightly before the wedge, though damping will often suffer a bit.

Davenport: Another way of expressing this idea is to say that when the una corda is in use, assuming the hammer clears the left string, the left string will always be somewhat out of phase with the other two. Anytime the strings are vibrating out of phase, the oinking problem will be worse. With strings out of phase, simultaneous damping becomes difficult.

Ballard: Right. Unsynchronized damping in the wedges can be taken care of by spreading the wedges with Karen Robinson's squiding line, or by tweaking a wedge. In the flats, you take a small implement with three voicing needles set close on the end, you pick which area of the flat you want to expand, then you delicately insert the tool and rotate five degrees. Mind you, every once in a while I get paid for doing this kind of work.

Fandrich: Just a comment on poor damping in general. I've found through trial and error that many damper felt pieces are too long for their own good, that is, they damp too long a portion of the string's length. In my experience, a length of 9/16" to 5/8" is about right, especially in the lower and middle part of the piano. This would, of course, be graduated to about 1/2" as you go up in the treble. The problem with felts being too long is that when you get up to about 3/4" in length, the likelihood of one or both ends of the damper felt touching a node increases dramatically. I recently had a case where a single piece 3/4" long, at the tenor break on a vertical, touched the 7th partial node on one end and the 6th partial node on the other end, and set them both off loud and clear. I replaced the long piece with a 1/2" piece, and it worked fine.

Story: Since we're talking about dampers, last time he was here, Misha Dichter complained that our Symphony Steinway D was bleeding on some strings with half-pedal — good grief. I checked it with him, and sure enough, though lifting properly with a visual check, the factory-regulated dampers did bleed on a few notes. He showed me a great trick to test this. Just half pedal, then strum the strings and the bleeders will show right up. That, of course, is the easy part.

Ballard: You're right, that's the easy part. I have, on rare occasions, shimmed up the sustain pedal, either at the retainer J-bolt on the sustain trapwork lever, or at the underlever frame, at the height that a pianist might engage the sustain pedal for "wet damping." With the action in, you can run up the keyboard to find where the unevenness lies in this wet damping. With the action out, you can get in there and regulate to get rid of early or late damping. Early notes get the underlever frame felt ironed; late ones get a shim under the felt, or for a micro-tweek, get two voicing needles set close together, inserted and rotated to upset the matte of fibers. All of this can be stabilized by holding the frame up slightly from its shim point, and dropping the individual levers onto it from full height.

Yes, all that is still the easy part. Then you get to the business of three strings on a note which don't extinguish simultaneously. Here you're working with the lateral spacing of strings and wedges. The regulation of vertical spacing is reserved for open string work with the hammers. As a result, when you get to the flats, it'll be the same micro-tweeking with the pair of needles. Don't worry, I did say on rare occasions.

And on rare occasions, but becoming more frequent, we get a knowledgeable, amiable group of technicians together to hash out difficult problems we're all faced with. Thanks to all our participants in this Roundtable edition. May all your wheezes, thumps and oinks be silenced, and may you damp in peace.

A Tuner's 10-Year Tonal Treasure Hunt

By Dan Franklin
New York City Chapter

A Chipper's Gold

When I applied at the Sohmer Factory for a job as a chipper in the 60s, I had one purpose in mind: to become a first rate tuner. A veteran tuner once told me that the best tuners started out as factory chippers. I had no idea whatsoever what chipping consisted of, but I took his advice. And looking back, I attribute my interest in the Duplex Scale primarily to my experience as a chipper.

The acoustical aspect of chipping that attracted me was the intervals. Instead of tempered intervals such as contracted fifths, expanded fourths, and stretched octaves, a chipper deals almost exclusively with perfect consonances, like perfect fifths (just), fourths, octaves and, of course, unisons. A chipper gets to hear the piano like no one else. There's a huge ringing echo to each sound because there are no dampers. It's like being in a jungle of sound. At first it's terrifying and confusing, but after a while you get to know some of the wild animals, and it can be a sound vacation, if you will.

When I began working at a Steinway rebuilding factory in New York City in the 80s, I picked up on this tonal safari. But this time I had grands, and great ones, to work on. I was the house chipper, tuner and outside man. This put me in a propitious position. I got to know each individual instrument intimately. I traced the "sound progress" of every piano from first chip to fine tune, out the door and frequently into the customer's home. This enabled me to compare the instruments accurately at various stages of the rebuilding procedure.

A Glimpse of the Treasure

After about a year and some quarter million strings later, I began to notice some distinct differences in the tone quality of the pianos. Most would have a certain sound at chipping time that was what I'd come to expect, but others would have a special "ring" to the consonances that just kept going, and going, and going.... Energized by this stimulating acoustic phenomenon, I began to keep a special eye on those pianos through the regulation and fine tuning stages. It seemed that the pianos that started out with more resonance at the beginning stood apart from the others noticeably at the end. Those pianos were sold out of the factory almost before they were fine tuned. Naturally, I wondered what was the cause. When a piano had that "ring" to it, it just zipped by its factory mates, cutting up the open lane in front of everybody else. I felt there had to be a reason and I set out to find it.

What was different about those pianos? Was it the hammers, the voicing, the bearing, the crown, the strike point, the blow distance, the quality of the strings? The work at that factory was as fine as it gets — worldwide. So it had to be something else. All this time I'm staring at the capo d'astro bar where the words "Duplex Scale Pat. May 14, 1872" frequently appear. Could this have something to do with the tone of the piano? That seemed to be a reasonable assumption, so I began plucking the Duplex Portion of the strings comparing the tone to the speaking length. I made extensive notes and eventually Darwined my way to a theory of "Duplex Selection."

It seemed each model of piano had a specific Duplex Scale, using similar consonant intervals. In most of the pianos being rebuilt, the intervals were somewhat flat or sharp of these consonances. The pianos whose strings seemed to keep on ringing forever were the ones whose Duplex portions were, for the most part, right on the octave or the fifth. It made sense. After all, I thought, the patent notice emblazoned in the casting was just as big as the manufacturer's name, so Steinway had to attach more than a little importance to the Duplex Scale.

The First Nugget

One day as I was chipping and staring at the Duplex Scale words, a string snapped in my head. Why not look up the patent? So I did. Thus began the treasure hunt.

Finding the patent in Washington, D.C., at first seemed to be the answer I was looking for because it confirmed a number of critical points:

- The Duplex Scale had a major role in tone production.
- The intervals of the Duplex Scale were intended to be consonances.
- The description I used to describe the Duplex Scale effect to myself was pretty close to the ones used in the patent text: "purity and fullness of the tone," "clarity and richness" and "duration of the sound."

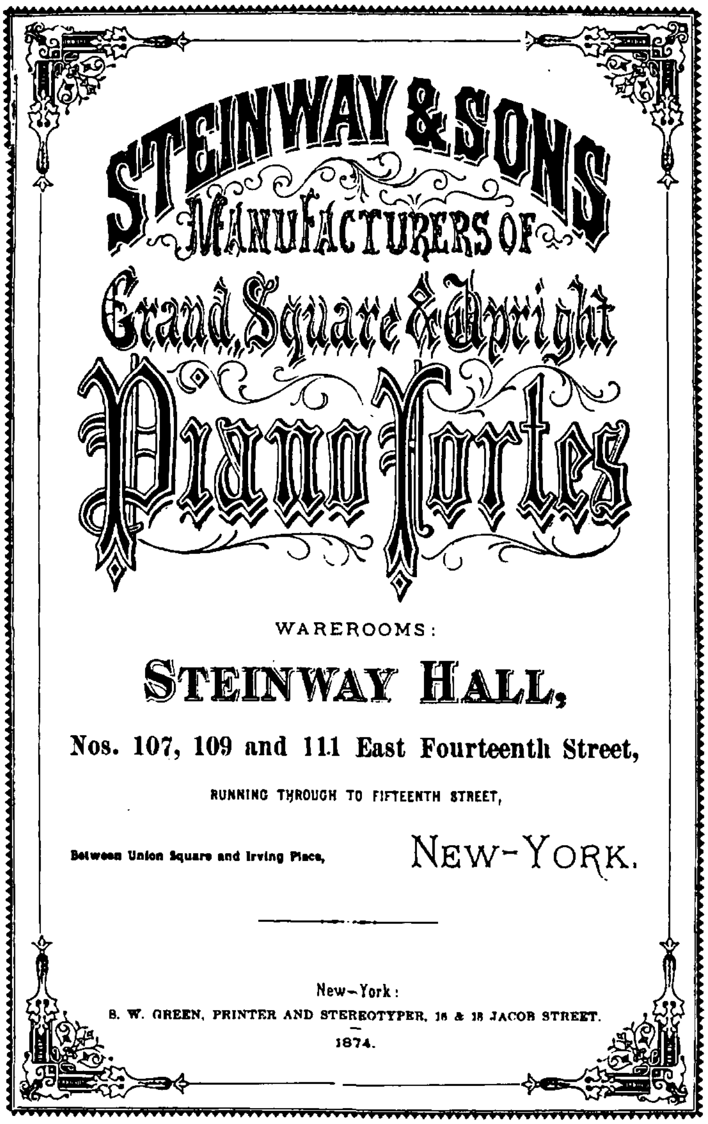
So I was greatly encouraged. The following is a partial reprint of the U.S. Patent #126848 called "IMPROVEMENT IN DUPLEX AGRAFFE SCALES FOR PIANOFORTES"

> "... 2. The arrangement, in a piano-forte, of a succession of strings, in each of which the longitudinal vibrations of that portion of the string situated between the extreme edge of the sounding-board bridge and the hitch-pin are brought in harmony with the vibrations of the main section of the string, substantially as described. — ***C.F. Theodor Steinway***"

Part I: A Duplex Scale Odyssey

Even though the patent is a century old, the language is perfect "patentese," the phraseology and terminology used in patents. It is excellently written and perfectly clear in every single way with one exception. The wavy word that disrupts our understanding of the text is the adjective — you guessed it — "longitudinal."

What did C.F.T. Steinway mean by "longitudinal vibrations"? Does anybody know? The problem is compounded because the phrase is used eight times, and appears in the second claim that describes the Duplex agraffe between the hitchpin and the bridge. I've shown this patent to innumerable technicians and their opinions fell into one of two categories: either Steinway didn't know what he was talking about, or what he was talking about was just too far out for anyone to understand. Somehow I could never accept either view, but I couldn't do anything about it, so I dropped the subject for a while.



A Last Resort

Although my interest never waned, the opportunity to pursue the matter had all but disappeared until one day the factory foreman was stumped. A customer refused to take her piano because she was not happy with the sound. Not only did the foreman meticulously check and recheck the piano, he even installed a new set of hammers, but the customer still refused to take her piano because she wasn't satisfied with the tone.

I had an idea what was wrong from the beginning, but I didn't want to repeat my error of making a plucking Duplex pest of myself and get fired, so I kept my opinion to myself until the last minute. I believed that the disturbing element the customer objected to would be alleviated if the moveable Duplex Harmonic Bridges (?) were tuned to more exact consonant intervals of the I speaking length.

I lowered the tension appreciably on all but a few strings which I used as tuning guides, and slid the Duplexes to a point yielding a consonant Duplex tone with the speaking length. I then raised the tension and retuned the piano. It took a few tunings to get the piano back in shape. In fact, on the day of the second tuning the customer was there waiting to try the piano for the third time in six months. She seemed self-conscious with my presence so I left. When I returned the next Wednesday the piano was gone!

Objective Proof

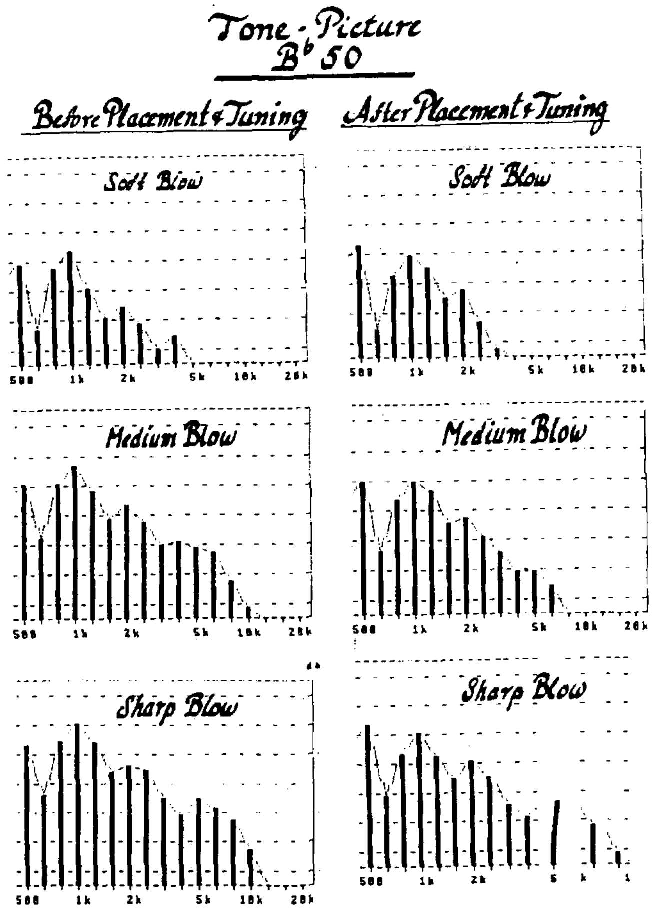
I then knew I was on a real treasure hunt. I knew I was right, but I had to find a way to prove it objectively. The chance came about a year later. On a certain job for a recording studio the perfect combination of circumstances developed. There was a Steinway B with the Duplex lengths off-consonance that also needed filing and voicing. I made a contract with the studio directors to do the work in return for permission to do my experiment.

We set up a "before-and-after" experiment using a dbx RTA harmonic frequency analyzer. Basically, the experiment consisted of sampling a series of notes with the Duplex in the existing position, then "tuning" the Duplex, and finally sampling the same notes after the procedure. Sound simple? It wasn't. Ruts and forks and dead ends made rough travel-

Tonal Treasure Hunt Continued On Next Page

A Tuner's 10-Year Tonal Treasure Hunt

Tonal Treasure Hunt Continued From Previous Page



ing. But we recorded the entire proceeding so we did gain some important ground. The objective proof I wanted, which was to compare printouts of the sound before and after tuning the Duplex, never happened because I wasn't able to get the same machine for the second half of the experiment. However there was a marked improvement in the piano and we moved at least a yard closer to the crypt.

About two years ago I renewed my acquaintance with a former Steinway bellyman who had formed a partnership with some extremely talented and accomplished young technicians and began chipping and tuning for the new company. They seemed to respect my work and they expressed conservative interest in my theory of the importance of Duplex Scale Tuning. They gave me the opportunity to do another experiment on a B they had recently rebuilt. This time I was determined to get my "before-and-after" printouts no matter what. What did matter was that I got results, but you would have to say it was a "fast-field" experiment.

I had to do the whole thing on the same day:

- Fine tune the piano.
- Sample the notes.
- Lower the tension.
- Tune the Duplex.
- Raise the tension.
- Tune the piano twice.
- Re-sample the notes.

The procedure was hurried, to say the least, and is most certainly limited in its technical value, but I got what I was after: a tone-picture of certain notes before and after tuning the Duplex Scale that could be objectively compared.

Learning to interpret the data was quite a project in itself because this unit has never been used for this purpose, either in the piano industry or the sound industry, to my knowledge. But after six months of digging on this side of the mountain, some glistening specks began unmistakenly to appear. The tone-picture "after" was at the very least, discernibly different and improved in certain specific ways. I intend to present a thorough analysis of these samples in a future article.

Back to the Other Side of the Mountain

Since the evidence was so consistent, notwithstanding wide error margins in our procedure, I could not understand why so little interest and attention has been paid to the subject. This consideration brought me back to Go, the Patent, and that splinter in your sole, the adjective: "longitudinal."

I searched the galaxy of piano luminaries, from the sages of Steinway to the troubleshooters of New York, and all I could ever get for an answer to this baffling mystery was a few arched eyebrows. No encyclopedias mention the Duplex Scale in any language in the Lincoln Center Library. No description of it exists in any technical journal or book I have seen. I seemed to have run out of gas, with two flat tires and a broken tuning lever at a dead end.

So I said, "O.K. Let's hike back to town, and get some new tools and a new rig. Let's go back before the patent and see how the idea developed from Helmholtz's theories to C.F. Theodor's invention." Surely some correspondence must exist. But where is it? And can I read it if I find it?

About six months ago I got a tip from a salesman that Henry Z. Steinway had donated some papers to the LaGuardia Community College Library in Astoria to begin a Steinway Archives Collection. In less time than it takes to strip-mute the temperament I was over to Queens going through the files.

It's In There

The Collection was in a nascent stage. I felt I was really getting close, but I didn't find the 100-karat diamond. I did, however, find a peculiar looking document hand-written on pale blue, tissue-thin paper in a beautiful but inscrutable script. The only words I could recognize were the words: "Doppel Agraffe Scala fur Piano-fortes," and "C.F. Theodor

Steinway von New York."

As it turns out, this was the real original patent. A copy of the complete text and the translation into readable German is available. The original word was "Langeschwingungen." I understand from extremely reliable sources that the word in German Factory terminology is now "Langsschwingungen," and it simply means the vibrations of the length of the string. Other ways to say it would be "the length's vibrations," "vibrations of the speaking length" or "vibrations of the length." Almost any of these choices clarifies the meaning of the passage in the patent so simply, it's like a revelation.

> "... 2. The arrangement, in a piano-forte, of a succession of strings, in each of which the *vibrations of the length* of that portion of the string situated between the extreme edge of the sounding-board bridge and the hitch-pin are brought in harmony with the vibrations of the main section of the string, substantially as described. — ***C.F. Theodor Steinway***"

A Piano in the Rough

Just about a month ago, Steinway D #16238 came into our shop for rebuilding. This instrument has a most extraordinary Duplex Scale design. In the section between the agraffes and the tuning pin there is a metal plate, notched in bridge-like fashion and set into the main plate. There is no Duplex support between the hitchpin and the bridge.

This old scarred jewel of a piano told me I must be getting close to pay dirt. This piano was made in 1869. The piano that Theodor Steinway delivered to Helmholtz was probably very similar to this one because the letter Helmholtz wrote to Steinway in 1871 indicates that the piano he received had a certain character to the tone that very likely was due to a limited duplex effect. Helmholtz's letter tells Steinway that he was on the right track. Since we know the patent was approved in May, 1872, it is almost certain that Steinway was on the verge of his discovery when he shipped Helmholtz the grand the year before.

Tracking the treasure had now become more exciting than a Super Bowl. I knew I was getting close, but I didn't know exactly to what! The treasure had to be some proof, some objective verification of the Duplex Scale's nature and importance.

A Fortuitous Cancellation

As it happened, a last minute cancellation of a tuning appointment gave me a morning free. I needed a better copy of the original handwritten patent, and I hoped I might find some new documents I might have overlooked on my first trip to the LaGuardia archives. I phoned and asked if I could have another go at the Steinway Collection. I was given the OK, and was told the collection had been appreciably updated since my last visit, and there would probably be some valuable new material available.

That was an understatement. The trip to the archives was the reward for all my efforts and then some. In the time since my last visit, the staff of the archives had completely reorganized the Steinway Collection and added innumerable documents, including copies of the Steinway Brochure from the 1876 International Exhibition held in Philadelphia.

A Duplex Treasure Chest

There were testimonials by 19th Century piano masters, such as Franz Liszt, that specifically referred to the Duplex Scale tone improvement, advertisements acclaiming the Duplex Scale, and a crowning jewel of the treasure trove of duplex gems was the Duplex Scale description on page 15. But even more awesome was the footnote at the bottom of the page in tiny print.

The Following Patented Improvements

ARE USED BY

STEINWAY & SONS

IN THE CONSTRUCTION OF THEIR

PIANO-FORTES.

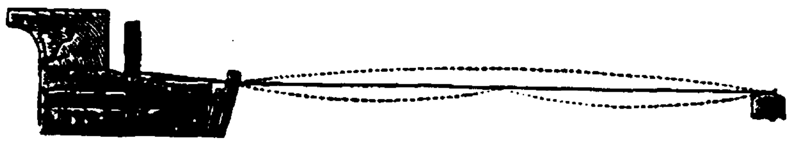
1. ***Patent Agraffe Arrangement,*** applied in all their Square and Grand Pianos, the full Iron frame being cast with a projection which overlaps and abuts against the wrest plank; into this projection the agraffes (through which the strings pass) are screwed, producing an extremely clear and sympathetic tone, together with the greatest possible durability. Secured by Letters Patent No. 26,300, dated November 29th, 1859.
2. ***Patent Overstrung Scale and Construction in their Grand Pianos,*** fully described and endorsed in the Official Report of the International Jury of the Paris Exposition, 1867. Secured by Letters Patent No. 26,532, dated December 20th, 1859.
3. ***Patent Resonator,*** an apparatus consisting of a number of set screws, applied in all Grand and Upright Pianos, and serving to compress the sides of the sound-ing-board at will, by which its tension can be regulated to a nicety and placed forever under control. Secured by Letters Patent No. 55,385, June 5th, 1866.
4. ***Patent Tubular Metallic Frame Action,*** applied in all Grand and Upright Pianos. Instead of the wooden bars which formerly supported the action and which were liable to atmospheric influences, this is sustained by hollowed brass tubes filled with wood, which are of immense strength, and can not be injured or affected. Secured by Letters Patent No. 81,306, August 18th, 1868.
5. ***Patent Vibrating Sound-board Bridge,*** with acoustic dowels, used in all Grand and Upright Pianos. Secured by Letters Patent No. 88,449, dated April 6th, 1869.
6. ***Patent Independent Detached Pilot and Metal Standards,*** applied to the action of all Grand Pianos, producing highest possible degree of perfection and durability. Secured by Letters Patent No. 93,647, dated August 10th, 1869.
7. ***Patent Ring Bridge on Sound-boards, and Oblique Treble Bar of full Iron Frame.*** Improvement in the Construction of Grand Pianos. Secured by Letters Patent No. 97,983, dated December 14th, 1869.
8. ***Patent Repetition Action, with Spring Back-Check,*** applied to Parlor Grand Pianos, style 1. Secured by Letters Patent No. 115,983, dated June 6th, 1871.
9. ***New Iron Cupola and Pier Frame for Self-Compression,*** applied in all our Upright Pianos, and Parlor Grand Piano, style 1. Secured by Letters Patent, No. 127,384, dated May 28th, 1872.
10. ***Grand Duplex Scale,*** applied to all Grand Pianos and Square Grand Pianos. In addition to the principal scale, a second scale of reduced proportional length is added between the agraffes and tuning-pins, representing a higher octave for each note, rendering the tone richer, more musical, and greatly increasing its carrying capacity. Secured by Letters Patent No. 126,848, dated May 14th, 1872.

Tonal Treasure Hunt Continued on Page 29

The duplex scale, in fact, is a second scale, of exactly and mathematically proportioned and shortened length, added to the principal scale.* This second or duplex scale is applied between the tuning-pins and the end-points of the strings upon the wrest-plank.

