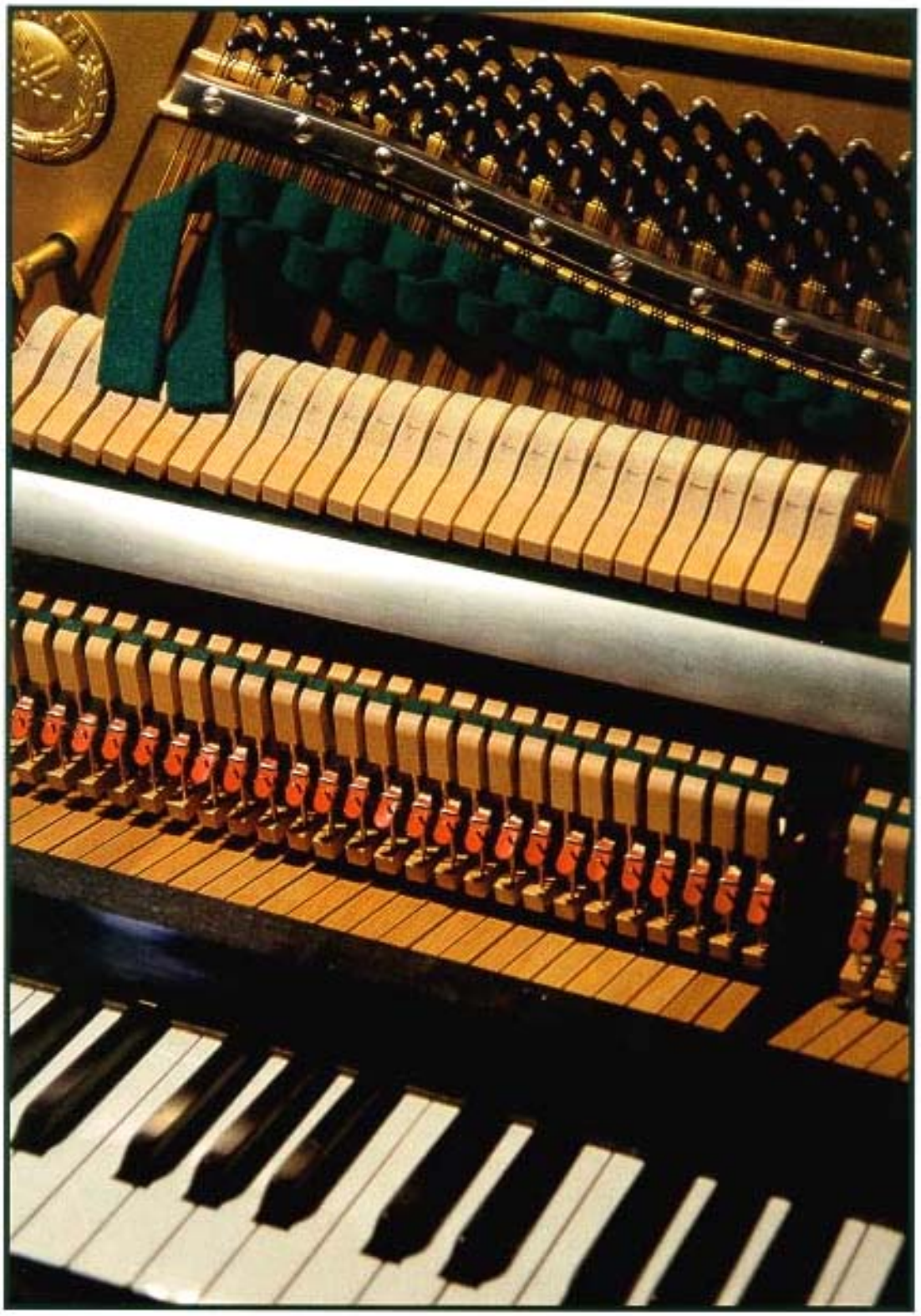
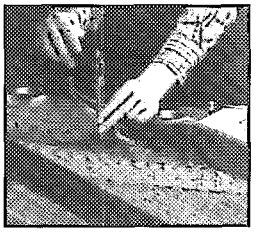
PIANO TECHNICIANS
Journal
Official Publication of the Piano Technicians Guild

March 1996 Vol. 39 • #3

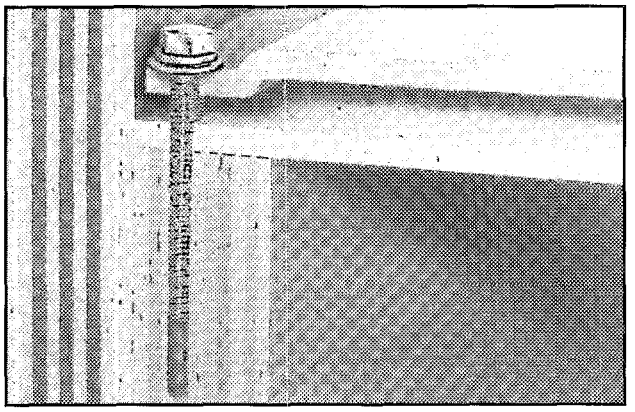


The Baldwin Piano

You can see why it sounds better.



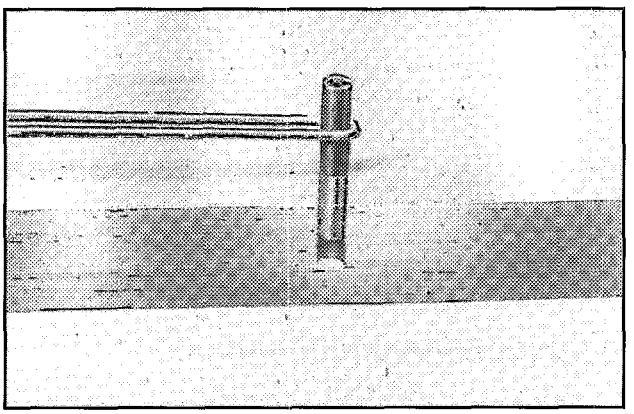
The precise setting of downbearing is critical for good piano tone. Too much bearing inhibits tone because the soundboard cannot vibrate freely, while too little bearing does not provide good sound transmission. From our research we have developed a unique method of setting downbearing with a degree of accuracy previously considered impossible.



Advantage #1

Grand Plate Mounting System

Each mounting hole around the perimeter of the plate is threaded to accept a hardened steel bolt. This allows the plate to be set at the optimum height for bearing on the front side of the bridge.



Advantage #2

Accu-Just™ Hitch Pin

Because this patented pin is installed vertically instead of at an angle, it is possible to raise or lower each string individually for ideal bearing on the backside of the bridge.

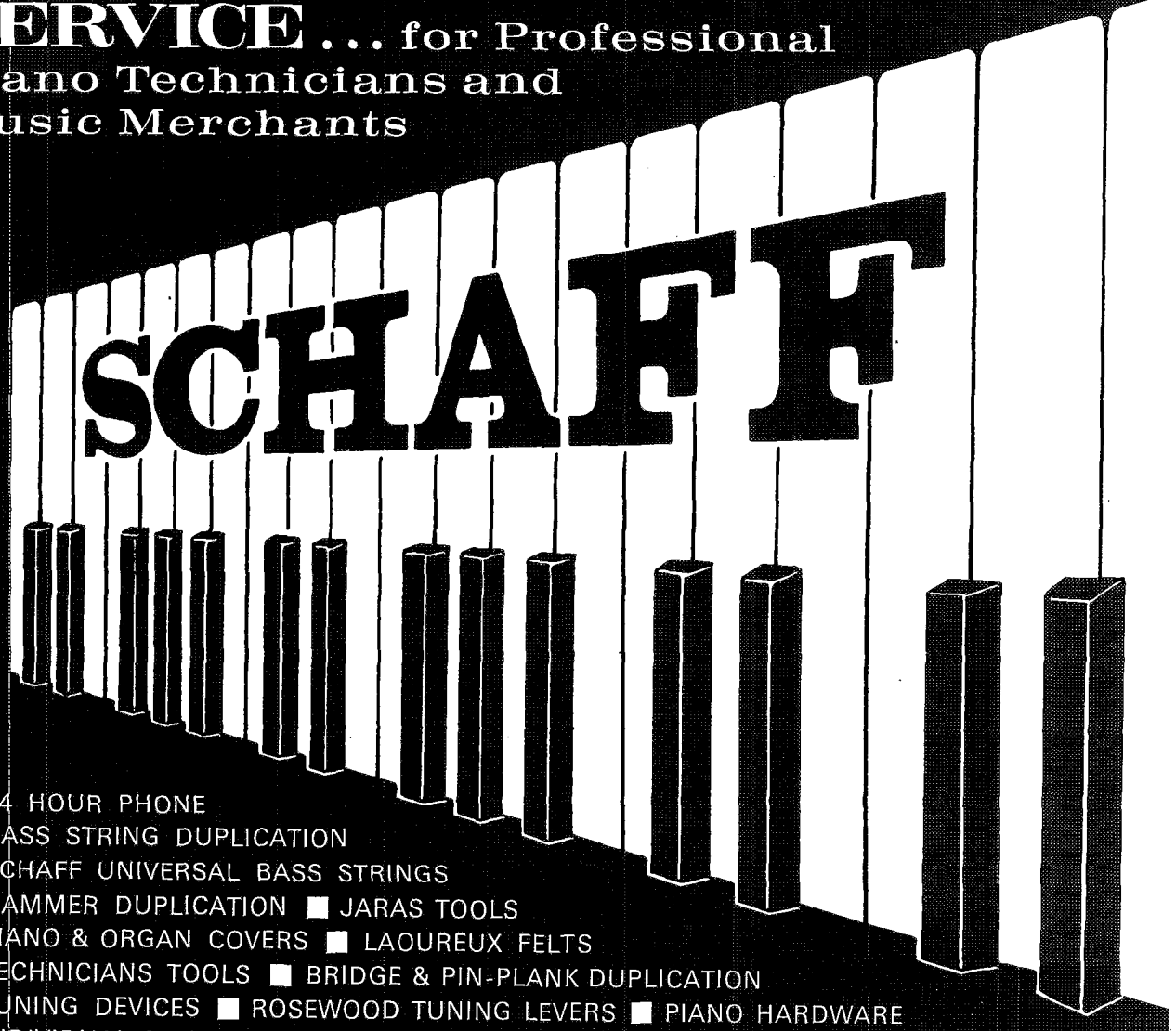
These are two important advantages for technicians.

If major soundboard or bridge work is ever needed, it is possible to remove the plate, pinblock, strings and tuning pins as a unit. Simply lower the tension, remove plate bolts and dampers and pull it out. Minor adjustments in bearing can be made without unstringing the piano or lowering the tension.

To make this procedure even easier Baldwin loans technicians special bearing-setting equipment. Whether restringing a section or an entire piano just call Baldwin Technical Services at 800-876-2976.

Innovations in piano technology **Baldwin**

THE HOUSE DEDICATED TO SERVICE ... for Professional Piano Technicians and Music Merchants



- 24 HOUR PHONE
- BASS STRING DUPLICATION
- SCHAFF UNIVERSAL BASS STRINGS
- HAMMER DUPLICATION ■ JARAS TOOLS
- PIANO & ORGAN COVERS ■ LAOUREUX FELTS
- TECHNICIANS TOOLS ■ BRIDGE & PIN-PLANK DUPLICATION
- TUNING DEVICES ■ ROSEWOOD TUNING LEVERS ■ PIANO HARDWARE
- INDIVIDUAL MOLDED KEY-TOPS ■ KEY RECOVERING ■ ACTION PARTS
- TUNING PINS ■ REFINISHING SUPPLIES ■ DAMPP CHASERS
- QUALITY QUEEN BENCH CUSHIONS ■ PLAYER PIANO STOOLS
- ARTISTS' BENCHES ■ PLAYER PIANO SUPPLIES ■ TECHNICAL BOOKS
- FAULTLESS CASTERS ■ GUARDSMAN POLISH ■ MOVERS EQUIPMENT
- AEROSOLS, LUBRICANTS AND ADHESIVES ■ DREMEL MOTO-TOOLS
- MUSICAL GIFTS ■ LAMPS ■ GIFT JEWELRY ■ TECHNICIAN CASES

- NEW WITTNER AND FRANZ METRONOMES ■ RHODES ELECTRONIC PIANO PARTS
- "PERFORMER" BENCH CUSHIONS ■ PIANO BENCHES ■ ROLL-OR-KARI TRUCKS
- CLAW FOOT PIANO STOOLS ■ DELIGNT PIN BLOCKS ■ GENCK TECHNICIAN CASE
- YAMAHA PARTS AND TOOLS ■ PIANOCORDER PARTS ■ PORTABLE TRUCK RAMPS
- KONIG POLYESTER REPAIR KIT ■ ESCALERA POWERED HAND TRUCKS

Schaff

PIANO SUPPLY COMPANY
451 OAKWOOD ROAD,
LAKE ZURICH, IL 60047-1516

24 Hour Hot-Line
Reg. (847) 438-4556
T-Free (800) 747-4266
Fax (847) 438-4615

PIANO TECHNICIANS
Journal
Official Publication of Piano Technicians Guild

Larry Goldsmith
Publisher/Executive Director

Steve Brady, RPT
Editor

Chris Trivelas, RPT
Dan Levitan, RPT
Del Fandrich, RPT
Contributing Editors

Joe Zeman
Director of Communications

Sandy Essary
Director of Member Services

Jerri Dowdy
Assistant to the Executive Director

Catherine Wilane
Director of Finance

Midge Sheldon
Advertising

Home Office
Phone: 816-753-7747
FAX: 816-531-0070

Editorial
Piano Technicians Journal welcomes unsolicited materials, photographs and ideas from our readers. Please submit by mail or FAX. MicrosoftWord 5.1-Macintosh format preferred. We'll acknowledge all submissions and return those we can't publish. DEADLINE: No less than 45 days before publication date (i.e., September 15 for November issue) Send materials and letters to: *Piano Technicians Journal*, Managing Editor, 3930 Washington, Kansas City, MO 64111-2963.

Subscriptions
Annual subscription rates: $85 (US)/1 year; $155 (US)/2 years; Single copies: Current year/$10; 1 year/$5; back copies/$2 if available. Piano Technicians Guild members receive the *Journal* for $45 per year as part of their membership dues.

Address Changes/Subscription Problems
Send or FAX a description of the problem and your current address to: Subscriptions, 3930 Washington, Kansas City, MO 64111-2963 or call between 8:30-5 p.m. CST—Monday-Friday.

 The Piano Technicians Journal (ISSN 0031 9562) is the official publication of The Piano Technicians Guild, Inc., 3930 Washington, Kansas City, MO 64111-2963. The *Journal* is published monthly. Second class postage paid at Kansas City, MO and at additional mailing offices, US ISSN 0031 9562 foreign and domestic.
POSTMASTER: please send address changes to: *Piano Technicians Journal*, 3930 Washington, Kansas City, MO 64111-2963.

Editorial Perspective

The Cruelest Month

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

"April," wrote T.S. Eliot, "is the cruelest month." Quite unintentionally, and some 70 years ahead of his time, Eliot thus expressed the frustrations of thousands of 1990s piano technicians. It is now March, and within a month many of us will face the specter of settling accounts for 1995 with our good Uncle Sam. This process will be harder for some than for others, but I daresay that few look forward to it. Taxes, in a variety of forms, now take a larger portion of our gross income than ever before.

Over the years I've watched as the percentage of my gross needed for taxes has grown steadily. Two decades ago there were years when, aided by the Investment Tax Credit, a much lower self-employment tax, a lower income tax rate, and bonus depreciation, I paid little or no income tax at all. In those days I didn't need to bother with estimated tax payments. With the "tax reform" of the 1980s, we saw many of our favorite legal tax-avoidance techniques evaporate. The self-employment tax imposed now is large enough to be a very significant part of our total tax bill. Although conditions vary from one municipality to another, most of us also pay some sort of business and occupation tax to the state, and an annual business license tax to whatever city we live and work in.

Today, I need to set aside fully a third of my gross just to keep within "striking distance" when April 15th rolls around. It seems that even though I do this, I still find myself scheduling large rebuilding jobs to coincide with the tax deadline so I'll have enough cash to make up the difference. But wait! There's more! Not only are Federal tax returns for the previous year due in April; we're also expected to make, in April, that first estimated tax payment for the current year. As if that weren't enough, I need to pay first-quarter state B & O taxes and collected sales taxes by the end of April as well.

Maybe all this doesn't bother you as much as it does me, but I frequently find myself asking: why is the small business person seemingly penalized beyond all reason simply for choosing to be self-employed? How can we win in a game where the deck appears to stacked in favor of big business and those who choose to work for big businesses? As usual, there are no easy answers, but I have a few suggestions to make.

First, we need to be active in lobbying our Senators and Representatives to consider the plight of the self-employed. I challenge each of you to find out the name and phone number of your Senator and your Representative in Congress, and to let them know it's time to ease up on sole-proprietor businesses.

Second, we need to make sure that our fees reflect the length and difficulty of our training, that they are commensurate with fees charged by other service professionals. Many of these other service professionals work for businesses which are set up to make a profit. Are we ensuring that our own businesses are profitable? Find out the hourly rate charged at your car dealer's service department, what hair stylists and massage therapists and pest control "technicians" charge per hour, and you'll soon find that there is a rough consensus on what kind of hourly rate is necessary to yield a profit. Remember, profit is what's left over after all expenses, including your own salary, are paid.

Finally, we need to manage our income and resources wisely, planning ahead realistically for the cruel month of April. This includes making sure that a

fixed percentage of your gross business income (probably around 30 percent to 40 percent, depending on your particular business and where you live) gets set aside, "off the top," for use in making tax payments. Planning ahead also includes getting good tax planning advice from a professional, or at least consulting books on the subject. To stay ahead financially in these times "taxes" our organizational abilities to the limit, requiring at least annual reassessment of strategies. I wish you all a successful tax return and a prosperous (and profitable) 1996.

■■■

I hope you have enjoyed, as I have, the return of Steve Fairchild to these pages after a long absence. As you can see, Steve has been generous enough to share with us the fruits of many years of labor on rescaling. In this month's article Steve presents us with a complete set of charts for plain-wire rescaling. We've placed this article in the center of the magazine to make it easy to remove for future reference.