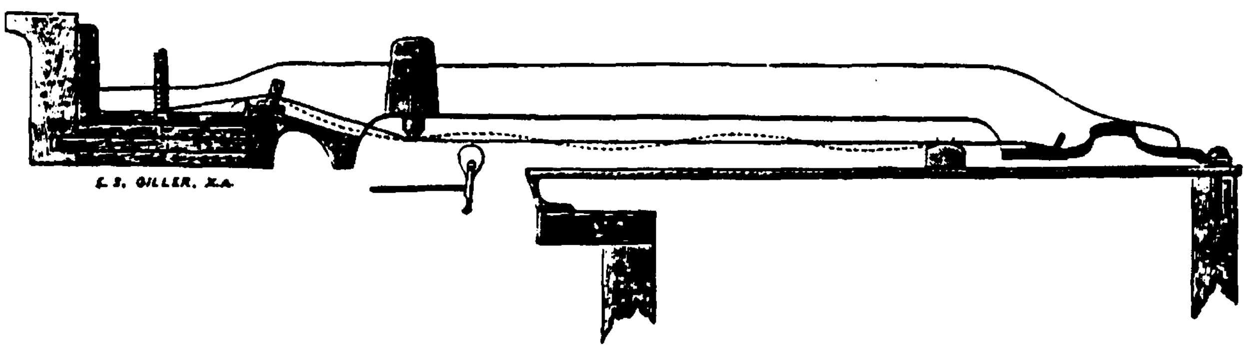
The next following illustration, Figure O, shows the former system of the application of the agraffe; the upper punctuated line shows the vibrations of the fundamental tone, in which, in thinner strings, but one over-tone or dividing point was formed, as is indicated by the lower punctuated line.

FIGURE O.



The next following illustration, Figure P, shows the patented construction brought to perfection, inasmuch as a higher dividing node has been chosen at will, which invariably contains all the lower overtone vibrations down to the fundamental tone of the entire length of the string.

FIGURE P.



P shows the transverse section of a grand (fully described under Patent No. 14), with capo d'astro bar and cupola frame.

The tone produced by a string consists of a fundamental tone together with a number of partial over-tone vibrations; the latter are again divided into perfect consonances (the over-tones of which accord in perfect harmony), and in disonances (affected by impurities of tone), such as for instance the chord produced by the prime with the diminished third and seventh. These latter have been avoided in the duplex scale, so that but perfect consonances are developed, such as the prime with its octave and super-octave with its fourth and fifth; they are used in such high pitch, that a disturbing after-sound or vibration is avoided. At the same time the principal string receives the impulse to divide itself in its vibrations at the smallest distances; this is attained by the points in the agraffes which permit of the crossing of the nodes of vibration. These qualities were not possessed by the short stiff strings, as formerly used.

The tone is thereby rendered richer, purer, and more musical, while its carrying capacity is considerably augmented.†
Secured by letters patent No. 126848, dated May 14, 1872.

* The strings between bridge and hitch-pin are also a shortened scale; the pitch of each string of this shortened scale must be compared with the pitch of the same string in the principal scale, which gives to the tuner a perfect control of the proper adjustment of tone and transport of the tension over the bridge.

† Professor Dr. Helmholtz writes about this invention as follows:

BERLIN, August 13, 1873.

MESSRS. STEINWAY & SONS:

GENTLEMEN—I can only congratulate you on the great improvement you have achieved by the introduction of your duplex scale into your pianofortes. I have repeatedly and carefully studied the effects of the duplex scale just applied to my STEINWAY grand piano, and find the improvement most surprising and favorable, especially in the upper notes, for splendid as my grand piano was before, the duplex scale has rendered its tone even more liquid, singing and harmonious. I deem this improvement very happy in its results, and, being based upon scientific principles, capable of still greater development.

Yours, very truly,

H. HELMHOLTZ.

Tonal Treasure Hunt Continued From Page 27

> "* The strings between bridge and hitch-pin are also a shortened scale; the pitch of each string of this shortened scale must be compared with the pitch of the same string in the principal scale, which gives to the tuner a perfect control of the proper adjustment of tone and transport of the tension over the bridge."

Now We Know What

Is this the end of the search? Far from it. Now we know what we should have known but weren't told because someone wasn't there to tell us. We know that the pianistic, scientific, and innovative collossi of the 19th century considered the Duplex Scale improvement of the highest importance to piano tone. We also know that the tone of the Duplex Scale Section must be a consonant interval of the speaking length. And finally we know that ***THE TUNER*** is the one in charge. In conclusion, let me say that we've only just begun.

Illustrated Catalogue

OF

STEINWAY & SONS'

Pianos.

WAREROOMS, STEINWAY HALL,

Nos. 107, 109 and 111 East Fourteenth Street.

FACTORY,

Fourth Avenue, from Fifty-second to Fifty-third Streets,

NEW-YORK.

Saw Mill, Iron Foundry, and Metal Works, Astoria, Long Island,

OPPOSITE 120TH STREET, NEW-YORK.

New-York:

S. W. GREEN, PRINTER AND STEREOTYPER, 16 AND 18 JACOB STREET

1874.

Tuning Forks

Accuracy, Stability And Practical Applications

By Jim Ellis, RPT

ABSTRACT

This article describes the general characteristics of tuning forks, presents definitive measurements of the effect of temperament on their pitch, and compares the temperature stability of aluminum forks versus steel forks. A detailed description showing how tuning fork pitch was measured to an accuracy of a few parts per million is included. The results of repeated eight-foot drop tests are given. The article concludes with a section on practical applications that includes a graph showing the length of time required for a tuning fork to stabilize at ambient temperature after being laid on the plate of a piano.

FOREWORD

When I first began writing this article, I intended for it to be a brief summary of the differences between aluminum and steel tuning forks. As I became more involved in the necessary research, however, I decided that I would spend whatever time it took to make the coverage of this subject as complete as possible. All measurements that I quote were made as carefully and accurately as my facilities would permit. Many measurements were repeated for verification. I hope this article will serve as a useful reference for piano technicians. I do not believe this subject has been adequately addressed previously.

INTRODUCTION

Tuning forks have been the primary pitch reference used by musicians and aural tuners for many years. They were standard equipment during the time of Bach and Handel, probably long before that, and they still are today. During the past two decades, some electronic tuning devices and pitch references, particularly those that are quartz-crystal controlled, have become available that are far more accurate than conventional tuning forks. Nevertheless, tuning forks still have their place in the musical world. They are small, rugged, reliable, reasonably accurate, and require no batteries or maintenance of any kind. A good tuning fork will last indefinitely. But it isn't all "clear sailing." There are things to know and precautions to take. In this article, I describe the kind of accuracy to be expected of a tuning fork, show how dropping it may affect its accuracy, and compare the temperature coefficients of steel and aluminum tuning forks and bars.

CHARACTERISTICS

After being struck against a firm but slightly-padded object, a tuning fork's tines vibrate primarily in a sinusoidal mode that produces a pure tone in air. They also produce high-pitched ringing tones that are usually subdued, but may become rather loud if the fork is struck against an object that is too hard. There are generally two of these ringing tones, which are inharmonic. Their frequencies are likely to be anywhere between the sixth and seventh, and the seventeenth and eighteenth harmonics, respectively, of the fork's primary frequency. If the handle of the tuning fork is held perpendicularly against a sounding board of some sort, both the fundamental tone and its second harmonic will be heard. In this case, the overtone is phase-locked to a perfect octave above the fundamental, with no inharmonicity. Describing the laws of physics that make these things happen is beyond the scope of this article.

DEFINITIONS

We must first define what we mean by accuracy, stability, volume, and sustain. Accuracy is a measure of how close the frequency of the fork's vibrations are to the specified frequency. *Stability* is the fork's ability to always vibrate at the same frequency. *Volume* is simply the amount of sound produced, and *sustain* is how long the sound will last after the fork has been struck.

ACCURACY AND STABILITY

We can't have accuracy without stability, and stability without accuracy is useless, so we must consider both together. Temperature is the quantity of primary concern here. Tuning forks vibrate at their specified pitch at only one temperature. Some makers will stamp the temperature at which their forks are tuned right on them, but most do not. In this article, I am addressing only those tuning forks that are available from piano supply houses, not those that are made of very special materials — the kinds that might be found in a laboratory.

As the temperature rises, the pitch of a tuning fork goes flat, so we say it has a negative temperature coefficient. Aluminum tuning forks, made of a hard aluminum alloy, are sold by some suppliers, and are preferred by some technicians because of their clear tone and long sustaining ability. The problem is this: they have a negative temperature coefficient that is more than twice that of steel forks. In addition, aluminum is less massive than steel, and its thermal conductivity is much greater. Just picking an aluminum fork up by its handle can transfer enough heat to it to throw its pitch off by a measurable amount. The problem is not so much one of accuracy, but instead, its thermal coefficient, thermal conductivity, and low mass. The picture of what appears to be an aluminum tuning fork on the cover of the October 1994 *Journal* is what motivated me to write this article.

THE TEST SET-UP

I had originally intended this article to be a simple set of measurements and a discussion about the temperature coefficients of aluminum versus steel tuning forks. Once I got started, I decided to go all the way, do it right, and make something definitive out of it. In order to get the data required to plot temperature effects, I would need to measure the pitch of each fork at temperatures both above and below ambient air. To eliminate possible compound errors, correct scientific procedure required that I keep the measuring instrument at the same temperature during the tests. When a fork was taken from its heated or cooled environment, its pitch would have to be measured quickly before its temperature changed. For convenience, speed and accuracy, I would need to use my Sanderson Accu-Tuner (SAT) to make these measurements.

I had complete confidence in my SAT, but good scientific procedure dictated that I must first check it against another standard, hopefully, a better one. That "better standard" would have to be my 8-digit frequency/period counter, but then the same rule applied to the counter. If I followed the rules, I would need to check it against an even better standard of known accuracy. In my case, that would have to be one of the standard carrier frequencies of radio station WWV, of the National Institute of Standard and Technology at Fort Collins, Colo., (formerly the National Bureau of Standards). These frequencies are as accurate as current technology knows how to make them. (See Figure 1)

My VFO did not tune below 3.5 MHz (MHz=million hertz) nor to any frequency outside any of the amateur bands. The only frequencies within any of the amateur bands above 3.5 MHz that could produce a harmonic at any of the WWV carrier frequencies would be 3.75 Hz. (4th harmonic at 15 MHz), and 4.0 MHz (5th harmonic at 20 MHz). Reception of WWV on 20 MHz was down in the noise level at my location, but 15 MHz was strong and steady during the afternoon hours, so that would be it. Fluctuations of the ionosphere between Fort Collins, Colo., and Oak Ridge, Tenn., caused the phase of the WWV carrier to shift a little bit, but I was able to tune the VFO to where its fourth harmonic was within one beat in two seconds of the 15-MHz WWV carrier, and keep it there for a full 10 seconds while the counter counted. This filled all eight digits of the counter, and reduced the ambiguity of the count to + one count in 37,500,000. The ± 0.5 Hz uncertainty in the setting of the VFO was equal to ± one part in 30,000,000, giving me a total uncertainty of ± one part in 16,875,000. I'll need to be a little conservative here and just say the measurement was good to ± one part in 10 million.

Setting the VFO to within ± 0.5 Hz of the 15-MHz WWV carrier and keeping it there for 10 seconds was very tedious. I had to try several times before I was able to do it. But having done it and recorded the number counted, I turned the receiver and the VFO off. Their job was finished for the time being. The counter registered 3,750,003.1 instead of 3,750,000.0, which was equal to a correction factor of 0.999999173 by which I would have to multiply the counted frequency if I got the exact answer.

The next order of business was to check the internal calibration oscillator of the SAT. Taking a direct frequency count, even for 10 seconds, the maximum counting interval of my counter would not provide adequate statistics for a good measurement. I would need to measure the average period of the SAT's oscillator output while it was in the internal "CAL" mode, and then convert that

Tuning Forks Continued On Next Page

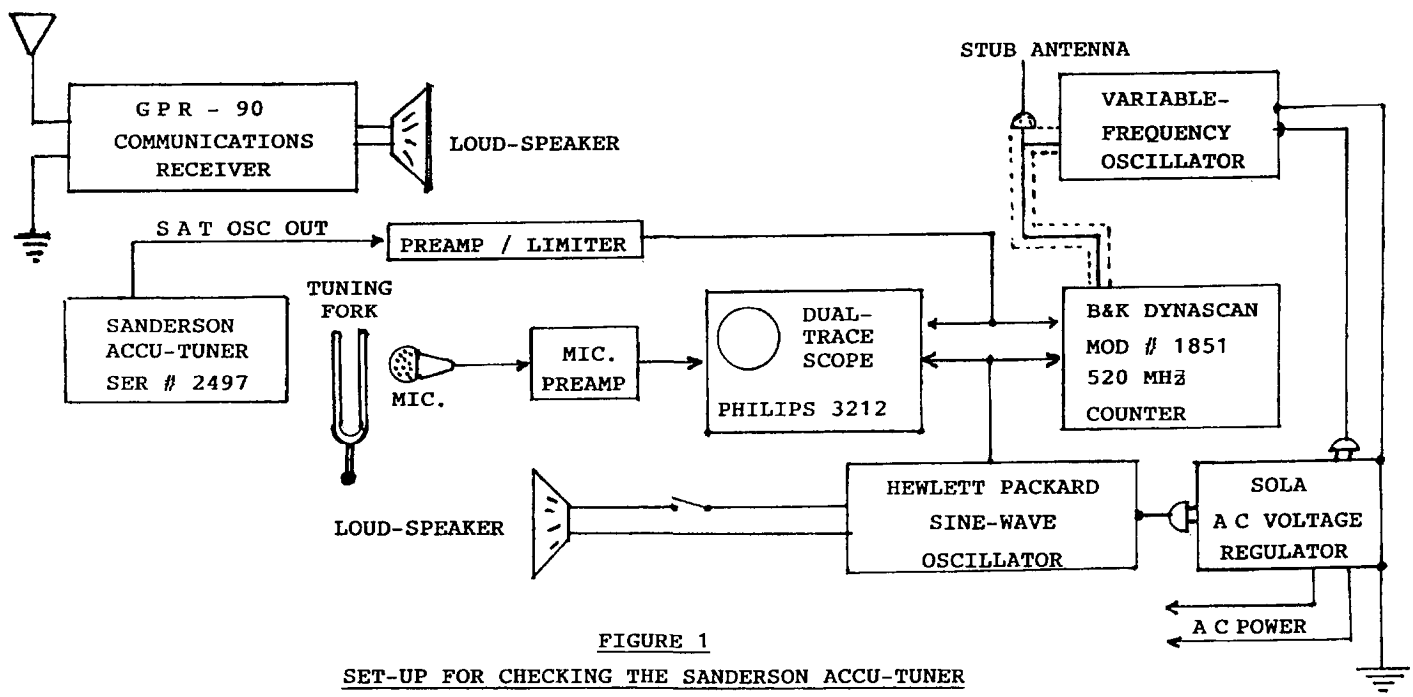


FIGURE 1

SET-UP FOR CHECKING THE SANDERSON ACCU-TUNER

AND MEASURING TUNING FORK AND BAR FREQUENCIES

Figure 1 is a block diagram of the test set-up. The first order of business was to check the counter (right side of the figure) against WWV. To do that, I would need to tune the receiver (top left) to one of the WWV carrier frequencies, and then tune the variable-frequency oscillator (VFO, top right) to the same frequency by picking it up on the receiver along with WWV and tuning the VFO to "zero-beat" WWV. It's the same principle as tuning a unison on a piano, except for the fact that the frequencies are in millions instead of hundreds of hertz (one hertz, abbreviated "Hz" is one cycle per second).[1] With this set-up, I used the VFO to provide a precise, steady frequency for the counter to count as a calibration check.[2]

Continued From Previous Page

to frequency. I connected the SAT's oscillator output directly to the counter, but that gave unsatisfactory results. The reason was that the SAT's oscillator output is a complex wave with a slow risetime, and the counter couldn't decide just when the next wave got there.[3] I overcame this problem by putting the SAT oscillator output through a preamplifier that had diode limiting in its output. This provided a square wave for the counter, and greatly improved time resolution.

The average period of the SAT's internal "CAL" measured out as 2272.726 microseconds (microsecond=millionth of a second). Converted to frequency, that's 440.0002077 Hz.

Correcting for counter error, we have:

440.0002077 x 0.999999173 = 439.9998438 Hz.

Error = 439.9998438 - 440 = - 0.0001562 Hz.

Error = 0.0001562 x 3.935 = - 0.0006146 cents (at A-440).

The Sanderson Accu-Tuner's internal calibration oscillator is specified to be within ± 0.01 cent of A-440. Serial #2497 checked out at -0.0006 cent, or six ***ten thousandths*** of a cent flat![4]

ACCURACY

My data on tuning fork accuracy is not very extensive, but the forks that I have checked at random over the past several years have shown more variations in pitch than I would like to see. It is not unusual to find a one-cent error, either sharp or flat. If tuning fork makers would all tune their products at the same temperature, this problem might be overcome. There is also a very gradual change in pitch due to the aging of the metal, but it takes years for this to become a measurable amount, and I have no data on that at the present time. I recently checked two of the better quality steel forks that were purchased from supply houses in the United States. One was made in the U.S., and the other in England. Both were stamped "A 440." At a room temperature of 73° F, the U.S.-made fork measured 0.7 cents sharp, but the one made in England was 1.8 cents flat.

FREQUENCY MEASUREMENTS

To measure precisely the frequency of a tuning fork in hertz, I set the Hewlett Packard sine-wave oscillator (Figure 1) to the approximate frequency of the fork. I sounded the fork, and aurally tuned the oscillator to it. I then turned the loudspeaker off and fine-tuned the oscillator by observing the two superimposed wave forms on the dual-beam oscilloscope. The sine-wave oscillator provided a steady, stable signal that could be accurately measured either as frequency or average period. Calculating the reciprocal of the period gave the result as frequency. I obtained the best results by synchronizing the oscillator to ten times the frequency of the fork, and adjusting the scope to make just one complete sweep per cycle of the oscillator. The wave form of the fork then appeared on the scope as a cross-hatched pattern that would move quickly to the right or left if there were even the slightest phase shift between the two signals. By measuring the average period of the oscillator's signal to seven significant digits, and taking the reciprocal, I was able to obtain excellent statistics. The measurements that I made using this method were so sensitive that I could see the very minute rise in the pitch of a tuning fork as its amplitude died away. I believe this was due to the decreased loading of the air as the amplitude decreased. If a fork exhibits a pronounced change in pitch as its amplitude decreases, it is flawed. Most likely, it will be a tiny crack somewhere in the metal. It was necessary to hold the fork perfectly still while making the measurements, otherwise, the Doppler effect would cause a measurable error. The Doppler effect is the apparent change in pitch as a result of motion.

DURABILITY

I did some drop tests to see just how rugged a tuning fork really is. I dropped a steel A-442 fork (European, compliments of C. Bechstein) in increasingly severe drops, checking its pitch before and after each drop with my 1993-model SAT. The first test was a seven-foot drop to a carpeted hardwood floor, moved to a bare hardwood floor, and finished with two drops to a bare concrete floor from four and eight feet, respectively. The total change in pitch after all the drops was less than 0.1 cent, which was the smallest increment I could measure with the SAT. This told me how much the fork di*d not* change due to the 8-foot fall to bare concrete. What I wanted to know was just how much it *did* change.

I repeated the drop tests again, this time using the instrumentation described above. I dropped the same tuning fork five times to the same bare concrete floor from the same 8-foot height as before (the height of my shop ceiling). Before the drop tests, I laid the fork on a heavy steel plate that had been in the shop for months and was at shop temperature, which is fairly constant. This made sure that the fork was at shop temperature. I handled the fork with a thick fabric glove on my hand, and struck it against a leather pad on the table instead of my knee to prevent warming it. After the five drops, I laid the fork back on the steel plate (heat sink) to ensure that it was at the same temperature as it was before the drops. At the 63°F shop temperature that day, the fork measured 442.2894 Hz before the five drops, and 442.2772 Hz afterwards, for a change of -0.0122 Hz or -0.048 cents. Dropping the fork eight feet to bare concrete, five times in a row, caused it to go flat by 3/4 of a beat per minute. No electronic tuner in existence today will take that kind of abuse and still be in one piece, much less function!

TEMPERATURE COEFFICIENTS MEASURED

The items chosen for these tests included a 440-Hz steel fork, a 440 steel bar[5], a 440 aluminum bar, a 311.13 (D#) aluminum fork, a 220 aluminum fork, and a quartz-crystal-controlled Hale Electro-Fork set to A-440. If we measure temperature coefficients in cents, then it doesn't matter whether the item is a tuning fork or bar, or what pitch it is. The material is what determines the temperature coefficient. To obtain good accuracy, I checked the forks and bars over a wide range of temperature from one degree to 81° Fahrenheit.

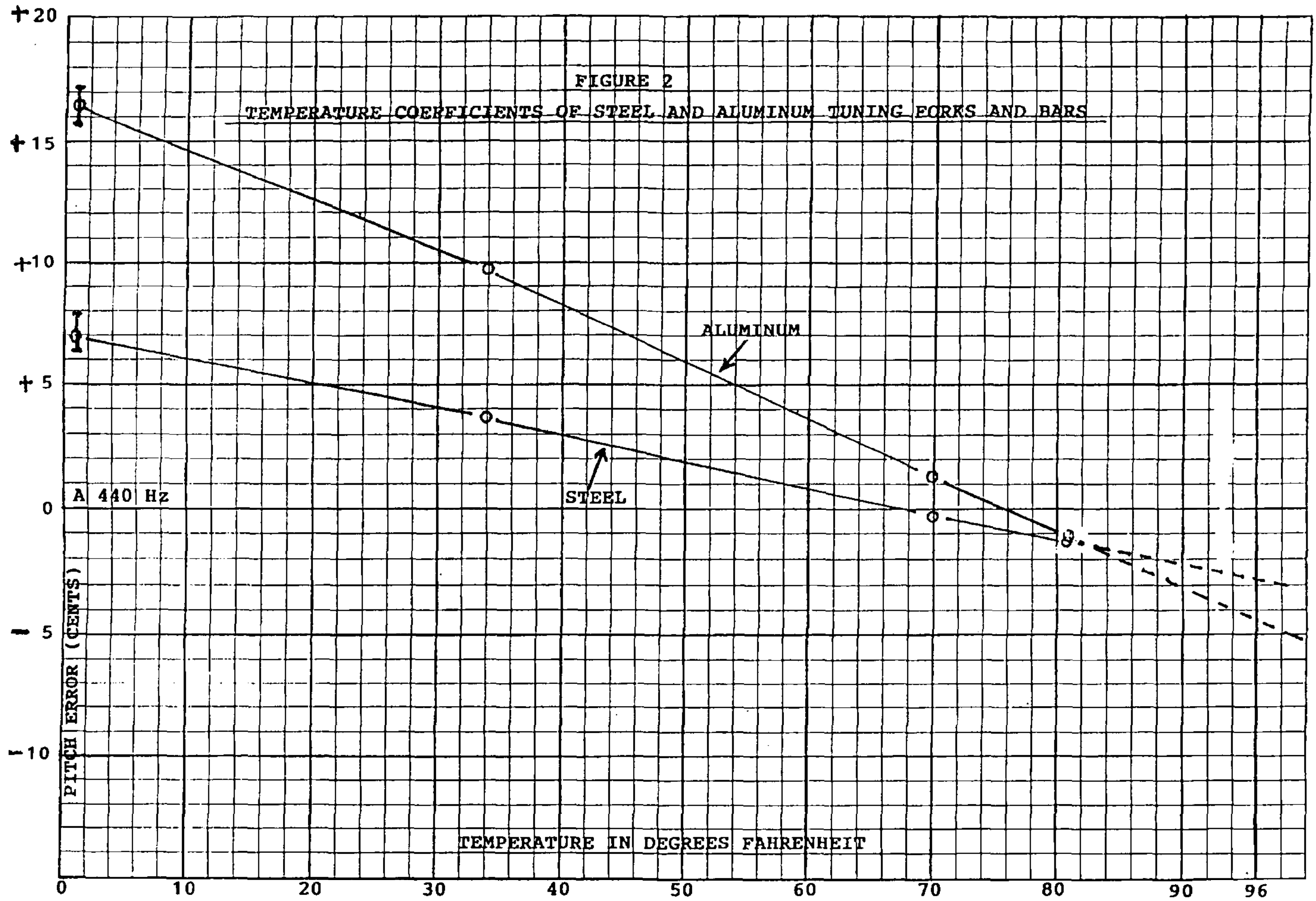


Figure 2

I put the items to be tested into the freezing compartment of my refrigerator, and left them there for several hours at 1° F. Then I took them out, one by one, and very quickly measured the pitch of each one with the SAT before it could warm up or collect any significant amount of condensate. The SAT was kept at room temperature during this time. For the next data point, I put the items into the main part of the refrigerator at 34° F overnight, and repeated the same procedure the next morning. The next measurement was at room temperature of 70° F, and the last one used a warmed oven at 81° F. The items were given at least four hours at each new temperature.

Figure 2 is a graph of the average error (in cents) of the steel fork and steel bar, and the average error of all the aluminum items as a function of temperature. I averaged the items of the same material to minimize individual measurement error. To verify my results, I made more measurements with just the steel items. Instead of using the freezer, the refrigerator, and an oven, I used a bath of ice water made from distilled water for the lowest temperature reference, and water baths of monitored temperature for all the others. I also did a thermometer check at the 32° F mark in the distilled ice-water bath to ensure the thermometer was referenced correctly. The second set of measurements differed from the first by one percent, and that is what I am quoting here because I believe they were the more accurate. Obviously, the fork and bar were quickly blotted dry before checking their pitch. The temperature coefficient of the steel items averaged -0.106 cent per degree Fahrenheit, but that of the aluminum items was -0.232 cent per degree Fahrenheit. The Hale Electro-Fork changed less than 0.1 cent over the entire range from 1° F to 81° F.

Figure 3 is a graph showing what the pitch of a fork made of steel or aluminum would be at a given temperature. The lines for both steel and aluminum are normalized to 70° F — to assume that was the temperature at which the fork was tuned. To use this graph to determine the pitch of a fork that was tuned at a different temperature, simply lay a straight-edge on the graph parallel to the appropriate line so that it crosses the A-440 Hz line at the temperature at which the fork was tuned, follow the straight edge to the current temperature, and read the pitch from the vertical "PITCH (Hz)" scale. The error bars at the low temperature indicate the measurement uncertainty.

Figure 4 is a conversion graph showing the relationship of beats per second to cents error of A-440 Hz and C-523.2511 Hz.

VOLUME AND SUSTAIN

I will say very little about this because most of it is obvious. Volume and sustain are closely related. All other things being equal, they affect each other in opposite directions. As a general rule, the larger a tuning fork is, the longer it will sustain the tone because

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it will store more energy. The more sound a given fork is producing, the faster its tone will decay because it will be giving energy up faster. Holding the handle of a tuning fork against a sounding board produces more sound, but it decreases the sustain. The energy has to come from somewhere, and the fork is where it comes from. The same principle holds true for a bar over a resonant box. The air itself has a damping effect on the tuning fork or bar.

PRACTICAL APPLICATIONS

In cold weather, a steel tuning fork just brought in from an automobile trunk could be five or more cents sharp. Double that if the fork is made of aluminum. In hot weather, the situation will be just reversed. A tuning fork in a tool case in the trunk of a car sitting in the hot summer sun can easily reach 125° F, making it six cents flat, 13 cents flat if it's an aluminum fork. There is nothing wrong with holding a cold fork in your hand or putting it in a pocket to warm it, or fanning it through the air to cool it if it's hot. However, if setting the pitch on a piano is going to be a critical issue, then these techniques alone won't do the job. No matter what you do prior to it, I like the idea of laying the fork on the plate of the piano for a few minutes just before you set the pitch of the piano. You are not going to tune the piano anyway if it is at some unreasonable temperature. Putting the fork on the piano plate usually, but not always, puts the fork near the appropriate temperature.

Let's suppose you were taking the standardized RPT Tuning Test, that your steel tuning fork was marked "Tuned at 68° F", and that it was accurate to that. Let's suppose the room temperature was 73° F, that you laid your fork on the piano plate, and therefore the room, the piano, and the fork were all at 73° F. If you had set the pitch of the piano exactly with the fork, it would have been flat by the same amount as the fork. If we calculate the fork's pitch, letting FE represent fork error in cents, then:

$$FE = k\,(T2-T1)$$

where k is the temperature coefficient in cents per degree, T_1 is the temperature at which the fork was tuned, and T_2 is the current fork temperature. Your error would have been:

$$FE = -0.106 \times (73-68) = -0.53 \text{ cent.}$$

That would not have cut your grade, but it would have used up more than half of your one-cent allowable tolerance.

Let's suppose you had just taken the same steel fork from your pocket when you went to set the pitch of the piano. The temperature of the fork would likely have been about 90° F, depending upon what you were wearing that day. Your

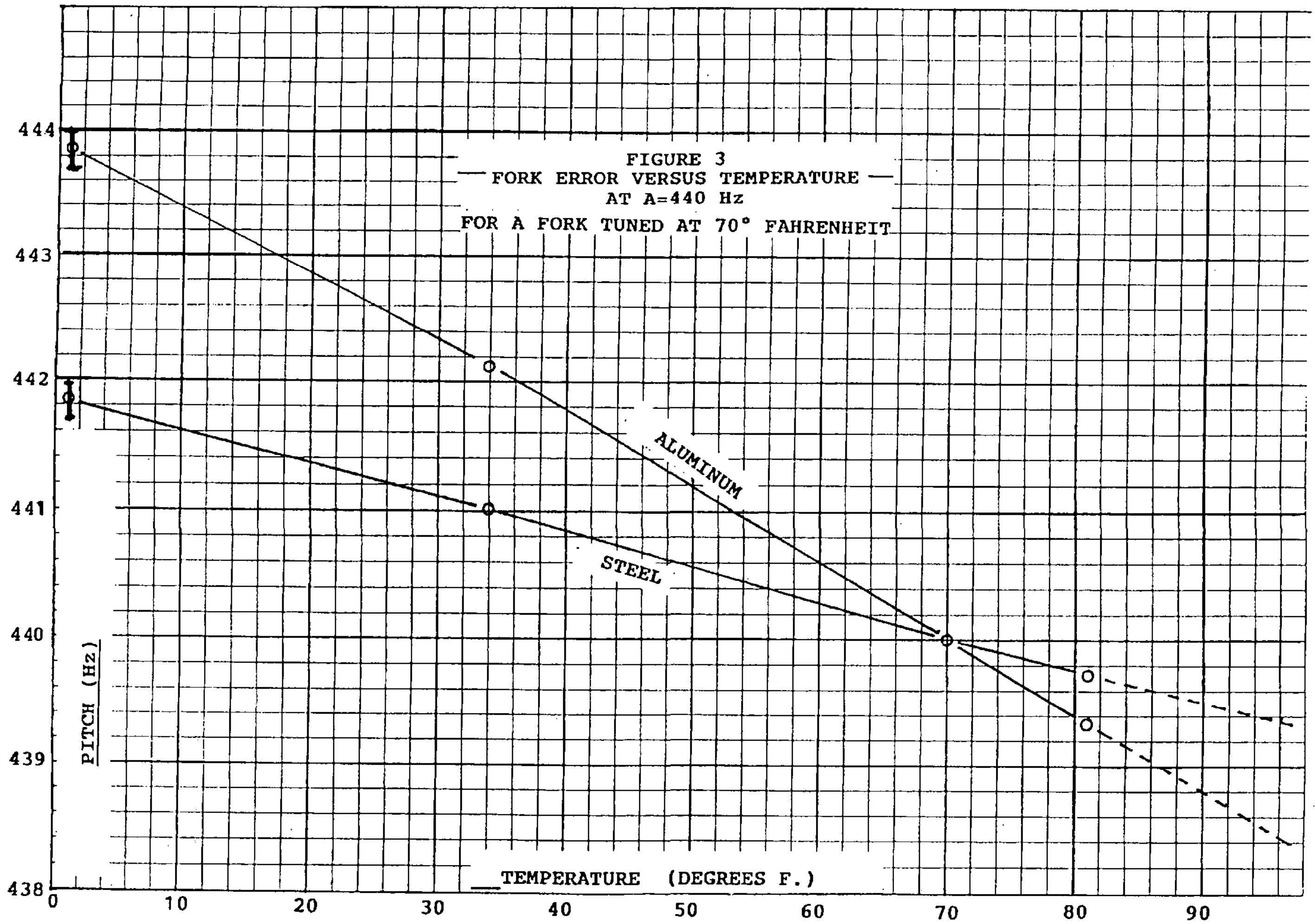

Figure 3

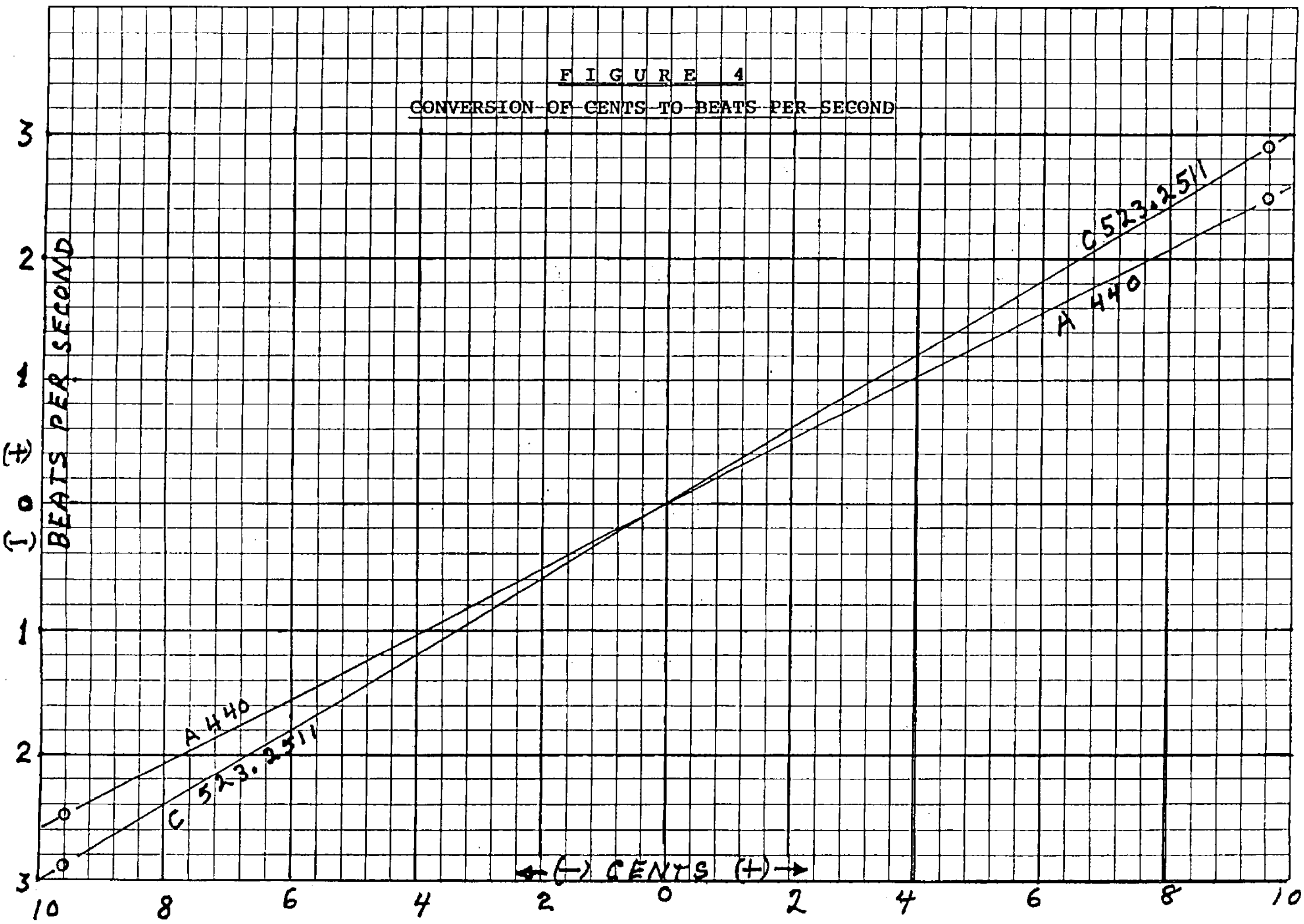

Figure 4

error would have been:

FE = -0.106 x (90-68) = -2.332 cents. That would have cut your pitch-setting grade to 87 percent — 80 is required for passing. If you had just taken the fork from under your arm, the temperature would likely have been somewhere between 92 and 97, if you didn't have a fever that day. At 92° F, your fork would have been flat by 2.544 cents, giving you a grade of 85. If your fork had been up to 97° F, it would have been flat by 3.074 cents, putting you right on the line between passing and failing. If you had a fever that day, it would have run your fork up by at least one or two more degrees, making it 3.18 cents flat, rounding off to 3.2 cents for a failing grade of 78 percent after you had been allowed your one-cent tolerance. If you had been using an aluminum fork that day instead of one of steel, your error, in all cases would have been twice as much.

Figure 5 shows the warming rates of a steel tuning bar and a steel tuning fork. Both were A-440. The bar was the same one I described earlier. It measured 8.5" long by 1.5" wide and weighed 356 grams. The fork was 5.375 inches long and weighed 95 grams. The bar was suspended over its resonant wooden box, but the fork was laid on the plate of a grand piano. Both were quite sharp when taken from the freezer at about zero degrees Fahrenheit. Within 20 minutes, the fork had stabilized at the temperature of the piano, but the bar was still 1.1 cent sharp and still changing. Both curves were normalized to be at zero cents error at the zero base line on the graph. It took the more massive and thermally isolated bar about two hours to completely stabilize at room temperature. This feature has distinct advantages and disadvantages.

There is another scenario relative to warming rates and pitch changes, that, in my opinion, has not received adequate attention. (CTE's, please take note.) Let's suppose that it's a hot July day outside, and the air conditioner is working hard to keep the room reasonably comfortable. Suppose you are about to take the official RPT tuning exam. You do all the correct things in preparation for setting the pitch on the piano. The compressor in the air conditioner is cycling on and off to maintain the room at a decent temperature. The air conditioner compressor comes on about five minutes before you set the pitch, but you don't notice that. By the time you have set the pitch, the ambient air had dropped four degrees, but you don't notice it because you are concentrating on what you are doing, and nothing much in the room has changed temperature because there hasn't been time yet for that to happen. By that time, the compressor will be back off again. What did change were the strings in the piano. Their mass is low, and they are exposed to the air. They will change quickly with the slightest air current, but the plate won't because it is so massive. The result is differential expansion or contraction, depending upon which way the temperature is changing.

A rapid drop of four degrees in ambient temperature can cause the piano,

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especially the middle section, to go sharp by about 5.5 cents. A similar rapid rise in temperature can cause it to go flat by the same amount. This is a transitory effect, and it goes away if the piano is left alone long enough for the strings and plate to come to the same temperature. The tricky part of this phenomenon is that, because the plain strings in a grand piano are so low in mass and so exposed to the air, they will sense this change in temperature before anything else does, whether it's the thermometer on the wall, or your clothed body. The plain strings in the middle are affected the most because the bass strings change temperature more slowly due to their greater mass, and the high treble strings are somewhat shielded by the plate, and their thermal conduction path to the plate is short.[6]

Not long ago, I was tuning a small grand piano in a church when I noticed that the pitch of the middle section of the piano was fluctuating between about eight cents flat to about eight cents sharp due to the cycling of the temperature in the air supply ducts of the building. I was tuning aurally, therefore I was able to get the piano fairly well in tune with itself in spite of the wild temperature and pitch fluctuations. Had I been tuning with an electronic instrument that would have had me tuning to absolute frequencies, the tuning would have been a disaster when I finished.

CONCLUSION

The approximate temperature coefficients of steel and aluminum tuning forks and bars are as follows:

Steel: -0.106 cents per degree Fahrenheit temperature rise.

Aluminum: -0.232 cent per degree Fahrenheit temperature rise.

At A-440 Hz, a one-beat-per-second error is equal to about four cents. The profound effect that rapid temperature changes have on the pitch and tuning of a piano needs to be more fully addressed with regard to the conditions that must be met before the official RPT tuning exam can be administered.

FOOTNOTES

1 The beat between radio carrier frequencies is called a "heterodyne," and if it is converted to a tone, the pitch of the tone is the same as the arithmetical difference between the two frequencies. Tuning one frequency to the other is easy until the difference between the two becomes less then 20 Hz, and then the tone (the heterodyne) becomes inaudible. However, if the carrier frequency is modulated with an audible tone (WWV

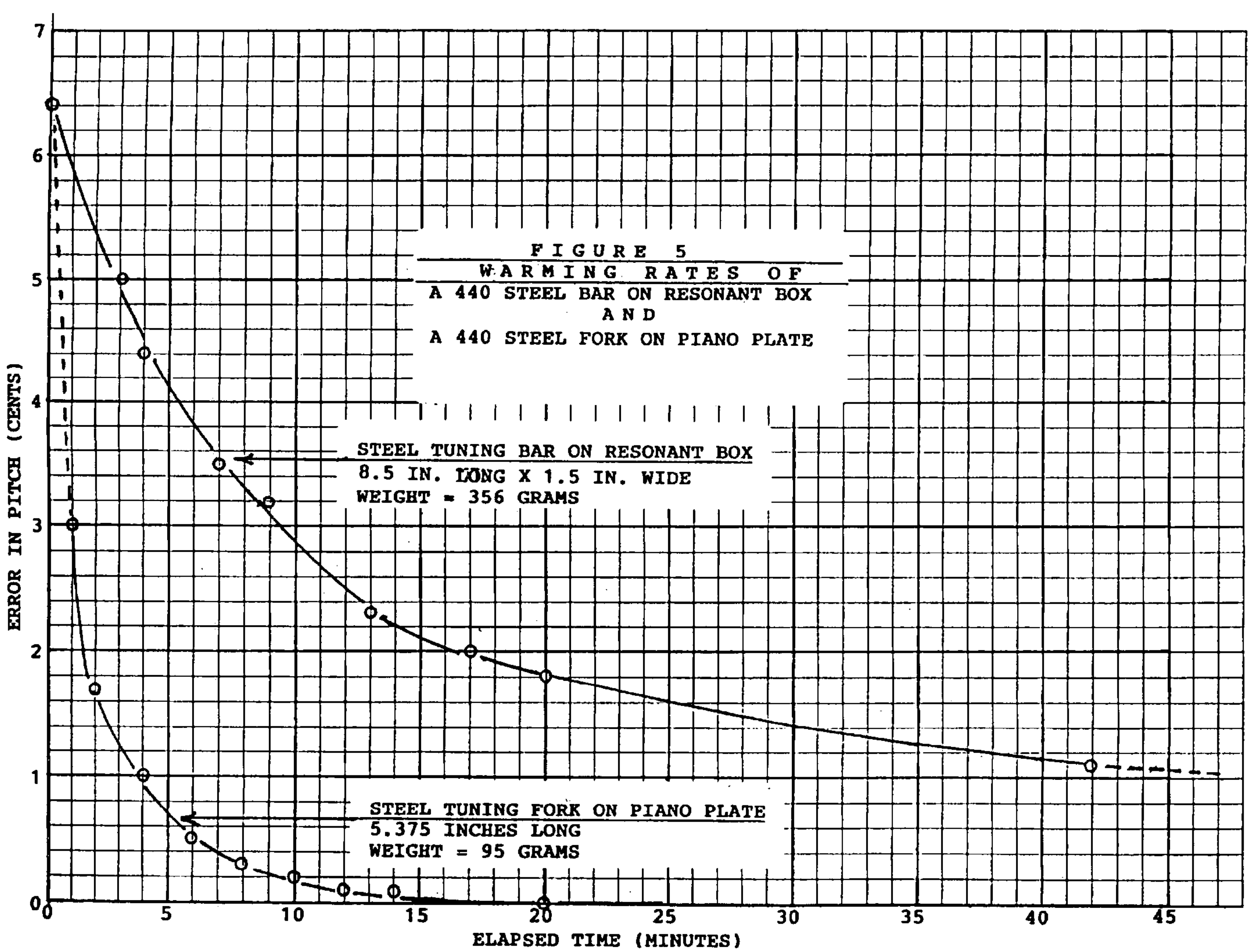

Figure 5

uses 500 and 600 Hz), then the very low and inaudible-frequency heterodyne becomes a pulsation of the modulated tone, and the procedure for tuning to a zero-beat of the carriers is simply to tune closer until the pulsation slows down and finally stops, like tuning a unison on a piano.

2 The VFO was a unit I had built some 30 to 35 years ago to control the carrier frequency of my amateur radio transmitter. I built it to be as stable as I knew how, using premium-quality military surplus parts and my own circuit design, the documentation has since been lost. I had not used it in years — not since single sideband replaced amplitude modulation on the lower amateur bands. It was ideal for the task, except for the fact that WWV had no carrier frequency within any of the amateur radio bands. I would have to find a frequency on which I could receive WWV that would be coincidental with one of the harmonics of a frequency that was within the VFO's tuning range. Think of it as coincidental partials on a piano, only these are true harmonics, not just partials.

3 Think of starting a foot-race if the "starting gun" were a deep rumble of thunder way off in the distance, and the finish line were the parking lot at the McDonald's down the street. The result was excessive time jitter of the measurement.

4 I checked out the SAT's chromatic steps and cents interpolation while I was at it, but that was another story. In some combinations, those used up most of the ± 0.01 cent tolerance band. Even so, that's excellent! It's "splitting hairs" when it comes to tuning a piano. That's equivalent to an A-440 fork that's off by one beat in nearly seven minutes!