FEATURES

14 — Editor's Roundtable — Key Repairs
Notable technicians serve up a hearty potpourri of tips and tricks of the trade.

18 — The Sweet Spot: Beyond Matched Frequencies In Unison Tuning
New Contributing Editor Chris Trivelas, RPT, looks for the "sweet spot" in tuning.

20 — Tuning Technique — Part II
Muting style, tuning order and procedure; Contributing Editor Dan Levitan, RPT, concludes his short series on tuning technique.

26 — The Fairchild Charts: A New Method for Plain-Wire Rescaling
Following his bass-string rescaling method in last month's Journal, *RPT Steve Fairchild presents his scaling charts for plain-wire strings.*

40 — Troubleshooting Piano Problems, Part 2
RPT Earnie Juhn looks at tuning stability problems, touchweight problems and more.

42 — Behold the Upright
Replacing hammers, shanks and butts is the topic in this installment of RPT Don Valley's series on vertical action rebuilding.

PACE
Professionals Advance through Continuing Education
LESSON PLAN

37 — PACE Lesson Plan
By Bill Spurlock, RPT
Technical Lesson #29 — Grand Regulation, Part 11. Adjusting Backcheck Angle & Checking Distance

COVER ART

The hows, whys and wherefores of this innovative muting method are described in RPT Dan Levitan's article on procedural technique beginning on Page 20. Photo by Sara Matthews.

COLUMNS & COMMENTS

2 — Editorial Perspective

The Cruelest Month

By Steve Brady, RPT

6 — President's Message

Strategic Planning — Now It's Your Turn

By Leon Speir, RPT

DEPARTMENTS

8 — Letters

Steinway Agraffe Replacement, and More Health Tips.

8 — Tips, Tools, & Techniques

A great carrying case for extra Dampp-Chaser rods, the inside story on the Davies lid prop, the great rubber band fix, and a ready source for splicing wire.

12 — Q & A

How do you re-attach a Steinway sostenuto monkey loop? What's the best way to store music wire in a humid climate?

IN ADDITION

44 — Grand Illusions

45 — PTG*Review*

Articles and information dedicated to the news, interests and organizational activities of the Piano Technicians Guild. This section highlights information that is especially important to PTG members. This month: Salesman(ship); At Twice the Price — Dearborn Is A Bargain; 1996 PTG Convention and Institute — Dearborn; Guthrie Goes the Distance; Industry News; N.C. Regional Conference; Quad Cities Piano Celebration; Visually Impaired Committee Report; PMAI Code of Ethics, new SPELLS Facilitator, and "A new Vision" video; and Reclassifications, New Members, Passages and Events.

55 — The Auxiliary Exchange

57 — Classified Advertisements

60 — Display Advertising Index

PIANO TECHNICIANS **Journal**

Volume 39 • Number 3 • March 1996

Strategic Planning — Now It's Your Turn

PTG President
Leon Speir, RPT

In meetings held in November and in January, the Board of Directors, Larry Goldsmith, and planning facilitator Cinda Rierson met to begin the long-range (strategic) planning process. Included with the *Journal* this month is a packet containing the results of the work accomplished thus far.

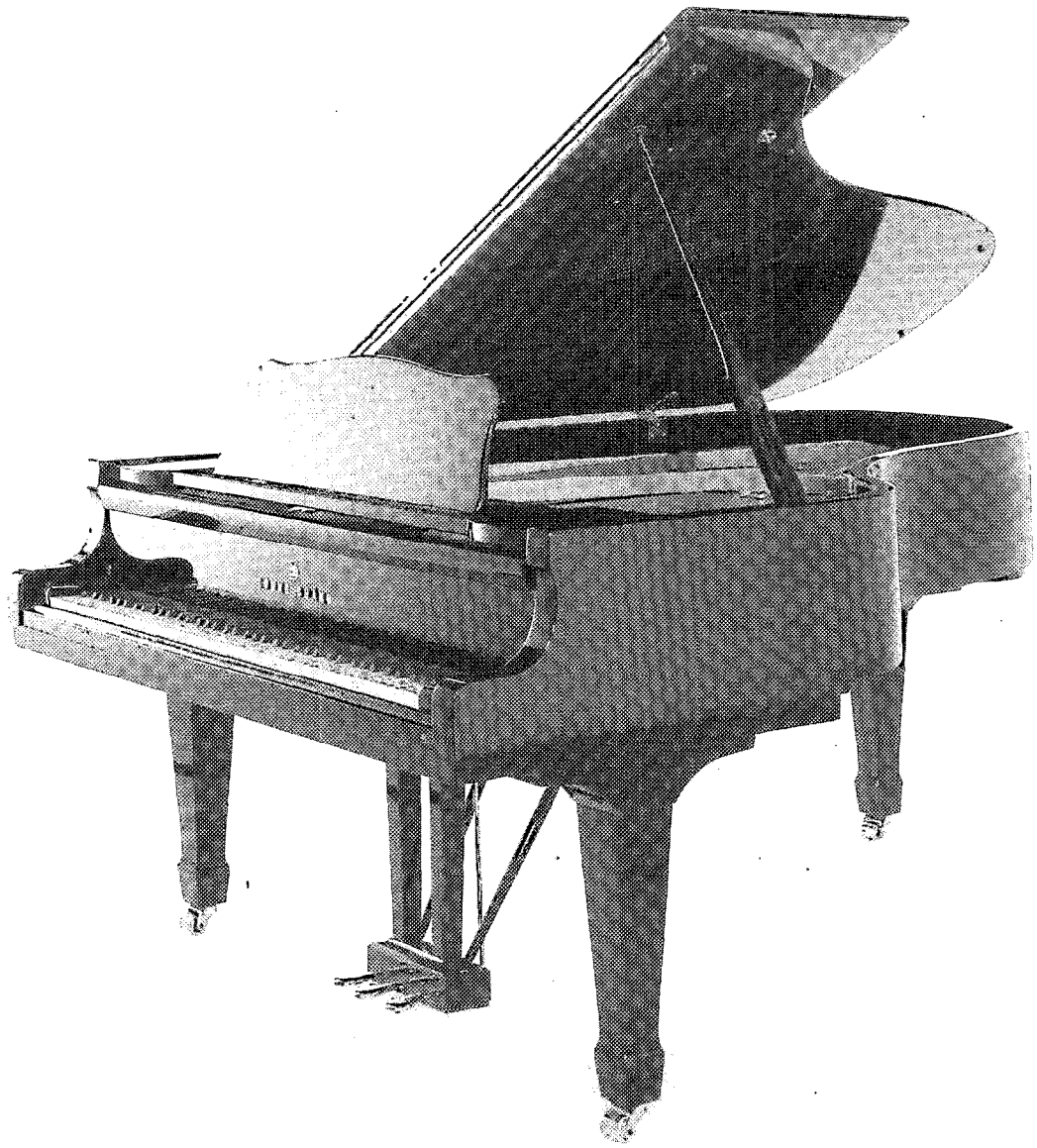
As you scan the information contained in the packet, you will better understand the enormous task to which we have committed. Planning for the future requires that we define our organization. Questions of: *"Who are we?"* and *"What is our purpose?"* must be clearly answered. This has never been easy for PTG since almost from our very beginning we have grappled with issues of education, marketing, membership categories, and rights of members. With this formal planning process PTG will provide a mechanism to address these questions in an organized and structured manner.

We have concluded the first phase of the planning process with the Strategic Plan proposal which is enclosed with this *Journal.* This proposal represents more than 600 hours of work by the Board and Larry, and many additional hours spent to compile the information. In the planning workshops we were asked to do some dreaming about what we wanted PTG to be in the year 2001. We were asked to complete the following: *"We have a dream, that in 2001..."* Using this exercise we identified six key points which are included in the enclosed material. These six points resulted in formulating three major strategic directions for the next three years: *1) toward providing more member benefits, 2) toward a more productive organization, and 3) toward a more professional organization.*

The conclusion of this first phase of the planning process brings us to the next step. This next step is for the entire membership to review the work done thus far by the Board. This report will then be presented to Council in the Agenda book so that the delegates will have an opportunity to evaluate the proposal and take action. Members working through their Council delegates will be ask to identify the Strategic Direction for the next five years. After Council makes its decision on the direction, the Board and the staff, with input from member groups, will draft specific plans to accomplish the direction Council has chosen. The 1997 Council will make the final decision on the specific plans.

This year the Board has worked very hard and has been very united in its determination to conclude its work and have this material available for Council to consider this year. We did it! Now the decision on the plan is up to you through your Council delegate.

Leon Speir



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

While many technicians consider Young Chang pianos highly evolved and refined instruments, we think of them as works in progress. Constantly seeking out innovations which elevate our instruments to perfection, we believe it's the only goal worth achieving.

Some of these innovations include a brass string bearing rod under the capo bar to smooth tuning and provide a longer-wearing, replaceable surface; an asymmetrically-crowned soundboard for richer tone and improved tuning stability; using spruce with a minimum of 12 annular grains in our soundboards; hand-planing our bridges after installation to ensure accurate downbearing (even in verticals); and designing a new grand action with lower mass, resulting in lower touchweight and improved control.