5 I had made this bar about 45 years ago from a piece of an old automobile spring leaf that was almost straight. It was still mounted on its original box that I had made. When I made it, I first tuned it to my A-440 Hz tuning fork by grinding it in the appropriate places to either raise or lower the pitch. I would dip it in water to cool it, and then grind it again until I got its pitch close to that of the fork. After doing that, I fine tuned it to WWV. I had no fancy test equipment then, but I did have a short-wave radio. That was when WWV broadcasted a continuous A-440 Hz tone. I would let the bar sit all day to come to ambient temperature, and then check it against WWV in the evening. I would grind a tiny bit more if necessary, and then let it alone until the next evening, when I would repeat the same procedure again. I did this until I had aurally tuned the bar as close as I could to the tone on the WWV. During the writing of this article, I checked that old tuning bar again with the instrumentation shown in Figure 1. It checked out at A-440.4487 Hz at 65° F — the shop temperature that day. According to the graph, Figure 3, it should be exactly at A-440 somewhere between 80° and 81° Fahrenheit. I believe I made that thing during the summer of 1950 when the ambient temperature in the early evenings in eastern Tennessee would have been in the low eighties.

6 This information was presented in the class "Pins and Strings and Things", Annual PTG Convention and Institute, Kansas City, Mo., July 1994, Graph #4, by Jim Ellis.

A Study In Inharmonicity

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In the January 1994 issue of the Journal *Michael Kimbell described the behavior of the partials that emanate from a vibrating string. He pointed out that the partials are inharmonic, that they are not in a whole number relationship to the fundamental; that is, the second partial is more than twice the fundamental, the third partial is more than three times the fundamental, and so on. The extent of this variation depends upon the scaling of the piano and, for sure, other elements such as the compromises necessary in manufacture, the condition of the hammer when it comes in contact with the string and a host of other variables.*

I thought it would be interesting to examine the phenomenon of inharmonicity in greater detail and to answer an interesting question: when one of the octaves is tuned just, are the other octaves also just? When the theoretical frequencies tables are examined, the answer is yes. When inharmonicity is taken into consideration, however, the answer is no. The table below shows the frequencies of the 2:1, 4:2, 6:3 and 8:4 octaves when only theoretical frequencies are considered:

Table 1: Theoretical Frequencies of F_3 and F_4

Partial Number F_3	Theortectical Frequency F_3	Partial Number F_4	Theoretical Frequency F_4	Octaves	Beats/ Second
8	1,396.91	4	1,396.91	Just	0.0
6	1,047.68	3	1,047.68	Just	0.0
4	698.46	2	698.46	Just	0.0
2	349.23	1	349.23	Just	0.0
1	174.61				

The purpose of this article is to learn what happens to the 2:1, 4:2, 6:3 and 8:4 octaves when one of them is tuned just and when inharmonicity is taken into consideration. In this article there is use made of certain mathematical formulas that are currently used to calculate inharmonicity. While these are not difficult to follow, a word about mathematical models is in order.

Mathematical models are representations of the real world. Their use goes at least as far back as Pythagoras. His use of the monochord and his subsequent analysis was certainly one of the first uses of mathematics to describe musical phenomena, and his influence is felt even today. While models do not predict *exact* inharmonic frequencies they are very close approximations, certainly closer than the theoretical frequencies we so often use. With that understanding, let us proceed to define what we mean by an octave.

The Octave. When the two notes of an octave are tuned we assume that one is constant and the other is a variable. In the higher regions the lower note is the constant and in the bass the upper note is the constant. Let us assume throughout that F_3 is the constant, which remains unchanged, and F_4, the note being tuned, is the variable. When the octave is struck, the string of each note is in vibration and each string has an emanating series of partials. At certain points the partials coincide.

From this we can define an octave:

2:1 Octave — An octave is an octave when the first partial (the fundamental) of the upper note has the same frequency as the second partial of the lower (constant) note.

4:2 Octave — An octave is an octave when the second partial of the upper note (F_5) has the same frequency as the fourth partial of the lower (constant) note F_3.

6:3 Octave — An octave is an octave when the third partial of the upper note (C_6) has the same frequency as the sixth partial of the lower (constant) note F_3.

8:4 Octave — An octave is an octave when the fourth partial of the upper note (F_6) has the same frequency as the eighth partial of the lower (constant) note F_3.

Now that we have defined the octave, we can attach frequencies. Authors such as Arthur Reblitz[1] and William Braid White[2] give the theoretical frequencies, which assumes that the string is perfectly flexible. While it is a convenient place to start, for our purposes we must delve deeper. What are the *inharmonic* frequencies of the partials, given a particular frequency of the fundamental? W.V. McFerrin[3] shows formulas that generate the inharmonic frequencies of partials. (The complete development of these formulas is found in Robert W. Young[4].) Young's formulas call for three variables, the diameter of the string, its tension (that is, here, its frequency), and its vibrating length.

When the measurements are in inches the formulas for plain wire strings are:

(1) The Inharmonic Frequency in Hz is $m \times n \times 2^{I/1200}$, where

m is the frequency of the vibrating string
n is the number of the partial
I is the Inharmonicity, where

(2) $I = B \times n^2$

B is the Coefficient of Inharmonicity, where

(3) $B = 5.3 \times 10^{12} \times d^2/(m^2 \times L^4)$

d is string diameter
L is string length

The Inharmonic Frequency of (IF) a given partial then, is given by $m \times n \times 2^{5.3 \times 10^{12} \times d^2 \times n^2 / (1{,}200 \times m^2 \times L^4)}$.

The values of these variables depend upon the scaling of the piano. The scaling determines, among other things, string length and diameter. Every piano will differ according to the manufacturer and model. Upon my request, Don Mannino of Young Chang, Michael Mohr of Steinway, Kent Webb of Baldwin, Ray Chandler of Kawai, Roger Weisensteiner of Kimball, Peter Mohr of Mason & Hamlin, and Del Fandrich of Fandrich Piano sent the string length and diameter of notes F_3 and F_4 of some of their pianos. With this information we are able to calculate the inharmonicity of the strings and answer the question posed earlier: what happens to the 2:1, 4:2, 6:3 and 8:4 octaves when one of them is tuned just? Let us examine the Fandrich vertical piano.

Table 2: Fandrich (48 inch vertical)

Note	String Diameter	String Length
F_3	0.042 inches	37.01 inches
F_4	0.039 inches	19.84 inches

The theoretical frequency of the partials of F_3 is the frequency of the fundamental (174.61 Hz) multiplied by 2, 4, 6 and 8. According to McFerrin, the inharmonic frequency of a given partial is found by multiplying B, the Inharmonicity Coefficient, by the square of the partial sought and multiplying that value by the theoretical frequency of the partial.

The Inharmonic Frequencies of F_3's octave partials, then, can be determined by calculation:

$$IF = m \times n \times 2^{5.3 \times 10^{12} \times d^2 \times n^2 / (1{,}200 \times m^2 \times L^4)}$$, where

m = 176.61
d = 0.042
L = 37.01
when, n = 2, IF = 349.36
n = 4, IF = 699.51
n = 6, IF = 1,051.25
n = 8, IF = 1,405.38

These calculations are shown in the Table below. The theoretical frequencies of F_3 are from Table 1.

Table 3: Fandrich (48 inch vertical)

Partials F_3	Theoretical Frequency F_3	Inharmonic Frequency F_3
8	1,396.91	1,405.38
6	1,047.68	1,051.25
4	698.46	699.51
2	349.23	349.36
1	174.61	174.61

2:1 Octave. To tune a just 2:1 octave, the frequency of the fundamental of F_4 must be equal to the frequency of the second partial of F_3. As shown above, the inharmonic frequency of the second partial of F_3 is 349.36. To find the frequencies of inharmonic partials of F_4 when its fundamental is 349.36,

$$IF = m \times n \times 2^{5.3 \times 10^{12} \times d^2 \times n^2 / (1{,}200 \times m^2 \times L^4)}$$, where

m = 349.36
d = 0.039
L = 19.84
when, n = 2, IF = 699.41
n = 3, IF = 1,050.41
n = 4, IF = 1,402.96

Table 4: Octave Fandrich (48 inch vertical)

Partials F_3	Inharmonic Frequency F_3	Partials F_4	Inharmonic Frequency F_4	Octaves	Beats/ Second
8	1,405.38	4	1,402.96	Contracted	2.42
6	1,051.25	3	1,050.41	Contracted	0.85
4	699.51	2	699.41	Contracted	0.10
2	349.36	1	349.36	Just	0.00
1	174.61				

From the table above, it can be seen that when a 2:1 octave is just, the higher partials of F_3 and F_4 form contracted octaves.

4:2 Octave. To tune a just 4:2 octave, the inharmonic frequency of F_4's second partial must equal the inharmonic frequency of F_3's fourth partial. To find the frequency of F_4 when its second inharmonic partial is 699.51, I used Hewlett-Packard's 48GX calculator, which utilizes a trial and error program to solve such problems. It showed the frequency of F_4 to be 349.41. This response can easily be checked by substituting 349.41 for m in the formula. Once that is shown to be correct, the frequencies of the higher partials can then be found.

$$IF = m \times n \times 2^{5.3 \times 10^{12} \times d^2 \times n^2 / (1{,}200 \times m^2 \times L^4)}$$, where

m = 349.41
d = 0.039
L = 19.84
when, n = 2, IF = 699.51
n = 3, IF = 1,050.55
n = 4, IF = 1,403.15

Table 5: 4:2 Octave Fandrich (48 inch vertical)

Partials F_3	Inharmonic Frequency F_3	Partial Number F_4	Inharmonic Frequency F_4	Octaves	Beats/ Second
8	1,405.38	4	1,403.15	Contracted	2.23
6	1,051.25	3	1,050.55	Contracted	0.70
4	699.51	2	699.51	Just	0.00
2	349.36	1	349.41	Expanded	0.05
1	174.61				

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A Study In Inharmonicity, *Continued*

Note that when the 4:2 octave is just, the 2:1 octave is expanded and the 6:3 and 8:4 octaves are contracted.

6:3 Octave. To tune a just 6:3 octave, the inharmonic frequency of F_4's third partial must equal the inharmonic frequency of F_3's sixth partial. For this to happen, the frequency the frequency of F_4's fundamental, must be 349.64. This frequency of F_4 was calculated by the method described above:

$$IF = m \times n \times 2^{5.3 \times 10^{12} \times d^2 \times n^2 / (1{,}200 \times m^2 \times L^4)}$$, where

m = 349.64
d = 0.039
L = 19.84
when, n = 2, IF = 699.97
n = 3, IF = 1,051.25
n = 4, IF = 1,404.08

Table 6: 6:3 Octave Fandrich (48 inch vertical)

Partial Number F_3	Inharmonic Frequency F_3	Partial Number F_4	Inharmonic Frequency F_4	Octaves	Beats/ Second
8	1,405.38	4	1,404.08	Contracted	1.30
6	1,051.25	3	1,051.25	Just	0.00
4	699.51	2	699.97	Expanded	0.46
2	349.36	1	349.64	Expanded	0.28
1	174.61				

Note that when the 6:3 octave is just, the 2:1 and 4:2 octaves are expanded and the 8:4 octave is contracted.

8:4 Octave. To tune a just 8:4 octave, the inharmonic frequency of F_4's fourth partial must equal the inharmonic frequency of F_3's eighth partial. For this to happen the frequency of F_4's fundamental must be 349.97. This frequency of F_4 was calculated by the method described above:

$$IF = m \times n \times 2^{5.3 \times 10^{12} \times d^2 \times n^2 / (1{,}200 \times m^2 \times L^4)}$$, where

m = 349.97
d = 0.039
L = 19.84
when, n = 2, IF = 700.62
n = 3, IF = 1,052.22
n = 4, IF = 1,405.38

Table 7: 8:4 Octave Fandrich (48 inch vertical)

Partial Number F_3	Inharmonic Frequency F_3	Partial Number F_4	Inharmonic Frequency F_4	Octaves	Beats/ Second
8	1,405.38	4	1,405.38	Just	0.00
6	1,051.25	3	1,052.22	Expanded	0.97
4	699.51	2	700.62	Expanded	1.11
2	349.36	1	349.97	Expanded	0.61
1	174.61				

Note that when the 8:4 octave is just, each of the lower octaves is expanded.

Observations

Inharmonicity plays a critically important part in tuning. While the theoretical tables have a certain value, they cannot be used to predict the condition of the various octaves. To determine the actual frequencies—and the beat rates that result—one must consider the inharmonicity of the strings involved. From the information supplied by the manufacturers listed above, fourteen in all, I make the following observations:

- To tune a just octave it is critical that your listening be directed to the desired partial and that the appropriate check be used to test the interval.
- When one of the octaves is tuned just, the remaining octaves are either expanded or contracted. You have to expect to hear beats emanating from octaves above and below the octave being tuned. How many beats are heard is a function of the size of the piano and the scale design of the manufacturer.
- Generally, when a just 2:1 octave is tuned, the 4:2, 6:3, and 8:4 octaves are contracted; when a just 4:2 octave is tuned, the 2:1 octave is expanded and the 6:3 and 8:4 octaves are contracted; when a just 8:4 octave is tuned, all the lower octaves are expanded.
- The inharmonic frequencies of the partials do not increase at a geometric rate. On the contrary, the increase is quite irregular.
- A just 4:2 octave gives a very slight expansion of the 2:1 octave. If a greater expansion is desired, one of the higher octaves should be tuned just.
- The shorter the piano the greater the contraction or expansion of the other octaves when one is tuned just. In one case there were something like thirteen beats at the 8:4 octave when the 2:1 octave was tuned just.

Finally, a word about the help I received in writing this article. My debt goes to Michael Wathan of the Cincinnati Chapter whose knowledge of mathematics far surpasses my own. He reviewed the contents and made many valuable comments and suggestions, most of which I agreed to accept; I take the blame for those I didn't. Robert Siegfried, also of the Cincinnati Chapter, and Dr. David Cutts, Professor of Physics at Morehead State University, read the text and offered their valuable advice.

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PACE

Professionals Advance through Continuing Education

LESSON PLAN

In brief:

This lesson begins a series on grand regulation. The scope of these articles will be limited to basic regulation adjustments, typically done when prepping new pianos or touching up pianos with only light wear. Complete, from-the-ground-up regulation that might be needed after extensive parts replacement is beyond the scope of this series. Rather than trying to cover every action design, I will emphasize regulation principles and timesaving methods that can then be adapted to most situations.

Getting started:

In order to pursue any serious study of piano technology, one must obtain basic resources. Catalogs from several piano supply houses, both large and small, are essential. Besides offering the necessary supplies, pictures and item descriptions are valuable sources of information. Piano manufacturers' service manuals are also essential sources of valuable information. Most are available at no cost. Most important to participating in this Lesson Plan series are the PTG Exam Source Books, both the tuning and technical versions. Articles in these books will serve as reference material for the lessons.

Hands-on session setup:

To teach this lesson in a hands-on format, you will need one or more grand pianos in good condition. New or good used pianos on a showroom floor are ideal. It does not matter whether these pianos have keyframe bedding problems; the object will be to check keyframe bedding and adjust as needed. Some slight bedding problems will usually be found on most new pianos.

Depending upon time and pianos available, this lesson may consist of participants working individually on separate pianos, or taking turns observing and adjusting on a single instrument.

Estimated lesson time:

One hour.

Tools & materials participants must bring:

For this lesson, participants should bring the following:

- A sanding block and pieces of 120- to 180-grit sandpaper.
- Keyframe bedding tool for square-tip glide bolts, or tuning hammer.
- "Stubby" flat blade screwdriver with short handle and 1 1/2" long blade (to reach between keys at scale breaks for turning glide screws).
- Needle-nose pliers.
- Dusting brush, cleaning cloth or vacuum for cleaning debris from keybed.
- Chalk.

Assigned prior reading for participants:

PTG Technical Exam Source Book (PTG Home Office, 816-753-7747), pages II.13-.14, August 1993 PTG *Journal*, pages 28-30. A highly recommended resource is Yamaha's video & book set, *Grand Regulation in 37 Steps*, available from Schaff Piano Supply and Yamaha Corporation.

Technical Lesson #20

Grand Regulation - Part 1: Keyframe Bedding

By Bill Spurlock, RPT
Sacramento Valley Chapter

This monthly lesson plan is designed to provide step-by-step instruction in essential skills. Chapters are encouraged to use this material as the basis for special Associate meetings, or for their regular meeting program, preferably in a hands-on format. This method allows the written information to be transformed into an actual skill for each member participating.

General Instructions

The keyframe is the foundation upon which keys rest. Its three rails—back, balance and front—must maintain stable heights under the weight and playing force of the keys. Any flexing of the rails will affect key height, key dip, and the power delivered to the action by the keys. Knocking noise will also be produced by balance or front rails not in solid contact with the key bed. Since the grand keyframe must slide side to side when the una corda pedal is used, it cannot be screwed down firmly to the keybed, and so must be carefully "bedded" (mated) to the piano's keybed so all three rails make proper contact.

A complete keyframe bedding process would include removing the keys, turning the glide bolts up out of contact with the keybed, then mating the back rail to the keybed. Next, the action frame would be mated to the keyframe. This is done by setting — not screwing — the action back onto the keyframe and adding shims under any action bracket feet that are not resting solidly on the keyframe. The front rail is then mated to the keybed, and finally the balance rail is bedded by turning the glide bolts down just until they contact the keybed.

This process ensures the most stable mating of keyframe and keybed and is normally done prior to setting key height and dip from scratch, such as after action reconditioning and keyframe felt replacement. However, in a piano in good condition and already in use, turning the glide bolts completely out of contact with the keybed may significantly change the key height, depending upon the method of bedding originally used. You would then have created needless work of resetting key height and dip from scratch.

Because keyframes are relatively flexible, there is a small range of glide bolt adjustment within which the glides may be considered correctly set, as long as they all bear against the keybed evenly. Completely undoing the original setting may let the balance rail flex downward under the weight of the keys, ruining the existing key level and dip setting. Thus, when doing a touch-up regulation or new piano prep, it is more practical to

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simply refine the existing glide bolt settings rather than change them to the extent that balance rail height may be affected. In addition, back rail bedding is least likely to cause problems, so the method presented here will simply be to check the front and balance rail bedding. I suggest the following procedures.

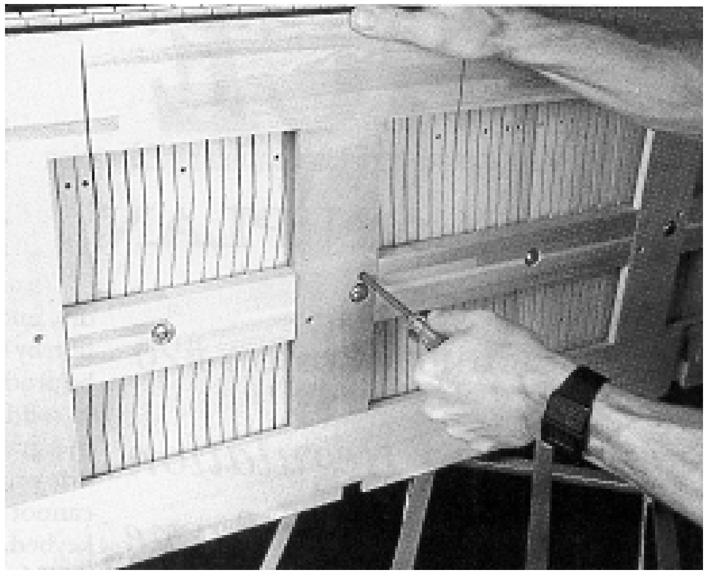
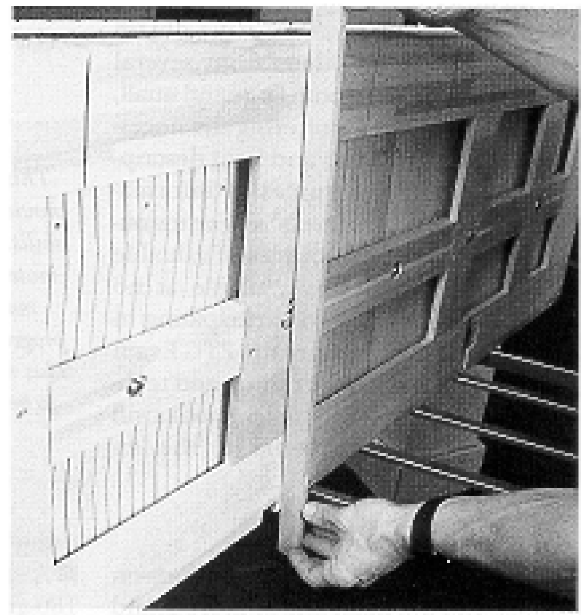


Photo 1 (Left): Tighten keyframe screws and clean keybed surface

Before checking how the keyframe mates to the keybed, make sure the keyframe and action assembly are solid. Tighten the screws holding the action brackets to the keyframe and all screws that fasten the keyframe rails together. Then vacuum or brush any debris from the keybed surface, and make sure no particles are embedded into the lower surfaces of the keyframe.

Photo 2 (Right): Keyframe construction

This straightedge reveals standard keyframe design, with the underside crowned so the only areas contacting the keybed are the front edge of the front rail, the glide bolts at the balance rail and the rear edge of the back rail. This design makes it easy to mate the rails to the keybed; high spots can be removed by sanding a thin area along the edge of a rail, rather than the entire surface.



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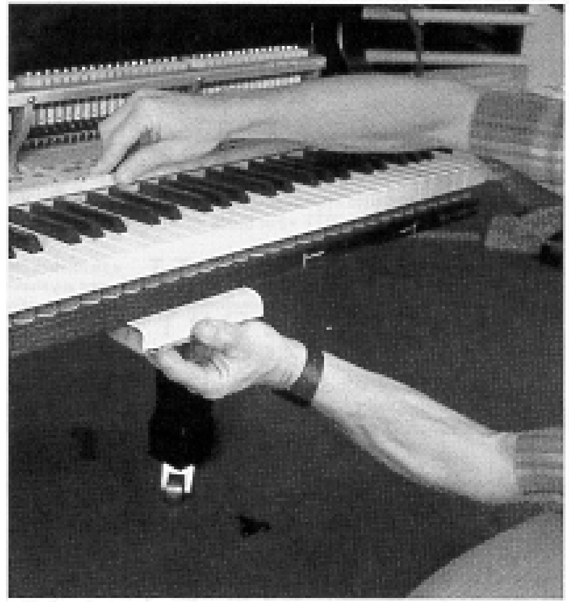
Photos 3 (Above) & 4 (Top Right Page 45): Bedding the front rail

The front rail should contact the keybed along its entire length. Any slight gaps can cause knocking as keys force the front rail down against the keybed. (Exceptions: Steinway and some others deliberately relieve the front rail very slightly for a few inches at each end, so slight downward pressure of the cheek blocks flexes the ends down into contact with the keybed. Thus, cheek blocks must be in place before checking for knocking on this type. Newer Baldwins use glide bolts either in the front rail or in the keybed, much like a balance rail. In this design the front rail does *not* contact the keybed other than at the glide locations. See the Baldwin Service Manual for instructions on regulating their keyframe.)

This continuous contact is checked by tapping along the front rail and listening for a distinct knocking sound; knocking reveals a gap. Tap with fingers, or rest a wooden stick on the front rail and bump with the palm of your hand as in Photo 3.

Use chalk to mark the beginning and end of any areas that knock, as shown in Photo 4. These areas have gaps that can be eliminated by sanding material off the front rail at the areas that do ***not*** knock. Remove wood only from the keyframe, ***never from the keybed.***

Pull the front rail out slightly past the keybed and sand lengthwise along the unchalked areas using a sanding block as shown. Use only a few strokes at a time, then dust off the rail and slide the action back in to check your progress. This method has advantages over the usual method of inserting sandpaper grit-side up between the rail and keybed and pulling it out; it's faster, leaves no rough cross-grain scratches in the rail, and doesn't leave bits of sawdust and sanding grit between the rail and keybed.



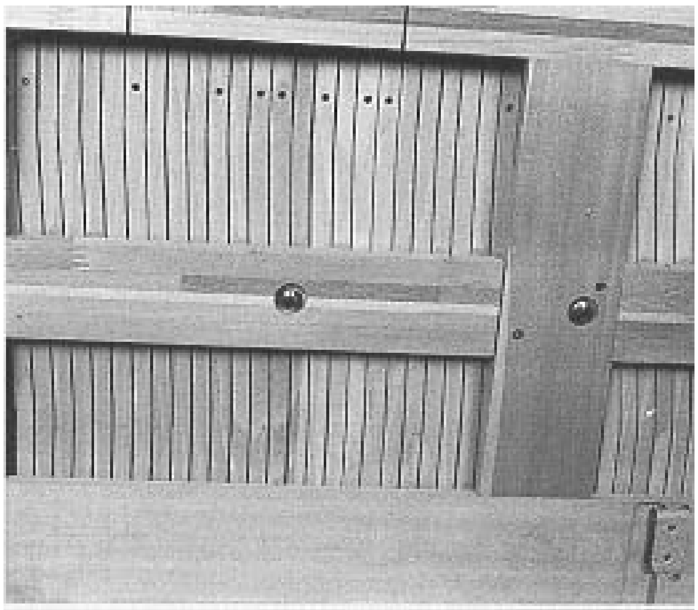


Photo 5 (Left): Glide bolts

Glide bolts are usually located at each action bracket location, and these are accessible from the top of the keyframe where the keys flare between sections. However, additional glides are often located in the middle of long bass and tenor sections, not visible from above. This photo shows one such hidden glide that supports the middle of a long tenor section.

Photo 6 (Right): Adjusting the glides

First, inspect the bottom of the keyframe and note the location of any glide bolts not visible from the top. Slide the complete keyframe, with keys and action, into position on the keybed. Install the cheek blocks.

Next, rest a small wooden block—short voicing block or sanding block wood-side down — on top of the balance rail keypins at one glide bolt location. Fold a business card and stand it on the keybed so its top edge comes just below the keytops in that same location. Wedge your hand between the bottom of the pinblock and the wooden block atop the keypins, and try to force the balance rail downward. (The wood block allows you to push against the balance rail, via the keypins, without touching the keys themselves.) Do this test at each glide location. If you see the keyfronts move downward in relation to the business card, that glide bolt is not contacting the keybed.

Before turning any glides, test each one to get a complete picture of the situation. Typically, one or more glides will be slightly too high and not contacting the keybed. Adjust one at a time, turning a few degrees at a time just until the keys no longer move downward when pressing on the balance rail.

Be careful to avoid lowering a glide any more than necessary, since doing so will "jack up" the balance rail. This will raise the key height in that location and lift adjacent glides off the keybed, possibly leading you to think they too need

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adjusting. This is sort of the reverse of trimming one leg of a chair at a time in an effort to stop rocking, only to find the chair suddenly getting very short! To guard against this problem, always go back and check all other glides after adjusting one, to make sure they have not changed. One glide should not affect the others.

Conclusion

The object of keyframe bedding is to provide a firm and stable foundation for the action and keys. This ensures that key level and dip will be constant, that the keys will deliver maximum power to the action, and that the keyframe will not knock against the keybed.

As mentioned under General Instructions, this lesson presents an abbreviated bedding procedure appropriate for pianos in good condition where there is no need or desire to change the existing key height or dip. The main difference between this and a complete bedding job is that in this abbreviated method the overall setting of the balance rail glides is not changed; only slight adjustments are made to individual glides so all will rest with equal weight upon the keybed. This preserves the existing balance rail height, and therefore the existing key height and dip.

Although glide bolts are not intended to be used as a means of adjusting key height, they support the — relatively flexible — balance rail under the weight of the keys, and therefore a start-from-scratch adjustment procedure that involves raising all the glides up out of contact with the keybed can allow the balance rail to drop lower, lowering key height in the process. Turning these glides back down just until they contact the keybed will then yield a properly bedded balance rail, but will not restore the original key height. Thus, such a procedure will create much additional work in resetting key height and dip.

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LESSON PLAN

Tuning Lesson #20

Refining the Midrange with Contiguous Interval and P5/P4 Comparison Tests

By Michael Travis, RPT

This monthly lesson plan series is designed to provide supervised practice of tuning skills as a supplement to independent study and practice. Chapters are encouraged to use this material as the basis for special Associate meetings, or for their regular meeting program. Each lesson is designed to take about one hour, with about four participants. Participants are assumed to have essential reference materials and tuning tools (see PACE checklist) and access to a well-scaled large upright or grand piano for independent practice.

In brief

This lesson consists of extended practice in listening to contiguous interval and P5/P4 comparison tests while applying them to improving a midrange tuning. Participants should gain a greater understanding of how to nitpick and improve their own midrange tuning

Chapter meeting set-up

These lessons are most conveniently taught to a small group of four or five. Each group should have its own piano and RPT instructor. Each piano should be in a quiet environment for close listening. Avoid using pianos that present serious obstacles to tuning, such as deeply grooved or misaligned hammers, string termination noises, etc.

For this lesson, the instructor or another RPT should prepare each piano by pitch raising or lowering to A-440 and then strip muting and re-tuning F2-F5. This tuning does not have to be concert quality, but should be stable. An FAC tuning would be acceptable. The result should be a single-string tuning that sounds good, but needs polishing.

Tools & materials participants must bring

■ Tuning hammer

Home study assignment for participants

Read *The PTG Tuning Examination: A Source Book*, "Learning to Pass the PTG Tuning Exam," part 5, Midrange, pp 26-34. Practice with a metronome until the 4:5 contiguous M3 ratio at various tempi is second nature to you (See PACE Tuning Lesson #12, *PTJ* 8/94). Strip mute and tune an expanded midrange (F2-F5) on your piano, and make sure you have good octaves, fifths and fourths. Then, practice refining your tuning by applying contiguous thirds, fourths and fifths and the P5/P4 comparison test to notes C3-C5, in chromatic order (do all the tests on C3, refine the tuning of C3 if you can, then go on to C#3, D3, etc. repeating all the tests and refining the tuning of each note as best you can). Review PACE Tuning Lesson #10, *PTJ* 6/94, on the M3-M6 4:3 P4 test and the M6-M10 3:2 P5 test.

General instructions

In this lesson, participants will be working with a strip-muted piano that has an acceptable single-string tuning in the range F2-F5, refining the tuning in the C3-C5 range by applying contiguous interval tests and P5/P4 comparison tests. Before beginning any tuning, get a feeling for what's on the piano to start with by playing parallel intervals, chords and octaves, etc. Then, after the tuning portion of the lesson, do the same thing and see if there is a noticeable improvement in the tuning.

Each participant should work with at least four different notes to try to improve their settings. Two of the notes may be selected at random for systematic application of contiguous interval and P5/P4 comparison tests, and re-tuned to a better setting if possible, as described in the background information. Participants should not pick up the tuning hammer until they have convinced other participants, through application of these tests only, that the note needs to be moved. The instructor should referee any arguments. Be sure to point out that this procedure alone can be effective if used systematically from C3-C5.

Another two notes may be selected by playing parallel intervals, such as thirds, fourths, fifths, sixths, octaves, and tenths, and listening for intervals that "stick out." Upon finding one such interval, the two notes to be individually checked with contiguous intervals and P5/P4 tests are the two notes of the interval. In this case, the participant must try to decide whether one or both ends of the interval need to be changed, and should try to convince other participants that this is the case before making any change. As before, the only tests allowed as evidence of the need for a change are the contiguous intervals and P5/P4 tests. The difference here is that the change(s) made must also improve the parallel interval sequence that was the original problem.

Once everyone has had a chance to work with their first four notes, take turns until time runs out in finding additional notes to check using parallel intervals, which allows an additional two notes each. Before leaving the piano, remember to play your chords and octaves, etc., and see if you think the tuning has been noticeably improved.

Background

Contiguous intervals are pairs of like intervals that have one note in common. Examples: the contiguous pairs of thirds, fourths and fifths that all have A3 in common are, respectively, F3-A3/A3-C#4; E3-A3/A3-D4; and D3-A3/A3-E4. We know these three pairs of like intervals as the contiguous interval tests. Playing these pairs of intervals will usually tell you whether the note in the middle, A3 in the example, is sharp, flat or OK, provided your tuning is fairly good to begin with.

The contiguous interval and P5/P4 comparison tests are most useful for di-

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agnosing problems or confirming success in midrange tuning, from approximately the mid-second through mid-fourth octaves. The P5/P4 comparison tests follow the simple rule that fifths up or down from a given note should not beat faster than fourths in the same direction. In practice, you simply play and compare the P5 and P4 down from a note, and then the P5 and P4 up from the note; if the fifth does not beat faster in each case, the note may be OK. However, a "dead" (pure or slightly wide) fifth combined with a very noisy fourth would still indicate a problem, even though the fifth is not beating faster than the fourth.

For example, to test the "down side" of C4, play and compare the P5, F3-C4 and the P4, G3-C4. Decide which one is faster-beating. If the P4 is a little faster-beating than the P5, you have a good relationship, implying C4 is OK. If the fifth is noisier than the fourth, this implies that C4 is flat. If the fifth is dead (pure or wide) and the fourth is beating too fast (also wide) this implies that C4 is sharp. Now play the "up side" tests, C4-G4 versus C4-F4, and decide which interval is faster-beating. If the P5 is faster-beating here, this implies that C4 is sharp. If the fifth is dead and the fourth is beating too fast here, this implies that C4 is flat. The P5/P4 test gives you a lot of information quickly, making it a valuable tool for nitpicking your midrange tuning.

Contiguous major thirds are also valuable for nitpicking your midrange tuning and are obviously very useful in setting and testing temperaments. Within a properly tempered octave you will have a series of three ascending major thirds (two pairs of contiguous thirds) that accelerate uniformly in beat rate and have an ascending beat rate ratio of 4:5. If you suspect a tuning error on a note, you can play the contiguous thirds around that note and check for the proper relationship. If the speeds of the thirds are "too far apart" (upper third beats more than five times for each four of the lower), you would have evidence that the note is flat. Likewise, if the speeds of the thirds are "too close together" (upper third beats less than five times for each four of the lower), you would have evidence that the note is sharp.

We have seen an application of the contiguous perfect fourths test in the Baldassin-Sanderson temperament (step #19, PACE Tuning Lesson #17), but one of the best uses of this test is in the nitpicking that follows the temperament and midrange tuning. Throughout a properly tempered midrange on a well-scaled grand piano, pairs of contiguous fourths will sound equal-beating or very nearly so; the upper fourth may beat very slightly faster than the lower, but the lower fourth should never beat faster than the upper. If you suspect a tuning error on a note, you can play the contiguous fourths around that note and check for equality of beat rate; one should not sound noticeably faster than the other. If the lower fourth beats slower than the upper fourth by more than just the slightest amount, you would have evidence that the note is flat. Likewise, if the lower fourth beats faster than the upper fourth, you would have evidence that the note is sharp. Typically, you play the two fourths and pick up these differences very quickly; usually one fourth will sound "dead" (too pure) while the other is "noisy" (beating noticeably). The M3-M6 test for a 4:3 P4 will tell you whether a beating fourth is wide or narrow, if you have any doubt. You may want to aurally focus on the double octave above the lower note of the fourth to hear the 4:3 beats, though this is seldom necessary since interference from the 8:6 coincident partial beats (at the triple octave) is negligible in the midrange. This is a particularly clear test for that reason.

Contiguous perfect fifths, though we might use them less often than contiguous thirds and fourths, can also be helpful in the midrange. Like the fourths, pairs of contiguous fifths in the midrange will sound equal-beating. If you suspect a tuning error on a note, you can play the contiguous fifths around that note and check for the proper relationship. If the lower fifth beats faster than the upper fifth, you would have evidence that the note is flat. Likewise, if the lower fifth beats slower than the upper fifth, you would have evidence that the note is sharp. If the common note is out of tune, one fifth will usually sound "dead" (pure) and the other "noisy" (beating noticeably). Sometimes you will get interference and be misled by faster beats at the 6:4 level, which could be more prominent on one of the fifths than the other. Be sure you are comparing fifths that are narrow at the 3:2 level. The best test for the 3:2 P5 is the M6-M10 test. Aurally focus on the octave (***not*** the double octave!) above the upper note of each fifth for the 3:2 coincident partials' beats.

The power of combining the contiguous interval tests and the P5/P4 comparison tests lies in the fact that you are in effect using six test notes to focus your attention on one "suspect" note. On a tuning that's much less than perfect, interpreting these tests can be tricky, since test notes that are themselves out of tune may cause conflicting results. In that case, you can use either the "majority vote" or the "squeaky wheel" rule, with a generous helping of judgement. If a majority of the tests tell you to move the suspect note in the same direction, do so, but see that you don't cause more problems than you solve. If one test is very clear and unambiguous compared to the others, the suspect note needs to be moved in the direction indicated by the clear test (the "squeaky wheel" rule) just enough to reduce that problem without upsetting the other tests too much. With practice, you get a feeling for where the center of the six notes should be, and whether the "suspect" note is centered dead on or is off to one side or the other.

On a tuning that is fairly good, these tests provide an efficient means for locating errors and making further refinements. For example, play the thirds, fourths and fifths up and down from C3, remembering to play both P5/P4 comparison tests and the contiguous P5 and P4 tests. If you hear any problems, refine the C3 tuning as best you can, and go on to C#3 and repeat. Continue systematically testing and refining until you are satisfied that no further improvement is possible.

Another way to use these tests to nitpick a tuning would be to run various parallel intervals up and down in the midrange, and when you find one that doesn't fit with its neighbors, see if one or both interval notes has a contiguous interval test and/or P5/P4 comparison test problem, the fixing of which could help the parallel interval. Using the tests this way, you are focusing on a note using at least seven other notes – the six in the pairs of thirds, fourths and fifths, plus the other end of the problem parallel interval! Compromise is the name of the game.

Of interest to those planning on taking the PTG Tuning Exam, your examiners will make a lot of use of contiguous interval and P5/P4 comparison tests in aurally verifying penalty points in the temperament and midrange. We have found these tests to be very convincing and usually easy to hear, though beat rates in the tests themselves can vary wildly with the quality of the tuning.

Note: *Do you find these lesson plans valuable? Do you have specific suggestions for changes or clarification? Please direct any comments or suggestions to the author c/o the Journal.*

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LESSON PLAN

Changing Environment. . .
What Do We Do About It?

Part III

Beverly Kim, RPT

For the past two months, I have been describing some of the shifts in our demographics, trends in the piano industry and new patterns in lifestyles and attitudes that impact our profession. I have tried to paint "the big picture." Let's face it, the world around us is a dynamic place. Every generation or decade has brought new perspectives, attitudes and challenges that require us to adapt if we want to be effective in our personal and professional roles. One way to be an effective piano technician is to have a clear idea of what we want our businesses to achieve.

Some people might call this their annual business goals and objectives. Others could say they have a vision, a longer-term strategy. Maybe you have a mental image of the kind of business and business person you are or want to be. The point is to identify a course that helps you move forward in the direction that suits your needs. The new PTG BusinessCraft Seminars include a session about developing a business plan, and this incorporates all of the things we've just described.

What is a business plan? According to Tom Gamble, Director of the Alamance Community College Small Business Center, "A business plan is the output or the result of a research and analysis process that demonstrates the ability of a business to sell enough of its product or service at a satisfactory profit for its owners. The business plan is an objective prediction of a firm's success based on stated assumptions and conditions." It sounds so, so formal. But the purposes of a business plan are to provide a statement of goals and objectives for the business, to provide a management control tool and to communicate those to possible stakeholders, such as your partners, investors, lender and employees.

To bring the business plan concept home, let's discuss some practical examples that might be explored in a business plan.

Here are just a few of the many real issues that we face:
1) We need to be efficient at our work, but how many of us spend most of our time on the really productive activities? Doing some "homework" on our time allocation can be helpful.
2) How many of us are thinking about converting to computers? What is the break-even point where that investment pays off?
3) Maybe there is a better way to allocate our time during the work week. How many hours or what percentage of your time do you want to spend tuning, repairing, rebuilding, etc.?
4) What products, if any, might you provide to your clients? The extent, the mark-up, the practicality, etc., are all things to include in the business plan.
5) What sort of customer mix do you want to serve?
6) Some technicians share shop space, repair and rebuilding projects with other technicians. An exploration in the cost and benefits is the sort of thing to put into a business plan.
7) Many people contemplate price increases at regular intervals. A little research and analysis in the recent changes and fees will influence your strategy and minimize potential customer complaints.

The business planning process involves some things that we already know as well as some information we need to know.

Mr. Gamble lists five steps: determine customer need, define how many potential customers there are, develop your strategies to fulfill customer need, plan your business operations, and prepare your financial pro formas, i.e., projections. Essentially, it sounded like a solid piece of advice: "Do your homework."

There are numerous benefits of a business plan. It focuses your company's plans and goals. It may prepare you for dealing with adversity. It sets you apart from the crowd who is applying for outside financing. It makes the future tangible for outsiders to understand. It helps you secure contracts and arranges strategic alliances. And it establishes value, a negotiating tool for selling a business.

As a final consideration, a business plan is an effective evaluation and management tool. You can more readily assess your business' focus, customer acceptance, and appreciation of investor needs and goals. Additionally, potential problems might be identified — with strategies to deal with them. And it can be a test of how realistic your ideas truly are.

Assistance in developing a business plan is available from your local SCORE (Service Corps of Retired Executives) chapter. This is a national organization offering free — repeat free — consultations to small business owners. Remember, piano technicians are not cheap, we are "value oriented!"

This introduction to the business plan is intended to prompt us to think about where we are really going in our piano service businesses. Are we following a course that really meets our needs, hopes, or dreams? Two key things keep coming to mind: "Am I effective?" and "Am I satisfied?"

Next month, we'll conclude this series with a discussion about satisfying our customers.

TECHNO*stuff*

Richard Anderson, RPT • Chicago Chapter

Particle Board Repair

Using particle board in piano case panels has a few advantages for piano makers. It is more dimensionally stable than lumber cores, so less cross banding is required. It's convenient because it requires no seasoning and can be ordered from the supplier in ready to use sizes. It machines consistently and presents few surprises and little waste. And judging from the pianos it's usually found in, it must be less expensive than lumber.

The very nature of particle board that gives it advantages for manufacturers also presents one distinct disadvantage for piano technicians. Particle board does not hold screws particularly well, and we all know how many screws there are in a piano. Because particle board is "particlely" instead of grainy, wood screws tend to strip very easily and tear out substantial divots when pulled out. There are new fasteners designed for use with particle board that resemble large drywall screws, but there are millions of pianos out there with old wood screws in particle board.

Further compounding the problem is the typical application of the panel and screws. The screw usually passes through a thick piece like a toe block or lid log, and is screwed into a relatively thin piece such as a side panel or lid with just a short length of the screw doing all the work.

So what's a technician to do about a log that's been ripped off a lid? The repair will depend on the nature of the damage to the particle board and the cosmetic requirements of the end result. If you want the piano to retain its original appearance, try to put the original screw back with one of the following repairs.

If the screw is simply starting to strip without starting to tear out, remove the log, or whatever is being held to the panel with the screw, and apply some ACC (super glue) to the hole. If there are some little chunks of particle board that come out with the screw, push them back into the hole before you apply the glue. Try to saturate the particle board surrounding the hole with the glue — thinnest viscosity works best — without filling the hole with glue. After the glue sets, install the original screw and tighten carefully.

If the screw has started to remove some of the particle board surrounding the hole, stuff some steel wool into the hole and glue with ACC. Use a grade of steel wool that corresponds with the size of the hole. The smaller the hole, the finer the grade of steel wool. Again, try to saturate the particle board and steel wool with the glue. Use an awl or smaller screw to create a path for the screw before the glue cures, or redrill after the glue cures and install the original screw.

If the screw has taken a large divot of particle board when it was ripped out, and the divot material is still around, you can try to piece it back together and glue it in. Usually the divot is missing and you'll have to drill out the site and install a hardwood plug of about the same size as the divot at the surface of the panel. Glue it back in with ACC so that the ACC can soak into the particle board surrounding the plug and reinforce that area. Then drill and install the original screw.

If cosmetics are less of a consideration than strength, change the method of attachment to eliminate the particle board holding a screw. Use machine screws to throughbolt the piece to the panel. Countersink tee-nuts on the finish side of the panel and patch over. You can also reverse the direction of the screw so that the screw passes through the particle board panel and into the thicker piece with more holding power. Countersink and patch if you wish. Reserve this last method for joints that are usually glued and/or won't ever have to be disassembled — or hope that you're not the one who has to figure out how to take it apart in the future.

The Tuner — Tuning Below The Temperament

By Paul Monroe, RPT

The intent of this article is to highlight some of the problems we encounter every day when tuning below the temperament octave and to share some of the methods I use that may be helpful to you.

Before getting to the heart of this subject, let's talk a little about the equal temperament. It is the central pivot point of a well-tuned piano, and we could get into a discussion that could last for months; so let the following definition suffice by saying that a temperament octave is made up of twelve equally spaced semitones. Therefore, as we progress up or down the keyboard the same intent should be our goal: evenly spaced intervals with semitone frequencies changing by a consistent ratio.

To learn more about temperaments, there is a book available to all of us that was written by a scholar, a musician, a composer and a piano tuner. The book is comprehensive in describing how we arrive at the equal temperament we have today. I urge all of those who haven't read the book to do so. The book I am referring to is by Dr. Owen Jorgensen, "Tuning the Historical Temperaments by Ear."

Those of us who have been tuning for any length of time are cognizant of the problems in tuning that are created by changing from plain wire to wound strings and moving from bichord unisons to unichord unisons. Pianos that have the shorter strings have greater problems than those with longer strings, i.e., spinets versus grands. The longer the strings, the fewer the problems.

The note on which the piano changes from plain wire to wound strings varies from one manufacturer to the next. It may range from B2 on a grand to A3 on a short console. Generally, quality pianos will change below F3. This helps a great deal when setting the temperament. The necessity of compromise is minimized.