Our aspiration for perfection also extends to our service to technicians and customers. That's why we offer a 12-year full warranty on all pianos as well as a limited lifetime warranty on actions and case parts. We also maintain a staff of full-time service personnel and a full inventory of replacement parts to support you.

For additional technical information, call Philip Glenn at (310) 926-3200, ext. 237, or write to Young Chang America, 13336 Alondra Blvd., Cerritos, CA 90703-2245

YOUNG CHANG

The best the world has to offer.®

Tips, Tools & Techniques

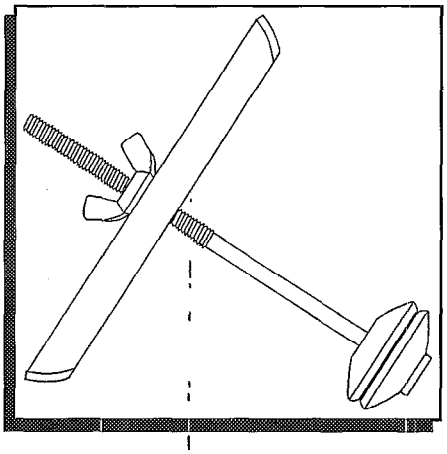
TT&T Carrying Case for Dampp-Chaser Rods

A molded plastic gun case is great for storing and transporting extra Dampp-Chaser heater rods. I got mine at L.L. Bean's for less than $20. It has a foam lining which can be cut as desired to accommodate cords, and it holds any length rod.

— Paul Rice, RPT

TT&T Davies Lid Prop

I was pleased to read Isaac Sadigursky's praise of my lid prop in the December 1995 issue of the *Journal.* This device solves a lot of long-standing problems for me. The big thing is that it won't break or slip out and let the lid fall on my head. That alone was a big step forward. But it's also easily adjustable and works quickly in virtually any vertical piano.



I thought perhaps I should submit a couple of pictures, an accurate drawing and some details of construction for the folks who like to make their own tools.

The prop stick is a piece of maple, measuring 3 3/4" X 7/8" X 5/16". Each end is angled and rounded a bit, then padded with leather.

The bolt is a 4 inch pedal prop. Its thin diameter is critical for slipping in through tight places. Note that under the head of the bolt I use three 1/2" lengths of 3/16" heat-shrink tubing, put on and shrunk successively one over another, to make a snug fit with the soundboard buttons. I don't suppose this is really necessary, but it's a nice touch.

It is very important to glue the soundboard buttons together with the grain running at right angles. This is the fail-

Continued on Page 10

Letters

Steinway Agraffe Replacement

I have restrung and replaced agraffes on several Steinway pianos and have not found it necessary to use shims or to trim the seat of the agraffe.

An ideal situation is to have the agraffe contact the plate one fourth to one third turn before coming into alignment. If one agraffe doesn't meet this desired requirement, try another one. Rarely is it necessary to try more than two or three to find one that is useful. There are slight variations in the threads in the plate and agraffe, so by simple trial one will be found that is satisfactory. If one doesn't fit, don't dispose of it because it may be perfect for the next spot.

I recommend using a lubricant made of equal parts of Ivory® liquid soap and water. Dip the tip of the shank in the solution. It will come up the threads as the agraffe is turned in and lubricate the seat as it contacts the plate. In this instance a drop is better than a bucketful.

Minor adjustments in alignment can be made after restringing but before the strings are pulled up to pitch. I would avoid turning the agraffe except for the most minor adjustments after the piano is up to pitch.

Also, note that the agraffes now available are threaded the complete length of the shank, and the seat has a thin margin that contacts the plate and it can be "ironed" a bit by turning it back and forth as one makes for proper alignment.

The time required for this operation is about three hours. It is important to have a good T-handle tool, otherwise one will spend twice the time and accumulate numerous blisters.

— Kermit E. Williams, RPT
Santa Barbara Chapter

More Health Tips

Reading the January *Journal* got me thinking of some technician health tips of my own.

Just the other day I sat on a piano bench and had the leg collapse from under me. I thought I had learned some time ago to tighten all bench legs before sitting on them. This time I didn't and luckily didn't hurt myself. Look for the leg stud threads protruding too far beyond the nut, which might indicate that you are pulling the stud out of the leg.

Also, lately I've been aware that I tend to hold my breath or take shallow breaths while tuning. Deep breathing will relieve stress and should be done at all times, especially while tuning.

Finally, I don't know what I would do without my key pounder. Mine is a 1" dowel with a hammer stuck in the end. I can grab it in my fist and pound away. It takes much of the shock from hard blows.

— Kent Gallaway, RPT

Journal Article Reprints

- Dampers, Trapwork & Action Centers
- General Repair
- Hammers & Touchweight
- Keys
- Soundboard Installation
- Rebuilding Skills
- Pinblocks & Plates
- Bridges & Soundboard Repair
- Stringing, Crown & Downbearing

All Reprint Books Are $15

plus Shipping & Handling

To Order, Contact the PTG Home Office:
3930 Washington, Kansas City, MO 64111
Phone: 816-753-7747, Fax: 816-531-0070

DRYBURGH PIANO SERVICE

distributors of
Satellite City **Hot Stuff**
adhesive products
1-800-GLUE ALL

ask for our complete guide of piano applications

10% discount on first order when you mention this ad

The Finishing Touches

Dry Transfer Decals

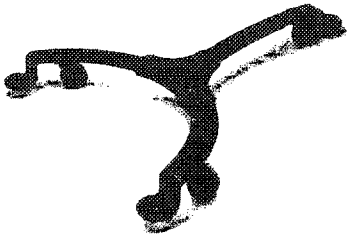
- Fast, easy, no cleanup
- Immediately ready to finish
- Over 700 Fallboard & Soundboard
- Custom Decals - send tracing for

Music Racks

- Authentic Steinway Designs
- Two styles

Grand Piano Carriage

- Made of the finest steel: coated
- Superior engineering and looks
- Two brakes included for added stability



- Smooth and effortless movement
- No finish damage to piano legs
- Shipped UPS

Decals Unlimited **Schroeder's Classic Carriage**

9333 96th St. No.
Mahtomedi, MN 55115 • 612-429-4465

Catalog available upon request

Computer Software

Piano Service Manager®

★Complete Customer Care, Schedule, Invoice, Auto-Reminders, etc...
★New to computers? PSM is for you!
★Already on computer? Direct data transfer into PSM is available.
✓PSM for DOS: $295

☎ *Phone support by the author!*

Dean L. Reyburn RPT
2695 Indian Lakes Rd, NE
Cedar Springs, MI 49319
616-696-0500

Tuning Manager®

★Harness your PC/Mac's power to your AccuTuner!
★CHAMELEON: Create custom aural quality tunings.
★Historical Temperaments.
★MIDI transfer-backup edit-graph-print-score.
✓TM-DOS:$295 Mac:$495

New Sanderson Accu-Tuners

New England Conservatory
Founded 1867

PIANO TECHNOLOGY CERTIFICATE PROGRAM

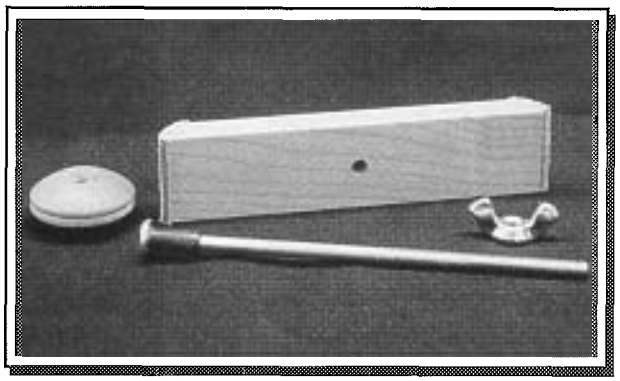
Frank Hanson and Vincent D'Errico, Master Teachers

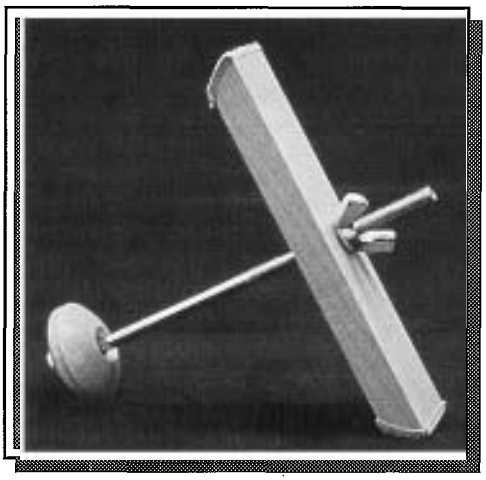
The nation's oldest independent conservatory of music offers a Steinway-affiliated master/apprentice program in the maintenance, tuning, and reconstruction of pianos. Program graduates are qualified for independent professional practice upon completion of this one-year course.

For application and a brochure, write:
New England Conservatory
School of Continuing Education
Sam Adams, Director
290 Huntington Avenue
Boston, Massachusetts 02115
Tel. (617) 262-1120, ext. 353

Your Ad could be
Here . . . Call
816-753-7747
For more information

Continued from Page 8





safe feature and should not be neglected.

Finally, two or three coats of any clear finish from a spray can will keep the wooden pieces from getting grubby. Another nice touch.