Back to the temperament. If you have tuned the temperament so the F3-D4 Major 6th is beating at a rate less than the G#3-C4 Major 3rd and faster than the G3-B3 Major 3rd, continue using this pattern until the beat rates are no longer usable. This pattern is called, "outside 6ths, inside 3rds." With a great deal of experience, I think you will find that it is faster and more accurate to tune octaves in this manner than to play the octave. ***Special Note:*** The piano must be strip muted.

Using this pattern is only the beginning. After tuning note E3 using this method, double check your accuracy by comparing the beat rate progression of the Major thirds above this interval. They should be even in their progression.

Use the Major 6th-10th test to check the interval of a 5th. Use the Major 3rd-10th test to check for the octave as you did when you tuned above the temperament. You may find the beat rate of the Major 3rd and 10th will be the same or close to it. Also check the even progression of the Major 10th, 6th and 3rd intervals. After you have established a pattern for the above, it should take you no more than a few seconds to check the accuracy of the note you have just tuned. While you are doing all these mechanical motions and listening for beat rate ratios, also listen for what is happening in the partial structures of the notes you are tuning. Take time to depress the octave E3-E4 without the hammer striking the strings and strike in staccato fashion note E5. Listen to the partial that each of the two strings sing out. If the octave is in tune you will hear no beats or rolling effect. What you are listening to is the 4th partial of the bottom note and the 2nd partial of the top note.

Now hold down the same octave and strike E5 and B5. You will now hear the 4-2 coincidentals, plus the 6th partial of E3 and the 3rd partial of E4, called the 6-3 coincidental partials. Both of these tests should have no beats or rolling effect. This exercise is really easy. Don't let the amount of words distract your thinking or your attention.

When you start tuning note C3, you may be able to use another set of coincidental partials to control the amount of stretch in the bass tuning. They are the 12-6 coincidental partials. The location where you can utilize these coincidentals will vary from one piano to another.

The 12-6 coincidentals are, of course, the 12th partial of the bottom note of the octave and the 6th partial of the top note. You can hear this by depressing the keys to lift the dampers off the strings and strike in staccato fashion note G5 when checking octave C2-C3. This will produce a beat rate. Use this beat rate as a control by slowly reducing the rate as you progress down the keyboard. Eventually you will hear all of these partials without the aid of striking the notes that have the coincidental frequencies.

If you want to have a little more fun, try this. Hold down octave C2-C3 and strike note E5. Most likely you will hear another beat rate. It, too, can be used to control the tuning of the bass octaves.

The use of partials is directly affected by the amount of life or lack of it in the wound strings. Another factor that affects the ability to hear beats is when the soundboard is separated from the ribs. Beat rates sort of fly away when this condition exists.

Using coincidental partials is my favorite way to have fun tuning the bass. However, there are many other ways, a couple of which I think you should know about.

On some grands — sorry I can't mention names — and

The Tuner Continued On Page 52

Just Another Concert Tuning

By Kent Swafford, RPT

I have had occasion recently to reflect on my experiences as a piano technician. I'm 42, perhaps I'll eventually look back upon my recent pensiveness as just part of my "mid-life crisis." An incident of a few years ago that didn't seem like such a big deal at the time has been looming large in my thoughts recently because of things that have happened since. It has become one of those defining moments in my life as a piano tuner.

This is one of those backstage stories that are rarely told. If the audience only knew! And for that matter, if more piano technicians knew that situations like this come up regularly, I wonder how many technicians would covet positions as piano technicians at colleges and universities.

I was asked to tune for a solo piano concert being put on by an outside group at the University of Missouri-Kansas City Conservatory of Music as a benefit of some sort. The artist's name was Greg Slag. Since the concert was being staged by an outside group, the usual paperwork that informs the piano technicians of the artist's choice of pianos was not filled out. A call was placed to Greg to confirm his choice of instruments, but he could not be reached immediately.

Mr. Slag had played at the Conservatory in the past and had apparently played a Bosendorfer, chosen from among the concert pianos in White Hall. At the appointed hour on the Sunday of the concert, I began the tuning, assuming that he would play the same piano this time as before. What we did not know was that Greg had recently been named a Steinway artist. So, not surprisingly, as I was finishing up the tuning of the Bosendorfer, a person appeared in the hall to tell me that I was tuning the wrong piano. A few minutes later a second person appeared to tell me I was tuning the wrong piano. A few minutes later, yet a third person appeared to tell me I was tuning the wrong piano. Somewhere out there in the world, the message inquiring about the choice of pianos had been received and Greg had apparently called everybody he could think of at the Conservatory that might be able to get the word to the tuner. But, as the schedule in White can be rather full, and the Bosendorfer was likely to be in use later, I went ahead and finished the tuning without discussion. This was cause for some concern among those who had been sent to tell me that I was tuning the wrong piano. No problem; there was time.

I began tuning the primary Steinway concert grand. This piano, at the time, had a penchant for breaking strings. Sure enough, a string popped in the treble, both speaking lengths on the same unison. No problem; there was time. I went to the cabinet of supplies to get the appropriate wire, but the canister containing the particular gauge of wire that I needed was nowhere to be found. (It wasn't until months later that my colleague piano technician happened upon the missing canister. He found it among his own tools and supplies and apologized for having removed it without returning it to its proper place.) Problem. By now the artist had quietly slipped in and needed to warm up. I needed to be gone for the fifteen minutes that it would take to get the proper wire from the piano shop located across campus. I had to tell Greg what was happening, even though it is not normally a good idea to explain difficulties to the artist since they already have more than enough to worry about. He took it well. As I fixed the string, time began to get tight. Greg knew that I had tuned the Bosendorfer and decided to warm up on it while I completed the Steinway. He went to the Bosendorfer and opened up the piano himself. As he removed the music desk, it literally fell apart in his hands! (I now have a "thing" about making sure that music desks and lids and such are kept in good repair.) While one often hears stories of "temperamental" artists flying into rages as the result of much less than what was happening to Greg, he calmly put down the now separated music desk and music rack without complaint and began warming up. I replaced the broken string and completed the tuning of the Steinway. It was just past time to open the house. Greg announced that he would play the Bosendorfer. He had warmed up on it, and figured that the new string on the Steinway could go out of tune. I couldn't really blame him, although the reality was that, during that time before it could be arranged for the Steinway to be restrung, concerts were regularly played on it with strings that had been freshly installed during the tuning for that very concert. The new strings did not go out of tune during any of those concerts, but of course, the pianists had not been told beforehand about the new strings. I wished I had been able to keep Greg in the dark about the new string, but even so, I was proud that when the time came, he ended up with a choice between two instruments, both of which were ready to go.

There is a point to be made here about two people who find themselves thrown together in a difficult situation. We both kept our cool when we could just as easily have made each other's lives hell for a few hours. I could have reasonably declined to do two complete tunings, and Greg had plenty to be unpleasant about, had he been of a mind to be so.

By the way, Greg played a magnificent concert. I will always remem-

The Tuner's Life

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The Tuner

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on one vertical that I am aware of, you can tune the bass octaves by using the minor 6th and Major 3rd test. This means that the beat rate of the minor 6th above the bottom note will beat the same as the beat rate of the Major 3rd below the top note. As an example: the beat rate of C2-G#2 and G#2-C3 should be the same. This is only possible on some grands and one vertical, as I mentioned above. Starting at the first note below the temperament, check to see if you can use this method. If you can, you will save a lot of time.

Another is the use of the minor 7th. When beat rates of the intervals you have been using become slow and laborious, listen for the beat rate of the minor 7th, i.e., C2-A#2. The rate should become slower at an even rate as you progress down the keyboard.

Now that we have broached the theory of tuning, let us set up a little routine for tuning the octaves below the temperament.

Starting with the first note below your temperament octave, play the octave by striking the notes gently, not hard. If you strike too hard you will set up a contradiction in the partials between the transverse and longitudinal movement of the string.

While playing the octave, proceed to get it in the ball park, then use the outside Major 6th, inside Major 3rd test to zero in on tuning the note accurately. Use all the other tests and checks mentioned above. Proceed down the keyboard in the same routine. Bear in mind the use of the outside 6th and inside 3rds will not be useful to the bottom note. As it diminishes in usefulness, choose one of the methods mentioned earlier.

Some may be asking what this method accomplishes. In my experience, it smooths the transition across the tenor-bass break, it keeps more consistency in the interval beat rate changes, and it reduces the amount of compromising below the temperament. It also helps you hear the required changes moving across the trichord, bichord and unichord unisons.

For the musician, if you haven't already discovered it, I have used the sharp "#" symbol throughout, which in some instances will disagree with the fundamentals of music theory. Interval C-A#, according to the fundamentals, is an augmented 6th; C-Bb is a minor 7th. However, for consistency, I still lean toward using the "#" symbol only, as not all piano tuners are musicians and for some, it is better to leave out the fundamentals of music theory.

In conclusion, remember that tuning below the temperament is building the foundation for above the temperament. To use an old cliché, "the stronger the foundation, the stronger the house." Happy tuning.

The Tuner's Life

The Tuner's Life Continued From Page 51

ber the feathery pianissimo that he coaxed out of that Bosendorfer during a Messiaen piece he played. The reviewer for The Kansas City Star some months later called that concert the "most satisfying" of all of the Kansas City piano concerts of that season.

Not long ago I heard that Greg Slag had died. I didn't really know Greg, but I think he may have been as talented, and certainly as much of a gentleman, as anyone I have ever met. I'll never forget the pleasant afternoon I spent with him.

I'll also always remember that missing canister of wire, so I'd recommend making it a habit of putting tools and supplies back in their proper places. Murphy's Law suggests they will be needed if you don't.

Albuquerque Accommodations

The 38th Annual Convention & Technical Institute will take place this year in Albuquerque, New Mexico. Convention Headquarters will be at the Hyatt Regency Albuquerque. The Hyatt offers fine dining for breakfast, lunch and dinner, and lounge facilities, an outdoor pool, and a health club and spa. The hotel lobby is also adjacent to retail shops.

A room block is being reserved at convention headquarters especially for PTG. Room rates for the Hyatt will be $85 for single or $95 for double occupancy.

In addition, a block of rooms has been reserved at the Doubletree Hotel Albuquerque, within walking distance of the Hyatt. The Doubletree is only a 45-second walk from the Albuquerque Convention Center via a carpeted concourse. Nightly rates at the Doubletree will be $92 for single or double occupancy.

Please note: You must register for room accommodations before June 23 with the Hyatt by calling 505-842-1234. You must register for room accommodations before June 16 with the Doubletree by calling 505-247-3344. It will be difficult to register for accommodations after this date, as the room block will be dropped.

Vision Quest — Albuquerque '95

By Fred Fornwalt, RPT, Institute Director

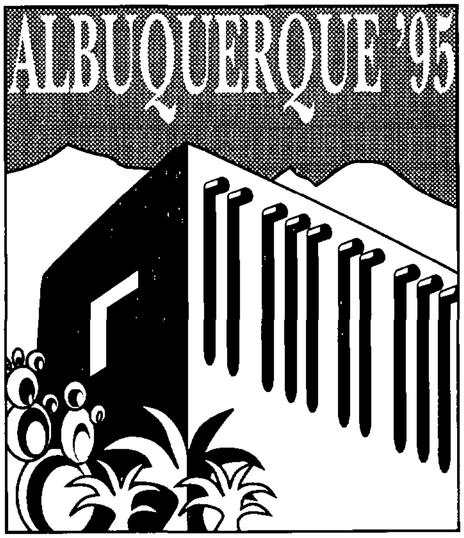
The past 18 months — since being appointed director of the 1995 Albuquerque Institute — have been very rewarding, exciting, enlightening and humbling, to say nothing of being extremely busy.

During this time I have had to redefine for myself what it takes to not just succeed, but to thrive in the field of piano technology.

- What are the basic elements and skills that must be mastered?
- What are the various theories and approaches behind these elements?
- How can they best be presented?
- Who are the instructors best qualified and prepared to present these skills?

My Vision Quest has taken me to many parts of the United States and put me in contact with manufacturers, suppliers, rebuilders, technicians, business consultants, historians and even physicists around the world. I have been truly astounded at the wealth of knowledge, depth of specialized expertise, and not only the excitement but especially the eagerness to share this hard earned knowledge not for financial reward, but to give back to the piano community, often at great personal expense. This is a true demonstration of the unique brother-

International Flavor...



...Southwestern Spice!

hood and sisterhood and altruistic spirit that exists in the Piano Technicians Guild.

The manifestation of this quest will come to fruition July 19 - 23 in Albuquerque. The members of the Institute Committee and I have designed a curriculum that covers every facet of piano technology, and will be presented by a faculty unequalled anywhere else in the world.

The next step in this quest is up to you.

- Review the class offerings.
- Study the class descriptions.
- Perform a self-evaluation of your skills.
- Review the demands of your clientele — past, present and future.
- Determine which classes would benefit you.
- Envision how much richer you will be for immersing yourself in the Albuquerque experience.
- Register today.

If you consider yourself a piano professional, you cannot afford to miss this chautauqua — "meetings of the minds."

"The Art of Visiting Albuquerque" is a free publication available from the Albuquerque Convention and Visitors Bureau and is available by calling 1-800-284-2282.

The publication includes visitor information; self-guided tours; activities and attractions; arts, cultural and shopping; maps; tours, travel and transportation; and a calendar of events.

Don't Forget Your Tools

By Paul Olsen, PACE Coordinator

Last year's PACE Academy in Kansas City was a great success, showing a big demand for classes. The one drawback was that many people forgot their tools and consequently were unable to attend such a rich array of "hands-on" classes. Let's not let that happen this year in Albuquerque. If you have any inkling whatsoever about possibly attending a PACE class, bring your tools. You will be glad you did.

If you are new to the field of piano technology and have not yet accumulated the necessary tools, the institute is a great place to purchase them. Visiting the display booths of the many piano supply companies is worth the trip in itself. This is where you can see first hand the various tuning, regulating and rebuilding tools. You will also get a chance to touch and feel the vast array of new tools and receive tips and advice from the experts. In any case, tools are our "life blood" and are necessary for many of the PACE classes. So remember, if you are attending the institute this year, "Don't forget your tools!"

In this issue of the Journal you will find a list and description of the 1995 institute classes. Included in this list will be the PACE Academy. Take note that some of the classes will have a surcharge to help defray the added costs of equipment and materials. These include the "Technical Hands-on" classes, the "Tuning (Tutoring) Hands-on" classes and the "Advanced Hands-on" classes. The fee is minimal compared to the value received.

To register for Hands-on or Tuning (Tutoring) classes, call the Home Office at 816-753-7747, and they will be able to tell you the availability of classes and send you a list of needed tools. Upon receiving your payment they will send you a confirmation securing your place in the selected class.

If you want to develop the knowledge and experience to make strides toward a successful career, plan to attend the 1995 Institute. In any case, the opportunity for learning by doing will be available in Albuquerque. And remember: "Don't forget your tools!"

Why New Mexico Is So Beautiful Geology In Living Color

By Fred Sturm, RPT,
Host Chapter Chairman

In New Mexico, geology isn't a boring science subject you study theoretically in school. It is what we see all around us in endless variety. Volcanoes and their effects are the most spectacular, so let's start with them.

There are no active volcanoes in New Mexico, but there are the remains of many eruptions and explosions over millions of years. Extensive lava flows occurred at many points in the state; the most easily accessible of which is in El Malpais National Monument, just south of Grants, about 70 miles west of Albuquerque. The lava beds there are quite extensive, and contain numerous lava tubes, a fairly recent cinder cone, and ice caves — where the temperature stays cold enough that ice is present year round. The Indians sometimes used ice caves to preserve food, and there is one that has been developed so that tourists can enter it.

Not all volcanoes produce lava flows. Sometimes they simply explode. When a large one explodes, it showers vast areas with ash, and leaves behind a large depression, known as a caldera. Of the several calderas in New Mexico, the most accessible is called Valle Grande, just west of Los Alamos, 100 miles northwest of Albuquerque. It is on private property, but a highway goes right along the edge, and provides quite a view. When the volcano that produces Valle Grande exploded, it showered immense quantities of ash over a wide area, in some places more than 1,000 feet thick. The ash hardened over time into a rock-like substance called tufa, which erodes fairly easily and often forms caves. The cave dwellings in Bandelier National Monument, mentioned in the February article, are built into tufa cliffs from the Valle Grande explosion.

During much of the past 100 million years or so, New Mexico was partly covered by shallow inland seas. For this reason, sedimentary rock containing fossils are particularly abundant here, with everything from plants to seashells to dinosaurs. Many important dinosaur remains have been found in New Mexico, one of the latest, called "seismosaurus," was apparently the longest dinosaur ever. Some seismosaurus vertebrae are on display at the New Mexico Museum of Natural History in Albuquerque, along with other dinosaur skeletons in addition to a wide range of other exhibits.

Sedimentary rock contains more than just fossils. In southern New Mexico there are large sedimentary deposits of gypsum, a white mineral used in drywall and plaster. In a certain area, gypsum dissolved in water flows and formed very shallow seasonal lakes. When the water evaporated, the gypsum crystals left behind were blown by the prevailing winds into a large area of white dunes. This is, of course, the white sands of White Sands National Monument — more than 200 miles south of Albuquerque — a very beautiful and unique place.

To the southwest of White Sands is another place formed by water and sedimentary rock, the incredible system of caves known as Carlsbad Caverns, and Lechugilla Cave, the recently discovered enormous cave near Carlsbad. Carlsbad Caverns is well enough known that I won't describe it other than to say that it is awe inspiring, and a visit is a must if you can possibly fit it in. Carlsbad is 275 miles from Albuquerque, so this is obviously more than a day trip.

What I like most about the New Mexico landscape is the mesas. Through some mysterious process of water, wind, and time, these large flat-topped expanses were left towering above the surrounding lowlands. Erosion often carves their edges into fantastic shapes. The mineral makeup of the various sedimentary layers usually means that they are striped in a wide range of colors — red, black, brown, white, green, tan — in all sorts of shades and blends. Add various shades of green from vegetation — yellow, white, red, orange or purple flowers, depending on the time of year — and the deep blue sky, usually with spectacular cloud formations, and it is hard to imagine a better feast for the eyes. Mesa country is especially beautiful to the west and northwest of Albuquerque.

And, of course, there are just plain mountains, caused by bucklings and slidings of tectonic plates. Just east of Albuquerque is as nice an example of uplift as you will ever see — the Sandia Mountains — which tilt up more than a mile into the air, leaving millions of years of geologic history exposed. The most mountainous part of the state is north central New Mexico, with peaks of up to 13,000 feet. This area is heavily forested in ponderosa, spruce, fir, and aspen, and has many trails and camping sites. Fly fishing and lake fishing are popular in New Mexico, though I'm afraid I am no expert on the subject. Large wilderness areas — closed to all motor travel — are available to those who enjoy the solitude of backpacking. In fact, the western face of the Sandia Mountains, on the eastern city limits of Albuquerque, is designated a wilderness area, and is a wonderful place to hike, with beautiful panoramic views of the Rio Grande Valley, and with hidden places so wild it is hard to believe a large city is only a couple of miles away.

Next month I'll write about things to do in Albuquerque, and explain the basic question "Red or Green?"

Welcome IAPBT

A highlight of this year's convention will be the biennial meeting of the International Association of Piano Builders and Technicians. IAPBT is an organization of technicians' organizations around the world. Besides PTG, members include technicians' organizations in Japan, South Korea, Taiwan, and Australia. It was formed during the 1979 PTG convention in Minneapolis, and previous meetings were in Switzerland, Kansas City, Toronto, Japan, Korea and Norway. Its officers are Ed Hilbert, RPT, president; Ling Ho Liu, Taiwan, vice president; Larry Crabb Jr., secretary-treasurer; Kenzo Utsunomiya, Japan, director; and Bo Jung Lee, Korea, director.

Although IAPBT activities will begin July 20, most will take place after the PTG convention closes at noon Sunday, July 23. The IAPBT program will end with a banquet on Monday evening, June 24. Among the IAPBT activities planned are a number of social functions, a Board and Council meeting, a tour of the Albuquerque area, and a symposium in which membership requirements and certification activities of the various groups will be discussed.

Tours from Japan, South Korea and Taiwan are planned to bring IAPBT members to Albuquerque, and participants will also come from other organizations, particularly those in Europe. A number of IAPBT participants also will serve as instructors in the PTG Institute.

PTG members are invited to stay over and take part in IAPBT activities.

IAPBT Schedule

July 20	Dinner
July 21	Dinner
July 23	Luncheon or tour to Sandia Peak (includes lunch) Banquet
July 24	Luncheon Business Meeting Symposium Banquet

Application for Convention Tuning & Tech Exam

Name ____________________

Member # __________ Phone ____________________

Address ____________________

City/State/Zip ____________________

Application For:

❏ **Written Exam Only** — No Fee
If you check here, you may not apply for other exams at this time.

❏ **Complete Tuning Exam—$60** — $ ______

❏ **Complete Technical Exam—$60** — $ ______

❏ **Partial Exam(s)**
Available only if repeating a section for the first time within one year of previous attempt:

_____ **Part 2 Tuning Exam—$30** — $ ______

_____ **Number of Technical Exam Sections—$20 each** — $ ______

❏ **Total Fee Enclosed** — $ ______
No fee required for tuning exam for RPTs enclosing a Consent-To-Serve Form

❏ **I have passed the Written Exam taken 7/90 or later**
Required for Tuning and Technical Exams

❏ **I will bring Reclassification Form**
Required for Tuning and Technical Exams

____
Signature *Date*

Yes, I would like to observe a Master Tuning on Tuesday, July 18 ☐ (please check)

If you are an Associate member who needs to take the PTG tuning or technical exams to become a Registered Piano Technician, an excellent opportunity will be available during the convention and technical institute in Albuquerque.

The PTG Examinations and Test Standards Committee will conduct tuning and technical exams July 19-23. Before taking the exams you must have passed the Guild written exam. A reclassification form, verifying that the written exam has been passed, must be brought to the examiner at the time of the test. Written test scores are not required.

Only a limited number of exam slots are available, so be sure to apply early by completing the form to the left and sending it to: Mitch Kiel, 11326 Patsy Drive, SE, Olympia, WA 98501

A $60 fee payable to Piano Technicians Guild is required from applicants for RPT status. There is no fee required for tuning exams for RPTs who are attempting to achieve CTE status, and are enclosing a CTE Consent-to-Serve form.

Deadline for applications and fee refunds is:

June 23, 1995

1995 Technical Institute Class Schedule

	1st Period	2nd Period	3rd Period	4th Period
Thurs.-Sat.	8:00-9:30	10:30-12:00	1:30-3:00	4:00-5:30
Sunday	8:00-9:30	10:30-12:00		

○ 1 class period
⬭ 2 or more class periods

Regional and Committee Meetings will be held during 1st period, Friday

	THURS-20				FRI-21				SAT-22				SUN-23		ROOM
BUSINESS CLASSES	1	2	3	4	1	2	3	4	1	2	3	4	1	2	
Bookkeeping & Record Keeping for Your Business - Ed Bordeleau	●	●							●	●					Pecos
Computers - The Tuners' Other Keyboard - Ron Berry			●							●					Mesilla
Estimates and Appraisals - Ward Guthrie	●							●							Mesilla
How to Build and Sustain a Business - Keith Kopp		●													Mesilla
How to Build and Sustain a Business - Keith Kopp						●									Pecos
Marketing and More - Evelyn Smith				●											Tijeras
Marketing and More - Evelyn Smith							●								Pecos
The "ONE-MAN" Service Organization - Gerry Cousins				●					●						Mesilla
Profits & Taxes - Ray Chandler			●					●							Tijeras
Time Power Management for Piano Technicians - R. Des Wilson			●	●							●	●			Pecos
REBUILDING & SHOP CLASSES															
Action Rebuilding - Geometry/Weight/Estimating - D. Morton						●							●		Acoma
Balance Rail Hole Repair - Ralph J. Onesti	●								●						Santo Domingo
Grand Action Rebuilding - Ed & Emily Hilbert						●								●	Sandia
Ivory Keyboard Repair - William Smith								●							Nambe
Ivory Keyboard Repair - William Smith										●					Jemez
Keytop Replacement - David Betts						●					●				La Cienega
New Parts on Old Frames - Rick Baldassin, Rudolf Genger									●					●	San Miguel
Not Just Another Hammer Boring Class - Glen Hart		●										●			La Cienega
Pinblock Replacement - Nick Gravagne / Andre Bolduc											●	●			Picuris
Removing Snake Oil from Grand Dampers - Richard Davenport	●	●					●	●							Picuris
Restringing the Grand Piano - Greg Hulme		●									●				Acoma
Setting Up Your Shop - Edward (Ted) Sambell			●	●											Picuris
Setting Up Your Shop - Edward (Ted) Sambell											●	●			Sandia
Soundboard Replacement - Nick Gravagne / Andre Bolduc									●	●					Picuris
Wood Behavior and Woodworking Techniques - John Hartman							●	●	●	●					Sandia
TUNING CLASSES															
Accu-Tuners in the Real World - Kent Swafford				●			●								Laguna
Advanced Aural Tuning - Virgil Smith											●		●		Laguna
Aural & Visual Tuning - Jim Coleman, Al Sanderson						●							●		Santo Domingo
Digital-Audio Tuning - Dean Reyburn				●							●				Santo Domingo
The Hand on Your Hammer - Bill Ballard							●								Santo Domingo
How Firm a Foundation - Jack Stebbins		●				●									Laguna
Physiology of Pitch Raising - Joe Garrett			●	●											Taos
Troubleshooting the Temperament - Jim Geiger	●								●						Laguna
Tuning with a British Flavour - Harry Lyddall								●							Santo Domingo
Understanding the Use of Partials in Tuning - Fred Tremper			●											●	Laguna
Your Friend the Unison - Bill Ballard		●													Santo Domingo
VOICING & CONCERT PREPARATION CLASSES															
Advanced Voicing: Language & Technique - David Barr			●	●							●	●			Ruidoso
Artist/Teacher vs. Technician - Bridging the Gap - Lucien Hut						●						●			Mesilla
The Psychology of Supporting the Performing Artist - David Barr						●								●	Tijeras
Steinway & Sons Concert Preparation - Ron Coners		●											●		Ruidoso
Touchweight Analysis Lab - David Stanwood	●	●									●	●			Tijeras
Voicing - What Pianists Really Want - Ari Isaac							●			●					Ruidoso
Voicing the Boston Piano - Scott Jones								●	●						Ruidoso
Voicing the Renner Hammer - Rick Baldassin	●						●								Ruidoso
PIANO DESIGN, CONSTRUCTION & MATERIALS CLASSES															
All About Piano Plates - Bob Beck	●	●									●	●			Taos

	THURS-20				FRI-21				SAT-22				SUN-23		ROOM
Piano Design, Construction & Materials *Cont'd...*	1	2	3	4	1	2	3	4	1	2	3	4	1	2	
The Art of Bedding the Keyframe - Paul Monachino				●							●				Zuni
Construction and Manufacture of Piano Hammers - Norbert Abel								●							La Cienega
Construction and Manufacture of Piano Hammers - Norbert Abel											●				Mesilla
Downbearing - Del Fandrich											●				Jemez
European Soundboard Design - Heiner Sanwald							●			●					Taos
The Evolution of the Pianoforte - Nikolaus Schimmel								●							Acoma
The Evolution of the Pianoforte - Nikolaus Schimmel											●				Cochiti
"From New York to Hamburg" A Profile of Steinway & Sons Sister Factories - Michael Mohr, Hartwig Kalb							●							●	Mesilla
Keys Where? & the Action There! - Jamie Marks	●	●													Cochiti
Kimball Product Design Update - Roger Weisensteiner												●			Tesuque
Making a Silk Purse out of a Sow's Ear - Del Fandrich			●											●	Acoma
No Woven Felt - No Pianos - Peter Van Stratum												●			Santo Domingo
No Woven Felt - No Pianos - Peter Van Stratum														●	Santa Ana
Pins and Strings and Things - Jim Ellis	●	●													Zuni
Secrets of the Superglues - Ed Dryburgh								●							Laguna
Secrets of the Superglues - Ed Dryburgh												●			Zuni
Solving Voicing Problems with a Second Action - Ken Sloane										●			●		La Cienega
Thinking Like a String - Bernard (Barney) Ricca	●											●			Acoma
IN-HOME SERVICE & REPAIRS CLASSES															
Action Centers: The Secret to Consistent Touch - Don Mannino			●							●					Santo Domingo
The Dilemma of Modern Trapwork - Norman Neblett						●						●			Cochiti
Grand Action Troubleshooting and Servicing - Kent Webb						●								●	Taos
The Grand Tour - Assessing the Piano - John Foy	●							●							Tesuque
Hospital for Hopeless Pianos - Gary Neie			●	●					●	●					Cochiti
Piano Moving - Jim Geiger			●					●							Zuni
Regulating the Fandrich Vertical Action™ - Darrell Fandrich							●			●					Santa Ana
Rescue 911 - Tom Patten				●							●				Tesuque
Restoring the Vertical Keys and Action - Richard Elrod		●				●									Tesuque
Secrets of Performance Piano Preparation - L. Edwards, Y. Suzuki			●	●							●	●			San Miguel
Selling Humidity Control - Bob Mair			●						●						La Cienega
Troubleshooting Uprights and Grands - Roger Weisensteiner									●						Tesuque
Turbo Charging the Vertical Action - Jack Wyatt							●						●		Tesuque
Understanding Relationships in Grand Action Regulation - S. Powell						●	●		●	●					Zuni
Vertical Dampers - Mary Cushing Smith			●							●					Tesuque
MIDI & DIGITAL TECHNOLOGY CLASSES															
Disklavier Master Class - B. Brandom, A. Nishio										●					San Miguel
PianoDisc - Technical Look at the 21st Century Player Piano - M. Burgett, D. Dusenbury							●								La Cienega
HISTORICAL & SPECIAL INTEREST CLASSES															
Artistic Hammer Carving - William Smith													●		Cochiti
Basic Harpsichord Service - Ferdinand Pointer				●					●						Acoma
The Early Piano, Evolution and Progression - Odd Aanstad							●								Tijeras
Historical Temperaments - Owen Jorgensen										●					Acoma
Maintenance and Restoration of Early Keyboard Instruments - O. Aanstad									●	●					Tijeras
The Russian Piano Industry and the Standard of the Trade - M. Matthias							●								Acoma
SYMPOSIA															
International Tuning Symposium - LaRoy Edwards, Harry Lyddall, Michael Kimbell, Kenzo Utsunomiya													●		Ballroom A
You and Your Business - LaRoy Edwards, Vivian Brooks, Beverly Kim and R. Des Wilson		●													Ballroom B
INDUSTRY ROUNDTABLE															
A World of Opportunity / The State of the Piano Industry - Fern Henry, Nikolaus Schimmel, Max Matthias, Robert Jones						9-10 a.m.	9-10 a.m.								Ballroom A

PACE ACADEMY	THURS-20 1	THURS-20 2	THURS-20 3	THURS-20 4	FRI-21 1	FRI-21 2	FRI-21 3	FRI-21 4	SAT-22 1	SAT-22 2	SAT-22 3	SAT-22 4	SUN-23 1	SUN-23 2	ROOM
WRITTEN TEST CLASSES															
Preparing for the PTG Written Exam - Randy Potter	●	●					●	●							Isleta
PTG Written Exams - Randy Potter				●						●					Isleta
TECHNICAL TEST CLASSES															
Preparing for the PTG Technical Exam - Mike Carraher		●							●						Jemez
TUNING TEST CLASSES															
PACE - Tuning I - Introduction to the PTG Tuning Exam/ Partials and Inharmonicity - Jack Stebbins			●						●						Isleta
PACE - Tuning II - Hearing the Beats - Margie Williams								●				●			Jemez
PACE - Tuning III - Pitch and Temperament Ramon Ramirez											●		●		Isleta
PACE - Tuning IV - Octaves-Extending the Temperament - M. Travis						●								●	Isleta
PACE -Tuning V - Unisons and Stability - Kent Swafford	●														Jemez
PACE -Tuning V - Unisons and Stability - Kent Swafford												●			Isleta
PACE HANDS-ON CLASSES ($20 per session)															
Bushing & Pinning Skills - Bill Spurlock	●					●							●		Nambe
Grand Action Regulation - David Vanderlip, Kathy Smith	●	●									●	●			Navajo
Grand Action Regulation - John Minor, Richard Raskob						●	●						●	●	Navajo
Hammer Shank Repair and Replacement - Margie Williams	●					●			●						Santa Ana
Hands-On String Repairs - Bruce Stevens							●		●					●	Nambe
Vertical Piano Regulation - Doug Neal			●	●		●	●						●	●	Jemez
TUNING/TUTORING HANDS-ON CLASSES ($20 per session)															
Beat Rate Practicum						●			●						ROOM
Comprehensive Tuning for Advanced Students						●			●				●		ASSIGNMENTS
Octaves Practicum				●				●				●			WILL BE GIVEN
Temperament Practicum		●					●			●					AFTER
Unisons & Stability Practicum	●		●								●				REGISTERING
ADVANCED HANDS-ON ($35 per session)															
Applied Bridge Capping-A Practical Approach - Willis & David Snyder			●	●							●	●			Nambe
Down to the Wire - Grand Dampers - Doug Wood		●						●					●		Santa Ana
Hands-On Chisel Sharpening - Kevin & Janet Leary		●								●					Nambe
Turning Touch-Up and Repairs Into Big Dollars - Karl Habijanac - Star Finishing			●	●							●	●			Santa Ana
Voicing Techniques That Work- Eric Schandall			●	●					●	●					Navajo
College & University Technicians Forum							●	●							Cochiti
VISUALLY IMPAIRED CLASSES															
Upright Regulation for the Visually Impaired - Brian De Tar	●	●													Sandia
Tuning with a British Flavour - Harry Lyddall			●												Sandia
Short Cuts to Efficient Piano Service - Ben McKlveen				●											Sandia
Chapter Resource Workshop - Keith Bowman							●	●							San Miguel

PTGReview

PIANO TECHNICIANS GUILD

Dedicated To PTG News • Interests & Organizational Activities

Working In The Real World

By Webb Phillips

How to be successful in the piano service business? How to make money in the piano service business? What's the difference? What do you consider success, and how do you measure it?

There are tuners who tune 12 to 15 pianos a week at $35 or $40 each. As an example, assume 15 tunings at $40, and you'll have $600 weekly, or $30,000 in 50 weeks. Other tuners service at least 30 pianos each week at $85.00, or more, per tuning, which equals $127,500 a year, based on the 50-week year. A big difference of $97,500 a year!

Both feel successful, but I'm sure that the $30,000 a year people would love to know how to increase their incomes to the nearly $130,000 level. Success and business do not have the same meaning.

The word business, to most people, means nothing more than P&L statements and spread sheets. First, there are many basics.

Most technicians want to know how to make money in this profession. This, for many, may not be as easy to learn as regulating a damper or setting a tuning pin. This is a whole new ball game. It is not only dependent on your skills as a piano technician, but skills in an entirely different field.

Ruth and I give business classes at chapters and seminars all over the country. In many of these classes we hear some excellent approaches to business or money making ideas; we also hear some disastrous approaches. Bob Mair, at Dampp-Chaser, has a transcript of one of these classes, which I am sure they will send to you if you call them.

We spend many years learning the mechanics of our trade and expect to be successful financially because we have acquired those necessary skills. We think people will rush to us because we are mechanical geniuses. It doesn't work that way! When we speak of some of the well known, successful people in our section of the country, such as Greg Hulme, Cliff Geers, Wally Brooks, Willis Snyder, Chris Robinson and many others, we tend to think first of their mechanical ability. This was only one key to their success. Their current status could not have been obtained without the marketing of themselves and their skills.

The best mechanics will not be financially successful with an empty schedule pad or empty work bench.

Our Guild has steadily improved its efforts in teaching the mechanics necessary for becoming skilled technicians. Fortunately, there is now also interest in business mechanics and marketing. Many sources of help are available outside PTG as well.

It's so easy to automatically follow others, not questioning whether they are qualified to lead. If the game were "follow the leader" that would be OK, but it tends to be "follow the follower."

The piano business, like any business, must start with an idea and a goal, then market the idea to achieve the goal. Marketing of any product, service, or even mechanical skills of any kind usually requires as much or even a greater degree of skill than the manufacture of a product or mechanical training.

Rule #1: Nothing happens until something is sold

This can be your product or your service. If you can't sell yourself, number one, or your skills, number two, you certainly can't prove your value.

Selling yourself can start many ways, but this has nothing to do with your piano skills. You now must enter the business world.

It used to be called *Selling*; today it's referred to as marketing. It is taught in high schools and is a four-year course in most colleges and universities.

There is no one, two, or even a few articles that could appear in the *Journal* that could teach you to become a good salesperson, selling your technical skills. Absorb those articles as a beginning, but accept that you must go infinitely further if you truly want to develop.

Mark Twain once said, "Inherently, each one of us has the substance within to achieve whatever our goals define. What is missing from each of us is the training, education, knowledge and insight to utilize what we already have." Accepting the fact that you must train to become a salesperson will make a far greater contribution to

The Real World Continued On Next Page

The Real World, Continued

your income than anything else I can suggest.

Those who avoid challenges by burying themselves in a small area of expertise can only lose.

There is a real world

The business sections of book stores offer a broad diversity of products and authors, from motivational programs to skill building.

The first book I would recommend buying is John T. Malloy's "Dress for Success." If you don't look professional, you can't charge professional prices.

Probably one of the most basic and best books on selling yourself that I have read is "The Lacey Techniques of Selling," by Paul J. Micoli. This has more of the basics than most and costs only about $5.

You might call Nightingale-Conant Corp., at 1-800-323-5552, or write to them at 7300 N. Lehigh Avenue, Niles, Illinois 60714. They have many programs on business and self development.

The transcript that Dampp-Chaser has also contains many fundamentals.

I am sending a list of the names and addresses of several programs on cassette, books, and video to be filed in the home office.

Work smarter instead of harder. Learn to sell your skills.

More Room, But Exams Still First-Come First-Serve

Examinations & Test Standards Committee

Movin' On Up!

Mitch Kiel, RPT

Most of you know that RPT exams are given at PTG annual conventions. This year is no exception. ETS will be offering RPT written, technical and tuning exams during the upcoming annual convention in Albuquerque, July 19-23.

ETS encourages you to take RPT exams locally whenever possible. It's usually easier and cheaper to take the exam close to home and gives valuable experience to our global network of examiners. However, far-flung Associates may not be able to afford to travel to both an exam center and the annual convention. Some Associates like to take a PACE class immediately preceding their RPT exam. Others may prefer the relative anonymity of being examined far from home.

Whatever your reason, if you're thinking about taking the RPT exam in Albuquerque, it's important that you send your registration as soon as possible. ETS schedules exams on a first-come first-served basis, and the number of exams we can offer is limited.

At last year's Convention Test Center (CTC) in Kansas City, ETS had to turn away 11 tuning exam applicants because we simply ran out of capacity. In response to that and an (heart-warming) upswing in the number of RPT exams at the local level in 1994, we've added a third tuning exam room at the CTC at the Albuquerque convention.

This additional tuning exam room will increase the number of tuning exams available from 16 to 24. We're able to do this thanks to the support of the PTG Board, the Institute Director, and our many dedicated examiners.

However, please note that, even with 1995 CTC's additional capacity, we would not have been able to meet 1994's demand. Add to that the predicted increase in 1995 exam applicants, and you can see that Albuquerque CTC's exam rooms will likely be full to bursting. Unfortunately, this means we'll probably have to turn away late registrants.

There's an exam registration form in this issue of the *Journal*. If you're planning on taking the RPT exams in Albuquerque, we strongly suggest you send it in ASAP. Like today, for instance. Like, right now. We'll wait while you sprint out to the mailbox.

You're back. Good. Let's continue.

Exams at Albuquerque's CTC will be the ultimate in efficiency and procedure. Some of PTG's most experienced and capable examiners will be in Albuquerque. The two most recent ETS chairs, Jack Stebbins and Mike Travis, and Teri Meredyth, ETS's Western regional CTE, will be joining ETS chair Mitch Kiel as full-time tuning examiners at the Albuquerque CTC.

And we're happy to announce that Yamaha Corp. will be supplying us with three S-400 6'4" grands for use as exam pianos. This piano is a real treat to tune. Examinees who aren't yet familiar with this model are in for a pleasant surprise.

The full-time technical examiner will be Mike Carraher, ETS technical exam sub-committee chair for the past several years. Mike will be offering as many as 18 technical exams in Albuquerque.

Randy Potter is again offering a PACE class, "Preparing for the Written Exam," and another class at which you can take the RPT written exam. If you prefer to take the written exam at your local chapter, remember there is no fee for the written exam, and it can be administered by any RPT, usually with little notice. Call your chapter president for further information.

These people are the cream of the examiner crop. They've literally written the book on tuning and examining.

Observe a master tuning

Master tuning of the exam pianos will commence on Tuesday, July 18. Master tuning usually takes three to five hours. At the discretion of the CTE-in-charge, a limited number of Associates will be allowed to observe, but not participate in master tuning sessions. If you wish to observe CTC master tunings, please indicate your interest on the exam application form. No fee will be charged. Preference will be given to Associates taking tuning exams in Albuquerque. Again, requests will be granted in the order we receive applications.

Listen to master tuned pianos

The three master-tuned exam pianos will be available for listening on Wednesday, July 19, from 9 a.m. to 5 p.m. (unless exams are underway or master tunings are not yet completed). No pre-registration or fees are required; just drop in at the CTC exam office on the third floor, and we'll let you know what's available.

Paean to participation

The five full-time examiners will spend the entire convention — all day every day — administering exams. Other CTEs and RPTs will contribute many hours assisting.

You might ask, "Why work so hard? Are they totally nuts?" No. "Then why give up so much class time?" Because they believe the RPT exams are vitally important and deserve their active support. Without such commitment PTG could not exist.

So if you're in Albuquerque and you see someone walk by wearing a black badge that says "Examiner," stop 'em and say thanks. You'll get a big smile in return.

ETS's bylaws proposal

This month's Update section contains proposed bylaws that your chapter's Council delegate will be voting on in Albuquerque. One of the proposals is from the Examinations and Test Standards Committee.

ETS proposes switching the order of sections within the electronic tuning exam. Presently, the order is electronic followed by aural. We propose to switch it to aural followed by electronic.

There's an explanation accompanying our proposal elsewhere in the Journal. Because this is an important issue that affects us all, we'd like to briefly discuss it here, too.

Here's our proposed new bylaw in its entirety. The underlined text is the proposed new language.

Replace Article V, Section 3, parts a and b with the following:

Article V - The RPT Exams

Section A - Requirements for Passing the RPT Exams

3. ...

a. A candidate who will use a visual tuning instrument for the main part of the exam must first tune octaves 3 and 4 aurally only and score at least 80% in pitch, temperament, and midrange. In the event said candidate does not pass one or more of these sections, the CTE-in-charge shall have discretion in permitting the examinee to complete the exam.

b. A candidate who passes all except the aural tuning of octaves 3 and 4 may repeat that portion of the exam one time within one year of the original exam provided that one-half the tuning fee is paid. After one year from the date of the original exam, the entire exam must be repeated at full fee.

Proposal to go into effect on January 1, 1996

ETS is proposing this change for many reasons.

1. We want to encourage all examinees to practice their aural skills. Too many ETD examinees arrive at the exam aurally unprepared. Placing the aural section first will grab their attention and remind them that the electronic tuning exam requires aural tuning ability.

2. We want to provide ETD examinees with a fair opportunity to show their aural abilities. If the aural section is attempted first, when energy and ears are freshest, ETD examinees will be in the same boat as aural-only examinees.

3. We want to increase exam efficiency. Years ago when this bylaw was originally adopted, ETDs were not as advanced as they are today. Back then it made sense to ensure that ETD examinees knew how to operate their machines. Today it's virtually unheard of for an ETD examinee to fail the electronic portion. However, it's all too common for them to fail the aural portion. Our proposal will enable both Associate and the examiners to learn whether an Associate will pass relatively soon, allowing more exams to be given on a given day or for everyone to go home early.

4. We want to minimize the emotional letdown of unsuccessful ETD examinees. Under present procedures, an ETD examinee's expectations are raised way up when receiving electronic scores — often in the high 90s — only to be dashed if they receive low scores in the aural portion. Switching the order, to aural followed by electronic, might smooth out this emotional roller coaster and reduce the antagonism felt by unsuccessful ETD examinees toward the exam's aural requirement.

5. We want to take maximum advantage of the convergence of examinee and examiner. Time now spent on the electronic portion could be put to better use. It's up to the CTE-in-charge, but the aurally-unsuccessful examinee might be better off with a targeted tuning lesson. The Associate's disappointment would then be replaced with motivation and optimism. This will tend to increase the examinee's chance of success on the next attempt.

6. We want to plant a flag on the philosophical high ground. Our proposal reinforces a point made repeatedly in this column and by many of PTG's most well-respected doyens: piano tuning is primarily an aural profession and electronic tuning is an offshoot of aural tuning.

ETS urges you to read our proposal's fuller explanation elsewhere in this issue, and to discuss it with your fellow chapter members. We believe you and your Council delegate will agree that our proposed bylaws change will benefit all of PTG and should be adopted at the Council session in Albuquerque.

NEXT MONTH

In the June Movin' On Up: a happy tale of how pre-screening helped an Associate pass his RPT exams.

EXAMINATIONS & TEST STANDARDS COMMITTEE

Presenting Programs to Teachers: A Personal Perspective

By Monica Hern, RPT
Teacher Relations Committee Chairman

Beginning my new career as a Registered Tuner-Technician — now Registered Piano Technician — in 1988, I was faced with marketing my new skills and establishing a new business. The most logical approach was to build on my previous experience and skills as a teacher. I had been a special education teacher for 17 years and had taught piano for 10 years.

After reading an article by Bob Russell *(Piano Technicians Journal*, February 1987, page 12), I developed a simple outline — described in the updated PTG handbook, Presenting Programs to Teachers — and wrote letters to several music teachers in private and public schools in my area offering to do a program for their students during Music in Our Schools Month.