— Clair Davies

TT&T — The Great Rubber Band Fix

How many times is it that you are out tuning an older piano and you find that one or more of the hammers are wobbling and to complete the job you are going to have to do the dreaded job of removing the hammer to repair or replace the flange, and you don't intend to remove the action from the piano if you can help it.

How many times is it that the cussed screw has fallen into the action when you are returning the hammer into the action and you've had the maddening job of digging it out and then have it happen again because the weight of the screwhead causes the screw to slip out of the flange. I've used a magnetic screwdriver, but even then it has happened because of the tight quarters you have to work in.

For this kind of job I applaud the Yamaha people for having a spring-loaded arrangement that holds the screwhead up so it can't fall into the action when the part is removed, and then holds the screw in the same position so it won't fall into the action when you install it again. And I applaud them for the "plus" screwhead which loads easier than the "minus" head we have to work with.

You'll still have to be careful taking the screw out of the action, but while doing a repair in one of the pianos at my store I thought of the Yamaha action and how I could keep the screw in the flange with no chance of it falling out, and lo and behold, again I had the solution that was quick and easy.

The solution is a rubber band of about a half inch diameter which is the smallest one made commercially and is available at any office supply.

1. Put the screw in the flange and then add the rubber band, putting it over the back stop shank.

2. The tension of the rubber band and the fact that it stretches will keep the screw in the flange and allow you to screw the flange to the action.

3. When you are sure the screw is in the action but not tightened, get your needle nose pliers and grab the rubber band and give a yank, which will break the rubber band and then you can finish the tightening. Sorry, you'll have to use a new rubber band every time. A small price, I think.

— John Dragone, RPT
{Reprinted from the Western Michigan Chapter Newsletter}

TT&T — Waste Ends for Splicing

Save the waste ends of bass strings when stringing pianos. Wrap a rubber band around them and put them in your tool case for a handy supply of string splicing stock. Each time you string a piano, replace your depleted bundle with a fresh one so you'll always have a good selection of diameters.

— Paul Rice, RPT

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

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

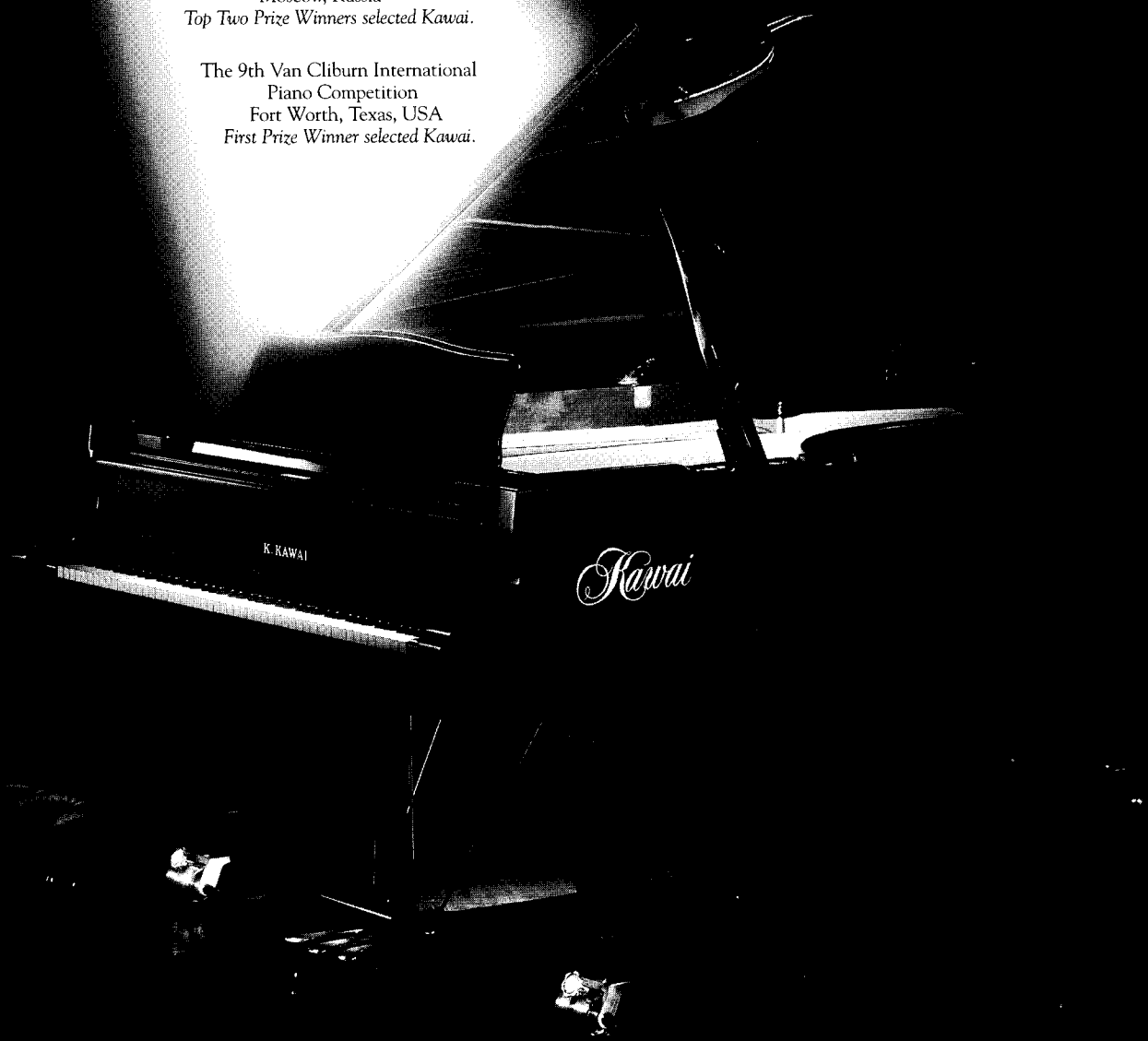
The 45th Ferruccio Busoni
International Piano Competition
Bolzano, Italy
First Prize Winner selected Kawai.

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

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

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

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

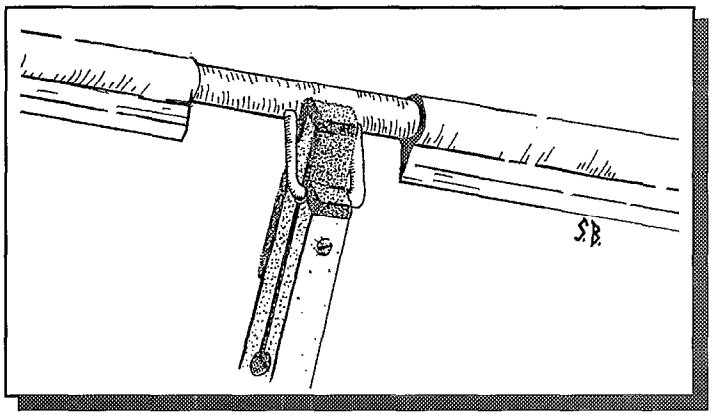


It's becoming a familiar refrain.

Q — Steinway Sostenuto Monkey U-Pin

The hanger loop [called "sostenuto rod hook" in Merle Mason's book, *Piano Parts and Their Functions.* — S.B.] that connects the Steinway sostenuto monkey to the sostenuto lifter blade is soldered into place. It is common for the loop joint to become wobbly and not uncommon for the loop to come off completely. What are appropriate tools, material, and procedures for reattaching the loop to the lifter blade? I guess I should say that I have tried epoxy, and that I considered the results poor. A soldering pen does not produce nearly enough heat to liquefy the solder used here.

— Kent Swafford, RPT



Steinway sostenuto rod showing monkey and hanger loop or sostenuto rod hook.

A — From Larry Fisher, RPT

Kent, I've seen CA (super) glue work very well in this area. The fit must be a tight mechanical fit to begin with. The holes and the surrounding area must be free of lube, dirt, oxidation, or anything else that would jeopardize the bonding action of the glue. CA glue holds metal to metal very well.

Resoldering the joint is a pretty good idea if you're any good with a small torch. Once again, clean the area really well. The joint may have failed in the first place because of contamination of some kind. Heat the loop ends, and clean with steel wool. Measure (with a micrometer) the wire of the loop in an unsoldered area and choose the same-sized drill bit to clean the holes in the sostenuto rod. Put an ample dab of flux on the loop ends and insert in the rod. Resolder using some good quality solder. Rosin core solder would probably work, as would acid core, but I've had fairly good results with just plain old solder. Allow the solder to cool by itself and install the rod in the piano.

A number of techs use a pencil-size butane torch (available at hobby shops or hardware stores). It sounds ideal for this purpose. I've always used a standard-sized propane torch, and have never needed anything else.

Q — Keeping Music Wire

How do you keep wire from rusting in a humid, salty climate? There is enough wire in my Havana workshop to string the pianos in Cuba and Costa Rica, thanks to your generosity. Now I want to keep it clean.

— Benjamin Treuhaft

Q — Keeping Music Wire II

Does anyone have any successful methods of preserving stringing wire, tuning pins, damper spoons, etc., from rusting in damp climates? The kind of climate where envelopes glue themselves shut, where mold grows in places it never should, and where damper spoons turn to powder in a few years?