One of my program presentations in a private school resulted in the classroom teacher securing permission from the headmaster to have me professionally clean the piano. The teacher was appalled by the dust and other debris inside the classroom piano when I opened it up to show the students. Today that school remains one of my best accounts. The headmaster asked me to recommend and carry out a schedule of tuning and maintenance for 12 of their pianos, including a Steinway D in the theater building.

For most of my piano technology programs I do not charge a fee. I present the program as a "public service" in exchange for passing out piano information brochures with my name and phone number on them. I still receive calls from parents of students who participated in piano technology programs I have done in the past.

Twice I have presented piano technology programs as a paid clinician — once for a Suzuki Regional Seminar at the University of Memphis, and once for the Keyboard Division meeting of our local association of the Southern Baptist Convention. I was paid for my teaching time and also gained many new customers from these events.

I continue to present piano technology programs for a variety of audiences. These include children, teens, teachers alone, parents of piano students, and church musicians. However, my focus is no longer building a new business but forging a better business. I still consider my teaching programs to be a public service. This service helps the piano-playing community to be better informed. Informed pianists are better customers. They exercise greater wisdom in purchasing and are more responsible in the tuning and maintenance of their instruments. That automatically contributes to my business!

When I developed my marketing strategies centered around teachers and students we did not have the Presenting Programs to Teachers handbook. The 1989 handbook became an invaluable resource for me. It provided realistic, practical suggestions for developing specific topics to fit different target audiences, insights into developing positive rapport with teachers, lists of available resources and more.

The updated 1994 handbook is even better. Many of our colleagues across the country have contributed valuable insights, suggestions and experience that are included in the handbook. There is even a section on how to set up a booth at a local, state or national teachers' convention to help your chapter successfully market PTG.

I recommend that you get your copy of the new 1994 edition of Presenting Programs to Teachers free from the Home Office today!

Photo by Douglas Parsons, Fort Worth vice president

Fort Worth Chapter President David Reed gives a program on restringing, followed by a lively discussion on rebuilding by many of the chapter members.

Passages

Reclassifications To RPT

REGION 1

061 OTTAWA, ON

DICK PAPALIA
1412 BANK STREET
OTTAWA, ON K1H 7Y9
CANADA

078 NEW JERSEY

STEVEN J. CARMODY
79 COTTAGE PLACE
WESTWOOD, NJ 07675

REGION 5

501 CENTRAL IOWA

SEONG Z. JO
4701 STONE AVENUE,
APT. C-1
SIOUX CITY, IA 51106-1992

REGION 7

841 SALT LAKE CITY, UT

DONALD J. FINDLAY
3977 W. ELWOOD WAY
WEST JORDAN, UT 84088

Paul A.U. Lawrence, 85, died Dec. 18, 1994. A long-time member of the Bluegrass Chapter of the Piano Technicians Guild, Paul serviced pianos in central Kentucky for 55 years. During many of his years as a Guild member, he served as chapter president and helped many young members learn about the trade. When Paul retired from tuning he became a Donovan Scholar at the University of Kentucky where he pursued his lifelong interest in art and gave private lessons in piano tuning. He played violin in the Senior Citizens Orchestra until just a few years ago, when arthritis prevented his continuing.

Paul was born in Maybeury, W.Va., April 1, 1909. While growing up, he helped with the family store there. Eventually he made his way to Kentucky where he graduated from Asbury College in 1931, majoring in music, French and art. In 1933 he married Wilma Russell. They had almost 60 wonderful years together. Wilma preceded him in death June 29, 1993, after a long and courageous battle with Parkinson's Disease. In 1935 they had twin daughters, Wilmetta June and Pauline Joan. June preceded her parents in death in 1991. Joan resides at 8616 Pratt Drive, New Port Richey, Fla., with her husband, Dan Greer. Other survivors include his sister, Ruth Lawrence, Bluefield, Va., four grandchildren and two great-grandchildren.

Paul A.U. Lawrence
April 1, 1909
December 18, 1994

Here in our Bluegrass Chapter, we all recall the Christmas gatherings with Paul's violin bowing a sacred "Silent Night." We miss his always kind words and never-exhausted supply of technical tips. We think of the bright pink tie he wore like the morning sunshine. We especially remember Paul for his love of wit and humor. He was encouraged by kinfolk, business associates and friends to save these treasures, which he did in his retirement with the publication,"Just Darling." These stories became such a hit at his retirement village that the Resident Council meeting would customarily end with one of his anecdotal tales, such as: "What would you take? . . .

"I was tuning a piano in a doctor's home when I noticed his little red-headed son there close beside me. I could sense that he wanted to say something, so I paused in my work and asked if he wanted something. He spoke just above a whisper, as if afraid his mother out in the kitchen might hear, 'Say, Mister, what would you take to fix the piano so it won't play at all?'"

Ben Griffith, RPT
Bluegrass chapter President

In Memory . . .

March 1995

CORNELIUS GRIFFIN, RPT
NORTHWEST FLORIDA

New Members In March

REGION 1

021 *BOSTON, MA*

RONALD E. ERICKSON
37 WESTBROOK ROAD
WORCESTER, MA 01602

PETER R. PLACE
1350 NARRAGANSETT BLV.
CRANSTON, RI 02905

BARRY L. ROSENBERG
17 NORCROSS STREET
ARLINGTON, MA 02174

054 *VERMONT*

WILLIAM R. DOWDALL
543 WINCHESTER PLACE
COLCHESTER, VT 05446

061 *OTTAWA, ON*

PIERRE J. LEBLANC
1708 SANSONNET STREET
ORLEANS ON K1C 5Z4
CANADA

064 *CONNECTICUT*

DAVID C. NORCK
126 HIGHLAND AVENUE
WINDSOR, CT 06095-4244

101 *NEW YORK CITY*

DANIEL T. FRANKLIN
181 AVENUE B, #1
NEW YORK, NY 10009

111 *LONG ISLAND-NASSAU, NY*

BOB C. ROBERTS
1724 WILLIS AVENUE
MERRICK, NY 11566

144 *ROCHESTER, NY*

CHRISTOPHER H. GLATTLY
174 GORHAM STREET
CANANDAIGUA, NY 14424

191 *PHILADELPHIA, PA*

KEVIN J. MCALLEY
893 SABINA CIRCLE
BEAR, DE 19701

NICHOLAS F. NATALE
26 OLD FENCE LANE
NEWARK, DE 19702

JAMES A. SIVEL
P. O. BOX 284
RICHLANDTOWN, PA 18955

REGION 2

223 *NORTHERN VIRGINIA*

STEVE T. GEORGE
14307 N. FALLBROOK LN.
WOODBRIDGE ,VA 22193

WILLIAM F. KUGEL
1801 CRYSTAL DR. #302
ARLINGTON, VA 22202

233 *HAMPTON ROADS, VA*

WILLIAM C. STEWART
9451 GRANBY STREET
NORFOLK, VA 23503

296 *WESTERN CAROLINAS, NC*

KEITH C. FREEBURG
RT. 2, BOX 105
FLAT ROCK, NC 28731

322 *NORTHEAST FLORIDA*

JASON R. HILTON
3421 INWOOD CIRCLE, E.
JACKSONVILLE, FL 32207

REGION 3

708 *BATON ROUGE, LA*

MARIO IGREC
5341 HICKORY RIDGE BLV.
BATON ROUGE,LA 70817

761 *FORT WORTH, TX*

BARRY E. HADDER
6400 WRIGLEY WAY
FT. WORTH, TX 76133

771 *HOUSTON, TX*

LESLIE W. BARTLETT
16315 LALUNA
HOUSTON, TX 77083

782 *SAN ANTONIO, TX*

CHRISTOPHER D. LEE
P. O. BOX 680571
SAN ANTONIO, TX 78268

871 *NEW MEXICO*

JOHN R. MARKHAM
3109 ALHAMBRA
ROSWELL, NM 88201

REGION 4

489 *LANSING, MI*

NADIMAR G. RICHTER
2182 BARCLAY LANE
E. LANSING, MI 48823

612 *QUAD CITIES, IL*

RICHARD D. KRUGER
900 8TH AVENUE
FULTON, IL 61252

REGION 5

551 *MINNESOTA-N. IOWA*

SAMUEL C. CROSSER
405 ASH STREET
OSAGE, IA 50461

MARC H. EMMONS
250 21ST STREET, NW
OWATONNA, MN 55060

553 *TWIN CITIES, MN*

SCOTT C. AUGUSTSON
21461 BONNEVILLE ROAD
GRANTSBURG ,WI 54840

RICHARD L. KRAMLINGER
1741 MARY LANE
N. MANKATO, MN 56003

809 *COLORADO SPRINGS*

SANDRA J. DAMRON
420 S. CEDAR
COLORADO SPRINGS,
CO 80903

REGION 6

901 *LOS ANGELES, CA*

GEORGE Z. WANG
10201 MASON AVENUE
CHATSWORTH, CA 91311

926 *ORANGE COUNTY, CA*

ANDREW THOMAS
9850 GARFIELD AVE. #131
HUNTINGTON BEACH,
CA 92646-2451

REGION 7

013 *BC COAST AND INLAND, BC*

M. SCOTT HARKER
716 W. 22ND AVENUE
VANCOUVER BC V5Z 1Z7
CANADA

Toxic Turbo Tongue

Everyone is familiar with the poison pen letter, malicious words written by a person without the courage to sign it. The Toxic Turbo Tongue (TTT) is the worst.

This letter is about bashing. In particular, the bashing of one technician by another. This is always done behind the back of the technician who is being bashed. As you can tell by now, this letter will be candid and to the point.

There was a time when a disagreement, an insult or point of honor was settled face-to-face out behind the barn or some other appropriate place. Of course this took a fair amount of courage and commitment to one's convictions.

However, as time goes by, I see courage, honor, and the commitment to stand for — for all to see — what you believe is being replaced by the absence of courage, the absence of honor, and the absence of integrity; the profile of a basher.

Innuendoes and insinuations about another's character and reputation behind his or her back appears to be more and more the rule of the day by some in our society and, regrettably, in our profession.

I have asked many technicians why. Why do these persons do such a despicable thing as a normal way of doing business?

Some of the answers:

They have terminal ego problems.

They have major character flaws.

They have monumental inferiority complexes.

They are self-appointed gods or goddesses, and nobody notices or cares.

They search for recognition without earning it.

They suffer from a deep-seated feeling of inadequacy.

When the TTT is activated and begins to wag, the poison dribbles from the mouth, over the chin and onto the basher's chest. There it leaves a stain for all honorable technicians to see.

This is not to say that there are those of us who are perfect. This in not to say that there are those of us who can lay claim to perfection. This is not to say that we all haven't been guilty, on some level, of bashing at one time or another in our lives.

This is to say that the basher, who makes a practice of this despicable act, who casts aspersions on other technicians, is disgraceful and a blight on our profession.

The basher uses such phrases as: "This is poor work, but you get what you pay for," or "Who repaired this piano? It still needs a lot of work," or "I have been trained by the exalted one," or "I went into the desert, placed my hand on a rock and anointed myself with supreme knowledge, so therefore, only I can save your piano," etc., etc., etc.

Does this sound familiar to any of you technicians who are out there trying to make a living in an honorable fashion, who are trying to live and let live, who are trying to improve your skills and, perhaps, be a positive instead of a negative force in your profession. If so, just maybe it's time to speak up, to identify the bashers, and call them to task for their violations of common decency, common courtesy and common sense.

We are all in the same boat, whether you, the basher, like it or not. So wise up, shape up, curb your toxic tongue and take a large bite of humble pie. Because you, my friend, may be a legend in you own eyes, but everyone knows what you really are. No one is an island.

At a time when so many of us are working so hard to enhance and promote this profession, the basher is doing more to destroying it than the ill-trained, and those who say, "I don't care," and "I just want to make a fast buck."

If I have offended anyone, other than the bashers, I wish to apologize. As you may have guessed by now, I am fed up with the prima donnas and their dime store halos.

Perhaps "behind the barn or some other appropriate place" is the place to confront this problem. I am not a stranger to these places. Who knows? I may even win one some day.

Innuendoes, connotation, insinuation, affront, aspersion, snide, insulting, sarcastic, derogatory, disparaging and malicious comments have no place in our profession.

Jack Wyatt, RPT,
Chairman, Trade Relations Committee

EVENTS CALENDAR

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.

May 12 - 13
Utah Intermountain Seminar
Snowbird Ski & Summer Resort
Salt Lake City, UT
Contact: Dennis Fife
70 So. Orchard Drive
North Salt Lake, UT 84054
801-292-4441

July 19 - 23
PTG 38th Annual Convention
& Technical Institute
Hyatt Regency / Albuquerque, NM
Contact: PTG Home Office
816-753-7747

September 5
POMONA VALLEY ANNUAL SEMINAR
Location: Unknown at this time
Contact: John Voss
2616 Mill Creek Rd.
Mentone, CA 92359
909-794-1559

October 5 - 8
NEW YORK STATE—NYSCON
Howard Johnson Plaza Hotel
Oakville, ON CANADA
Contact: John Lillico
605-200 Queen Mary Drive
Oakville, ON L6K 3L1
800-469-7266

October 12-16
TEXAS STATE ASSOCIATION SEMINAR
Clarion Hotel
Richardson, Texas
Contact: Thom Tomko
114 S. Greenstone Lane
Duncanville, TX 75116
214-780-0143

October 19-21
CENTRAL EAST REGIONAL SEMINAR
Mariott Hotel
Brookfield, WI
Contact: Dave Hulbert
4760 N. 158th St.
Brookfield, WI 53005
414-781-6343

AUXILIARY
E X C H A N G E

Dedicated To Auxiliary News and Interests

And The Winners Are . . .

***Michelle Yip**, College Division, a first year student at the University of New Mexico. She is the only child of Ronald and Susie Yip, and was born in Albuquerque, New Mexico.*
Michelle began piano lessons at the age of seven. Her teachers included Marian Henry and Meribeth Gunning. She is currently studying with Dr. Myung-Hee Chung at the University of New Mexico.

Michelle has entered several competitions. In October of 1990, she won the NMMTA Central District Honors Competition. In November of 1993, she received first place in the state division of the NMMTA High School Yamaha Piano Competition. Also, in November 1994, she won the state division of the NMMTA Wurlitzer Collegiate Artist Competition. Besides piano, Michelle enjoys reading and singing as a hobby. She is an active church member and loves to spend time with her family.

***Matthew Hahn**, Senior Division, age 17, is one of three sons of Sangkoo and Soonja Hahn of Los Alamos, New Mexico.*
He started playing piano at the age of five under the tutelage of his mother. He has competed in numerous competitions in New Mexico, including the NMMTA Honors Competition, the Yamaha Competition, the Baldwin Competition, the University of New Mexico High School Competition, and the New Mexico Symphony Young Artist's Competition, taking top honors in all of them.

This last year he competed in the Yamaha Competition, taking first place and was sent to Las Vegas to compete in the divisional competition. Besides spending time on the piano, Matthew is an accomplished violinist. He has been a member of the New Mexico All-State Symphonic Orchestra all four of his high school years, and this last year was second chair in the first violin section. Matthew is also valedictorian of his school with a GPA of 4.31. He plans to attend a competitive university and major in a science field so that later he may enter medical school. Matthew has been accepted at Yale University, although he is not certain where he wants to attend. In addition to school and music, Matthew has spent time in Boy Scouts, achieving the rank of Eagle Scout. He also enjoys being around his friends, hiking, playing tennis, soccer, and basketball.

The Auxiliary is proud to have played a small part in the lives of these two talented and accomplished young people. This is what our Scholarship is all about. You will be able to hear what your contributions have brought about, as Michelle has accepted our invitation to play for the Auxiliary Tea/Reception Thursday, July 20, and the Baldwin Recital Thursday evening at 7:30. Matthew is in the process of arranging his schedule to also accept our invitation and is confident this can be done.

Ginger Bryant,
Chairman Scholarship Committee

PTGA Grant Funds Russian Study

The following is a brief summary of how I used my grant from the Piano Technicians Guild Foundation to further my study of Russian music.

In May 1994 I began to work on a program of Russian piano music which culminated in a recital on Oct. 28, 1994. I received help from Faina Bryanskaya of Boston, and Adelina Krivosheina of Delmar, N.Y., in the preparation of this program.

Because I wanted to share my knowledge of Russian music with my students, I began to look at Russian piano literature that would be appropriate for their level. With the help of Faina Bryanskaya, I compiled a list of the best repertoire and assigned it to my students. Much of this music was performed in a student recital on Feb. 12, 1995.

I am grateful to the Piano Technicians Guild Foundation for making this grant possible to me through MTNA. The year's study has been a very positive experience and has led to a new project for me in studying Russian teachings techniques with Faina Bryanskaya.

Thank you again for giving me this award.

Rhonda Ballou

Members Nominated For Election

As chairman of the Auxiliary Nominating Committee, I wish to present the following members for 1995-1996 officers:

President . . . . .L. Paul Cook
Vice President . . . . Carolyn Sander
Recording Secretary . . . . Shirley Erbsmehl
Corresponding Secretary . . . . .Judy Rose White
Treasurer . . . . Sue Speir
with Immediate Past President . . . . .Phyllis Tremper

These officers will be voted on during the council meeting in Albuquerque, N.M.

Nancy Strouss, chairman, Patsy Escobar and Christine Monroe comprised the nominating committee.

Nancy Strouss

A Tuner . . . A Mother ?

In response to being asked to write about the topic of "Mother" for the PTGA page, I was struck by the analogies that could be made between a tuner/technician and a mother:

As a tuner/technician cleans a piano . . . a mother bathes a child,

As a tuner/technician polishes a case . . . a mother clothes a child,

As a tuner/technician sets a temperament . . . a mother gives goals and values to a child

As a tuner/technician tunes a piano . . . a mother educates a child.

As a tuner/technician voices a piano . . . a mother tones her child with manners,

As a tuner/technician regulates and adjusts a piano . . . a mother re-teaches,

As a tuner/technician repairs a piano . . . a mother nurses the physical ills of her child,

As a tuner/technician re-conditions a piano . . . a mother reinforces self-esteem,

As a tuner/technician prepares the piano for the artist's performance . . . a mother prepares the child for the symphony called life.

Judy Rose White

Members of the Pennsylvania State Conference convene for their Midyear Board Meeting. First row, from left: Keith Bowman, RPT, Immediate Past Chairman; Chuck Erbsmehl, RPT, Northeast RVP; Earl Orcutt, RPT, President; Barri Hartmann, Vice President; Susan Yacina, Convention Assistant; Howard Yepson, RPT, Host Chapter President. Second row, from left: Shirlie Felton, Auxiliary; Barbara Yepson, Auxiliary; Hilbert Felton, RPT; Jim Bittinger, RPT; Mary Zoshak, Treasurer; Celia Bittinger, Auxiliary; Sharla Kistler, RPT, Secretary; Ruth Brown, RPT. Third row, from left: Richard Bittinger, RPT; Mike Carraher, RPT, Testing Chairman. The Pocono Northeast PA Chapter is the Host Chapter for the next convention, which will be March 30 - April 2, 1995, at the Ramada Inn in Wilkes-Barre.

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DISPLAY AD INDEX

PianoDiscussions™

May 1995

News From The World of PianoDisc

QuietTime™

Electrifies world ... and pianos!

PianoDisc recently unveiled its newest product, QuietTime, to the international music market at MusikMesse '95 in Frankfurt, Germany. QuietTime is the new stand-alone retrofit product that can mute a piano 100 percent. Like the PDS 128, QuietTime can be installed on virtually any piano, grand or vertical. It is completely compatible with the PianoDisc system, but can be used independently.

"International dealers were impressed with the obvious benefits of QuietTime," says PianoDisc Vice President/Marketing Tom Lagomarsino. "With QuietTime, you can play, compose or practice on your piano with no sound other than what you hear through the headphones. Anyone else in the room is undisturbed."

An option that was especially well received was the internal tone generator, which can change a piano performance into other sounds (like harpsichord or organ) or special effects (like Chorus, Reverb and Pan) and key ranges (transposition). With the keyboard interface and tone generator connected to any external MIDI device, it's possible to orchestrate, create sheet music, even lay down drum tracks. In fact, the possibilities are endless.

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QuietTime will be available in the summer of 1995.

PianoDisc Installation Training 1995

- May 9-13
- June 20-24
- July None
- August 8-12
- Sept. 12-16
- Oct. 17-21

Continuing Education Series 1995

- May 4-5
- June 15-16

Tuition for the installation and Continuing Education seminars is **free**, but a $50.00 refundable deposit is required for confirmation. The PianoDisc Continuing Education Series seminars are restricted to PianoDisc certified technicians in good standing. For more information about attending a PianoDisc Installation Training seminar or a Continuing Education seminar, call PianoDisc during our office hours (see below).

PianoDisc
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Sacramento, CA 95834
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Fax: (916) 567-1941

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(916) 567-9999

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PianoCD on line

After its smashing debut at Winter NAMM, PianoCD has been the product everyone has been waiting for. Now the wait is over, and PianoCD is ready. PianoDisc's newest development in player piano technology, PianoCD uses a standard compact disc as the recording medium. The data that drives the piano is stored in one channel of a CD, while accompanying music is recorded on the other channel. The PianoCD then reconstitutes the stereo separation within the control box. PianoCD is the only CD-based system that can do this.

Other appealing features unique to PianoCD include full individual note expression, and advanced and synchronized volume control. The PianoCD music library has been launched with 60 exciting CDs which sample every musical genre and include recordings by Grammy winner Peter Nero and country music legend, Floyd Cramer.

For more information about PianoCD, call 1-800-566-DISC.

Music library: bigger and better than ever

PianoDisc's music library is growing by leaps and bounds. Now over 120 disks strong, with many more in various stages of production, our library can best be described as being in a vigorous growth mode. Many dealers have commented that the size, variety and quality of our disk library has made it a compelling reason their customers decide to buy PianoDisc instead of the competition.

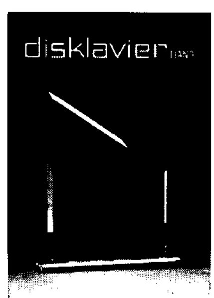
Of particular interest is our ever expanding Artist Series. With outstanding disks by pianists such as Peter Nero, Floyd Cramer and Jessica Williams already available, the series is getting a lot of attention from customers and dealers alike. Soon to be released are a history making diskette by jazz great Dick Hyman, and a unique and stylish offering from the incomparable Steve Allen.

Also noteworthy are three new additions to the synthesized or Symphony disk category. Outstanding pianist and arranger Tom Macfarlane has recorded three new classical disks. Works by Strauss, Brahms, Liszt, Mozart, Schumann and Grieg are performed in dazzling fashion with full orchestration.

Our dynamic music library is one more convincing reason PianoDisc is the best value for the money on the market today.

1994 KEYBOARD PRODUCT OF THE YEAR

Dealers have chosen the Yamaha Disklavier Piano as "Keyboard Product of the Year." It just goes to show that great craftsmanship, great technology, great dealers and great salespeople can make things happen.



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