— Raymond Johnson

A — From Newton Hunt, RPT

Build a box with a hinged door large enough to store the wire in an orderly and accessible manner, and place two short Dampp-Chaser rods in the bottom, perhaps with a couple of sets of blued tuning pins. The difference in temperature will keep the humid air out of the box. Condensation occurs because the metal's temperature is lower than that of the surrounding air. If the metal or the surrounding air is kept higher inside the box than outside, then condensation cannot occur. It is simple but quite effective. I keep my tuning pins in the lower part of the box, just above the Dampp-Chaser rods because they act as a heat reservoir to compensate for rapid changes outside the box. My box is about 30" wide, 40" high and 12" deep, with 8 or 9 shelves inside for various sizes. Using this box, I have had no rusting wire, but in the basement of our music hall, my tools rust readily.

EDITOR'S ROUNDTABLE

Key Repairs

Steve Brady, RPT
Journal Editor

Those of us who do a lot of action work see damaged keys frequently. Often, damaged keys are returned to the keyframe in less-than-optimal condition because many technicians lack the skills or the time to perform proper repairs. However, smooth, well-fitted keys are so crucial to the operation of the action and to the "feel" of the keyboard that these essentials should never be overlooked.

Some recent threads on "pianotech," the Internet listserver for piano technicians, explored methods of repair for some of the more common varieties of key damage. I've combined the three for this Roundtable article on key repairs. Our contributors include:

Bill Spurlock, RPT — A popular columnist for the Journal, Bill operates a successful piano service business with his wife, Fern Henry, RPT, and also runs a specialty tool company for piano technicians.

Tim Coates, RPT — Tim is staff piano technician at the University of South Dakota.

Paul Kupelian, RPT — A one-time pipe organ technician, Paul is now staff piano technician at the State University of New York, Oswego.

Avery Todd, RPT — Avery is staff piano technician at the University of Houston.

Paul Dempsey — An Associate member and veteran technician, Paul is staff piano technician at Marshall State University.

Barbara Richmond, RPT — Recently staff technician at Illinois Wesleyan University, Barb has relocated to Northern Texas, where she is establishing a private piano service business.

Terry Q. Anonymous — A noted artist, composer, author and coiner of aphorisms, Terry is now dabbling in piano technology.

Doug Hershberger, RPT — Doug recently relocated to the Los Angeles area. He tunes the pianos at Disneyland.

Mark Dierauf — Mark tunes and rebuilds pianos in Concord, N.H., and is the author of WinScale piano rescaling software.

Kent Swafford, RPT — A frequent Journal contributor, Kent is on the staff of the Music Conservatory at University of Missouri, Kansas City.

David Vanderhoofven — An Associate member of PTG, David works on pianos in Joplin, Mo.

Newton Hunt, RPT — Newton is a veteran tuner who works as staff piano technician at Rutgers University in East Rochester, N.Y.

Repairing Damage to Key Sides (And More!)

Bill Spurlock: Randy Rush turned me on to a great way of repairing the sides of keys chewed out by finger nails:

- Get some very fine light colored wood sawdust, or buy "wood flour" where epoxies and epoxy fillers are sold, such as marine suppliers.
- Also obtain some pieces of polyethylene or Teflon® at least 1/4" thick or thicker. (Look in the yellow pages under "Plastics." Most shops have scrap barrels with lots of useful types and sizes sold by the pound.)
- Clean any finger grease off the keys using ammonia and a Scotchbrite® pad; let dry.
- Mix the wood flour with a clear epoxy having a reasonable working time. The consistency should be liquid enough to wet-out the key wood, not thick like putty.
- Apply the mixture to the sides of a key, and sandwich with the polyethylene.
- C-clamp lightly (see figure 1).

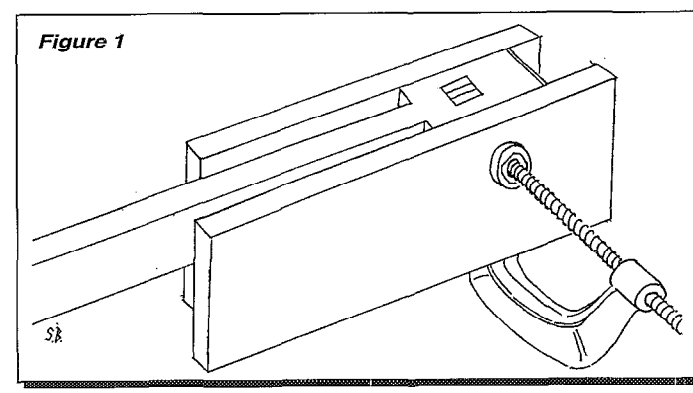


Figure 1

Polyethylene clamping blocks in place.

The epoxy will not adhere to the plastic, so after the epoxy has cured, the plastic pieces will come away easily, leaving a perfectly smooth molded surface to the sides of the keys. The filler will be similar in color to the key wood.

This method works well when the sides of the keys have "pockets" worn into them, since there are usually unworn areas to clamp the plastic against. This restores the original key side profiles. If the entire key sides are worn away (usually from careless trimming after key recovering), other methods or key replacement are needed.

This same type of repair can also be done on broken

case parts, like chunks broken off the bottom edges of vertical piano case sides. For this, I like to use Wood Rebuilder®, a polyester filler that Webb Phillips sells. Apply some paste wax to the finish bordering the break, so squeeze-out doesn't stick to the finish. Then apply the filler and the plastic piece. Back it up with a thick flat wood block and clamp securely. In five minutes you can remove the clamp, and you'll have a perfectly smooth fill that's flush with the surrounding wood. The filled area can then be colored and grained as with any touch-up fill.

Tim Coates: Bill Spurlock's suggestion for re-wooding keys is very good. But it sounds rather involved compared to using Wood Rebuilder®. Has anyone else used Wood Rebuilder® for key repairs? I find it to be wonderful. Stainable, sandable, and non-shrinking. It also works great just as a glue.

Spurlock: As I mentioned, I do like Webb Phillips' Wood Rebuilder® for single-fill case repairs, precisely because it is fast-setting. However, it is usually not convenient for filling the sides of keys if you have very many to do because of the short pot life. You have to continually mix small batches, so there's a lot of waste. With epoxy, you can repair a whole keyboard with one or two batches of half-hour epoxy.

The Wood Rebuilder® is very convenient for two or three keys, though. It's also great stuff for rebuilding chipped carved areas on legs. You can apply it, then sculpt it to shape when it's partially cured to the consistency of hard cheese.

Paul Kupelian: I have also used Wood Rebuilder® for various repairs, and it works great. Some uses have been: repairing the screw holes in the grand top cross piece, replacing a section of seat that had been broken on a piano bench, filling in some gouges along the rim, etc.

Damaged Key-Bushing Mortises

Avery Todd: I have a Yamaha vertical that, somehow, got several keys up above the keypins. The tops of these pins come to a fairly sharp edge and when the keys were pushed back down the pin got in between the bushing and the wood. This has caused some wood damage in the bushing hole. I've steamed out the bushings and cleaned out the pieces of wood fragments in the hole. Now, looking down at the holes, I have a slight U-shape instead of a flat surface to which to glue the bushings on one side.

Does anyone have an idea of how to repair the wood to make a flat glue-surface again. Somehow, the wood needs to be built up. I have several ideas to try, but I thought I'd check first and see if anyone has already had and solved this problem.

Paul Dempsey: Don't you just hate it when that happens? However, it is a fairly straightforward woodworking repair.

First, set up your dado blade on your table saw, or you can use a straight side-cut router bit on your router table. Set it so that you cut the entire front rail mortise out to a depth of 1/8". The length of cut should be 5/8" to 3/4".

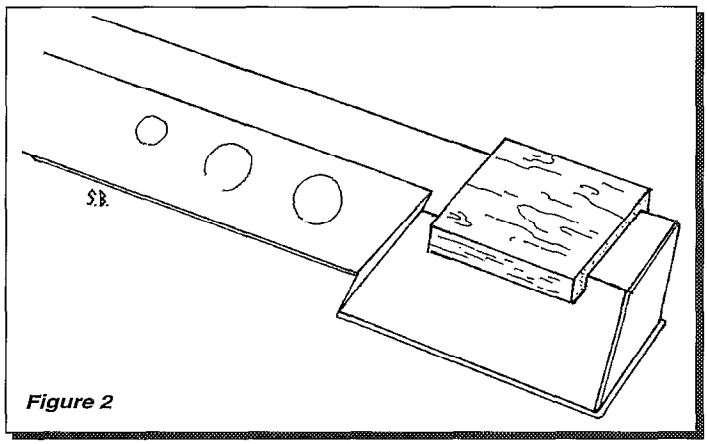


Figure 2

Wooden insert glued in dado across front-rail mortise.

Try to leave as much wood as possible at the very front edge of the key.

Next, fashion some wood inserts cut to the exact dimension of the cut-out you just made, leaving them a little wider and thicker to allow for sanding (see Figure 2). Glue in and clamp. Sand sides and bottom flush when dry. Choice of wood? Any close-grained softwood is fine. Maple (a hardwood) will do fine as well.

Now, the tricky part. Put the key on its balance rail pin and carefully hold the key in position over the front rail pin and lightly tap. You want to make a small dimple in the new wood insert. Repeat for each key. Or, do all the naturals first, sharps last. Using the dimple as a guide, drill a new hole(s) for the key pin. How big? Measure the key pin and add the thickness of both pieces of bushing cloth. Elongate the hole to the same length as its neighbors, keeping the sides parallel and straight. Rebush and ease as necessary.

This works well for a few keys. If many are involved you may want to fashion a jig to facilitate cutting all the dadoes.

I have done entire sets of keys this way, after they have been bushed one too many times leaving the wood a mushy mess. It works great and doesn't take all that long to do.

Barbara Richmond: Several years ago I bought DAP Wood Trim® (veneer 8' x 13/16", used for edging shelves, cabinets, tables and crafts) at the local Ace Hardware. I cut little shims and glued them in the keys using Titebond®. I used one end of a toothpick to put the glue in the key and the other end to position the shim in place. I've used this method when I have followed bushing jobs where a lot of wood was taken out with the bushings (so I don't have to use really thick cloth).

"Pulley" Keys

Anonymous: Has anyone discovered any new methods to treat pulley keys? This term refers to enlarged balance rail pin holes in the key. I've heard of sizing the hole with diluted glue. Which glue? I've had limited success with this method. Then there's the tool which drills out the key bottom to fit in the inserts (see APSCO Supply

Continued on Next Page

Key Repairs

Continued from Previous Page

Catalog Page 23, No. 16201). Are inserts available in various sizes?

Doug Hershberger: Kimball put out what they called a "grand and vertical troubleshooting manual" one to two years ago. It has a very good description for repairing pulley keys, providing the keys are not too far gone. If that is the case, then you might have to use some kind of added insert. I'm sure Kimball has these manuals left over, even if they are getting out of the grand piano business. The manual I speak of is very well done and I would recommend it, especially for technicians newer to the trade.

Mark Dierauf: Just recently, I decided to finally try to do something about a particularly bad case of "key chuck" on my own piano, a Fischer grand Ampico player. Not only did the keys chuck back and forth almost a full 1/16th, but they also chucked side to side! Needless to say, they made quite a bit of noise.

I had been anticipating sending the keyboard and frame off to Seneca Piano Key for their balance-rail repair job, where they replace the key buttons, keypins, and also add (or replace) the key shoes. Before I did, though, I thought I'd try to fix them by steaming and then glue sizing.

Here is what I did:

I got a good head of steam up in my old tea kettle on the stove, and held the key's balance rail hole right in the flow for a couple of seconds only, not long enough to loosen the balance rail bushing. Then I plugged a bushing caul into the key button, to keep them from steaming loose. I then continued to steam for 10 to 15 seconds, while I watched the moisture begin to seep into and along the grain at the top of the key button. Then I put a drop of very thin hot hide glue into the hole. I had the glue just thick enough so that it wouldn't flow right down the hole, but would cover the hole completely and just start to ooze down.

After a couple of seconds, I turned the key over and hit the hole again with the steam. This would clear the inside of the hole of the glue and, I hoped, drive the glue into the wood. Then I wiped off any excess glue and went on to the next key.

The result is that after two weeks in a very dry room, the worst keys have only a minute amount of chuck — far less than many brand new pianos! I really didn't expect this to work at all, let alone this well. An extra benefit is that the steam fluffed up the bushings, so that they are now tight as well. The entire job only took a couple of hours.

These keys did not have shoes or inserts, and the key wood was sugar pine. If your keyboard has shoes and this method doesn't work for you, then replacing the shoes is not that bad a job.

Kent Swafford: My bread-and-butter method for sizing BR holes is to remove the keys from the keyframe, coat the BR pins with McLube®, place an action-length voicing stick (or a keyslip or a length of dowel rod) at both the front rail and the back rail. Coat the sides (and area around) the BR hole with diluted [frankly, I don't think the ratio is at all critical] aliphatic resin glue with a paint brush small enough to fit into the BR hole itself. Let sit for a bit, then blow out the excess glue from the hole, and place each key back on the key frame, with the sticks keeping the keys (and glue) safely elevated above the BR cloth punchings. Let sit overnight, then remove the keys, clean the tiny bit of glue off the BR pins (your fingernail may even work), and then re-fit the keys, because most will now be too tight. A few may need a second treatment.

David Vanderhoofven: I would second Doug Hershberger's recommendation of the Kimball troubleshooting manual! Also, let me refer you to a manual about the same size, by Nikolaus Schimmel, called *The Grand Keyboard and Action: Function and Regulation.* In my opinion, this is the best written (short) guide on regulation. It has well written descriptions (and many pictures) of the different steps in the regulation process. I got it from the Schimmel booth at a PTG convention.

On page 19, Mr. Schimmel recommends lightly rubbing the wood with the handle of a screwdriver to tighten the balance rail hole. If this is not enough, he recommends using glue-size. "... we recommend a mixture of one part glue to three parts boiling water, which is dripped around the hole using a hammer shank." Mr. Schimmel does not say what kind of glue he recommends. In extreme cases, inlay a small strip of wood in the bottom of the key near the balance rail hole. And in very extreme cases, you need to put in a hardwood insert "not more than 2.5 mm thick." Be careful to drill the hole in the same spot!

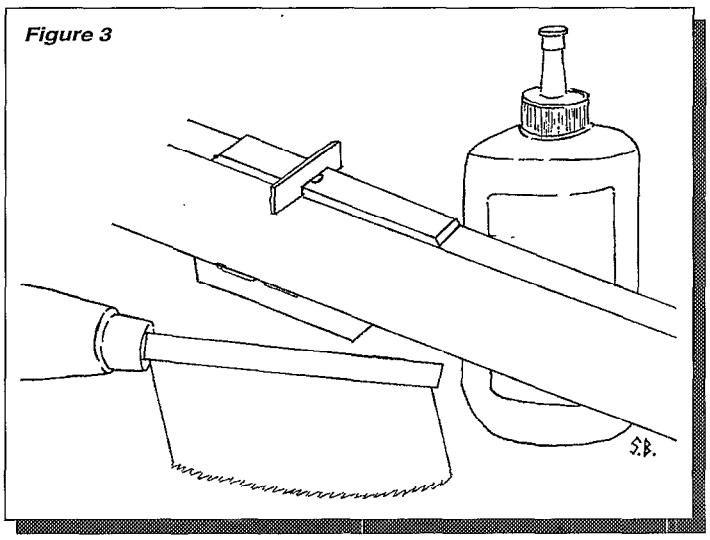


Figure 3

Veneer shim glued in kerf.

Also, look up Art Reblitz, *Piano Servicing, Tuning and Rebuilding,* 2nd. Ed., page 120. He has a short section on glue-sizing a loose balance rail hole. He recommends using a sewing needle to "needle the wood surrounding the hole, and apply a drop of water. While the water is drying, clean the pin with metal polish. When the surface of the wood feels dry, apply a drop of aliphatic resin glue to the wood, which will soak in and strengthen the wood."

Finally, the PTG Home Office sells a book which has reprints of various articles from past *Journals.* The one on

"keys" includes 7 articles on balance rail hole repairs! In one of these articles, Susan Graham recommends using a solution of one part glue to four parts water. Use water-soluble glue and hot water. Use white or yellow glue, but she says not to use hide glue because it tends to dry too hard. Bill Spurlock has a good article on repairing pulley keys as well.

Richmond: In extreme cases, where glue-sizing or steaming haven't worked, I've used my handy X-acto saw (it's the right width) to saw a shallow kerf on the offending end of the balance hole (across the entire width of the key) and then glued in a veneer shim. After the glue dries, trim the veneer flush with a chisel or small saw.

Swafford: For this repair, I use the mini-cuttersaw from Spurlock Specialty Tools. It is a pull-saw and makes the kerf in one pull.

Newton Hunt: In answer to the posed question, yes, there is a new procedure for correcting keys with enlarged balance pin holes, and it does not come from APSCO.

Ralph Onesti has taken the old insert idea and created a new system. It is composed of perhaps 15 sizes of guide pins, a cutter for the key and a cutter to make inserts of any wood you wish. The guide pins are inserted into the key until the proper fit is found, the keys are marked and sorted according to the size for the hole. The drill press is set up with the cutter and a guide pin for the size of hole in a group of keys. The guide pin perfectly centers the key and the cutter cuts out material to accommodate the new insert.

The cost of the system is $400. I have a set on order.

Swafford: There is a slight problem with this system that must be allowed for. Keys that are bad enough to need inserts have balance rail holes that are grossly enlarged. The guide pin in Onesti's system "perfectly centers the key" only if you can determine where the original (smaller) hole was, which may be difficult.

One might be able to use thick paper balance rail punchings to help relocate the original hole: lightly glue a punching to the bottom of each key; place each key back on the key frame and adjust each key in relation to the others (i.e., so that the key-fronts line up); the keys will be adjusted and temporarily held in place by the paper punchings, the adjustment itself being made by moving the paper punching on the bottom of the key until its hole, temporarily serving as the balance rail hole for the key, properly locates the position of the old hole. Let the punchings dry in place and then use the punching hole to align the guide pin of Onesti's tool (and just drill away the paper punching in the process).

Perhaps the "key" message in all this is that there's more than one way to skin a cat (or repair a key)! Thanks to all our participants in this edition of the Roundtable. —S.B.

The Sweet Spot:

Beyond Matched Frequencies In Unison Tuning

Chris A. Trivelas, RPT
Contributing Editor

Early in my tuning career, a violinist whose piano I had just tuned called back with a complaint. She said the piano had lost its vibrato. It didn't cross my mind then that someone might prefer the sound of out-of-tune unisons, and I couldn't imagine what the problem might be, so I paid a return visit (paid is the correct word here). Sure enough, after eliminating other possibilities, I had to conclude that this person missed the familiar sound of her out-of-tune piano. I told her that I could throw the unisons out of tune a bit but she declined and naturally never called me back. I was a little relieved myself, since I was at a loss to deal with the situation.

Years later, a similar situation arose. But in the meantime I had gained much more control of my tuning technique, and learned about what I am calling the "sweet spot" in unison tuning. In this more recent situation the client complained of a "deadness" in the mid-treble which had not been there before. She was not a musician so it took a while to bridge the gap between her words and the sounds I was hearing. At some point the idea that it might be the unison tuning popped into my head (though it had no logical connection to what we had been talking about). I tried making the unison tuning in the mid-treble a bit "wetter" (but not nearly as extreme as the "wet tuning" button on some electronic keyboards). This cured the problem. The difference was surprising.

Since this client was a photographer, I made the analogy of using a "softer focus" for the unison tuning. But the term "soft focus" has just a hint of "deliberate error" in it, so now I would refine the analogy and say that I "played with the contrast" for a more pleasing overall result. Pleasing to the client, that is. The unisons she preferred were still acceptably beatless (barely) and the overall effect was of more complexity and more sustain to the tone, but with some loss of clarity.

As with many aspects of our work, there is a trade-off going on here. Unisons with exactly matched frequencies sound cleaner, more pure, more accurate but may die out quickly or lack character. As unisons are offset from matched frequencies, they may pick up some sustain and complexity, but will lose purity and eventually start beating and become unacceptable. To say that unisons should be tuned beatless gets everyone into the ball park, but then we must allow a subjective element to enter, and say that within that ball park, the tuner must use her or his aesthetic judgment and set the trade-off to the most musical compromise under the circumstances. In the above example, I naturally preferred my original tuning, but the compromise that my client preferred was also musical.

"In the beginning, unisons are the easiest thing to tune, then they end up being the most difficult." Virtually all of us have either heard that statement when we began learning our trade, or have spoken it to aspiring technicians ourselves.

Considering the complexity of the tuning tasks we face daily, it seems as if tuning three strings to the same frequency should be simple, especially since they (almost always) have the same speaking length, inharmonicity and wire size. The simple part is to get into what I call the "acceptably beatless" range. This is relatively easy to hear precisely because the strings do have the same characteristics. The difficult part is to hit the desired sweet spot within that range, to do it consistently enough to create a unified effect over the whole tuning, and to do it with enough stability. If it is easiest to hear unisons when tuning, it is also easiest to hear them when they go out of tune. If we think about the actual amount of wire sliding over the termination of the speaking length during this operation, we must conclude that fine tuning takes a truly extraordinary degree of hand/ear coordination.

Someone who has not been tuning long is doing well to get in the acceptably beatless range at all, but for those who have gained some mastery of hammer technique and pin/string setting, there is a choice of where within that range to set the unison. The sweet spot is certainly different for different pianos, different situations, and even for different tuners. Pianos vary in the basic sustain and complexity of their tone, the rooms they are in have an effect on perceived sustain, and as for tuners, we should know better than anyone that one person's noise is another person's signal.

There is little shared knowledge about this phenomenon, so my aim here is less to do an exhaustive analysis and more to share my experience in order to stimulate discussion. Also, I'm giving the pendulum a little push in the direction of recognizing the subjective element of our work which is most important when we are dealing with the finest level of adjustments.

Getting Practical

The sweet-spot effect pertains mostly to the upper half of the keyboard. Somewhere between C 40 and A 49 there is a transition below which I prefer unisons with frequencies as matched as I can make them. This is probably because sustain is usually plentiful here and the increased inharmonicity (and audibility of upper partials) guarantees enough complexity to the tone without having to add any. Often in the very high treble (say notes 78-88), matched frequencies and maximum sustain go together. I include in the idea of "sweet spot" the fact that manipulating unison tuning can often mitigate or even cancel out a

false beat.

I happen to tune by strip-muting the entire piano, tuning middle strings first. Then I tune unisons, top section first (left to right), by tuning the left string to the middle string, then the right string to the other two. At this stage I am tuning unisons as beatless as I can get them, but moving quickly, not trying for perfection, noticing extremes of sustain and false beats. Then I go over the unisons again, this time from the top down, right string to middle, then left string to the other two. This is when I tune for the sweet spot. The unisons are already very close, the adjustments are small, and I can move from one unison to the next quickly enough to compare the sustain and tone quality. Overall effect is more important than individual notes.

It is helpful if the timing of my "listening" blows is related to the sustain time of the note. If I play a note and wait for it to decay, then do the same on another note, it is difficult to make a comparison of sustain time. On the other hand, if I am repeating the note at regular (time) intervals, it is easier to compare the sustain time to the rhythm of repeated notes. Again, the point here is to quickly compare one note to the next. And, as always, the tuner should set aside some brain cells to notice which notes need further attention such as voicing or repairs.

Let's say that a section in the treble has one or two notes with enough falseness that those unisons cannot sound as clean as the others. Should the tuner offset the rest of the unisons to blend in? The answer to this type of question is always: it depends. How prominent is the falseness? If there is to be a transition zone, how big should it be? Ultimately, the most important skill that piano tuner/technicians can possess, and the best tool for addressing these kinds of questions, is our own sense of what is most musical for the circumstances. Our great advantage in developing this skill is that we each listen to many, many pianos. But we miss an opportunity by not listening more to each other's tunings, not to find fault, but to be more aware of the range of musical compromises available.

There are good reasons for tuning methods other than the one described above, such as tuning unisons as you go up the scale. For myself, I find that constantly changing the type of adjustment I am making is a major cause of fatigue. Thus, switching back and forth from octave to unison or from coarse adjustment to fine adjustment is more tiring than doing a group of octaves, then a group of coarse unisons, then the final group of "sweet spot" unisons. Going over unisons the second time from the top also has the advantage of allowing me to hear each side string with the middle string separately, then of course finishing by listening to all three strings. If the friction characteristics of the piano allow it, I keep the string moving, going back and forth over the desired rest position in smaller and smaller movements. The end result is usually that the right string is matched exactly to the middle string, and the left string, if necessary, is offset sharp. Naturally, exceptions may have to be made from this pattern if a more musical compromise works for a particular note. But in general, if unisons are going to be offset, it's best that they be offset in the same direction.

Beyond Unisons

The question arises, if there is a sweet spot for unisons, wouldn't there be one for octaves, too? I believe there is. However, it is more difficult to work with. Often an octave (depending on where it is in the scale, and other factors) may sound more "full" and have more sustain if the beat starts to "bulge" just as the tone is dying out. As before, the result is not an audible beat, but an extension of tone (sustain). But for the octave the "acceptably beatless" zone may be smaller than the zone for unisons, more constrained by having to satisfy other intervals. Indeed, in the high treble, the overall musicality of the tuning may demand a single octave beating on the sharp side while the triple octave is beating on the flat side. Still, particularly in the midrange of the piano, the "acceptably beatless" zone (which for the octave must include proper relation to other intervals), may be large enough to include a sweet spot. A further complication here is that the sweet spot may change when all six strings are sounding as opposed to two. This may be the strongest argument for tuning unisons as you go, even in the temperament.

"Ultimately, the most important skill that piano tuner/technicians can possess, and the best tool for addressing these kinds of questions, is our own sense of what is most musical for the circumstances."

There is one other area where the sweet spot makes a difference in my tuning. For most of the bass section, it occurs when the lower note is tuned just flat of a perfectly beatless 6:3 octave. The other way to say this is that the minor third should beat just slightly slower than the major sixth on that test. This seems to satisfy the other intervals nicely (at least to my taste) at the same time. But bass strings are not nearly as uniform as plain wire, and partials are often not exactly where they're supposed to be (or not as loud or as soft as they're supposed to be), so again the tuner must find the most musical overall compromise.

Knowing what I know now, there is still no guarantee that I could have satisfied the violinist with whose story we began. At that time, my frame of reference was that unisons should be tuned to exactly the same frequency. Leaving that standard behind (once I was able to do it intentionally and consistently) added more tricks to my bag, and allowed me to get rid of some dysfunctional ones, such as telling someone I could throw the unisons out of tune if they liked it better that way. It is not a good idea to define what we do as deviating from a standard. In terms of unison tuning, this means that my commitment is not to matched frequencies, but to what is most musical.

Tuning Technique — Part II
Procedural Technique

Daniel Levitan, RPT
Contributing Editor

"A foolish consistency is the hobgoblin of little minds ..."
— Emerson

The first article in this two-part series on tuning technique, in the January issue, was concerned with the physical processes of tuning, such as manipulating the tuning hammer and delivering test blows. This article looks at another important aspect of tuning technique that I call *procedural* technique, by which I mean the sequence of steps we take in tuning a piano — how we mute, adjust pitch and so forth. In a way, the two are closely related. Mental stress creates physical stress, and so the smoother, faster, and more trouble-free our procedures, the less likely we are to add to our level of physical stress while tuning.

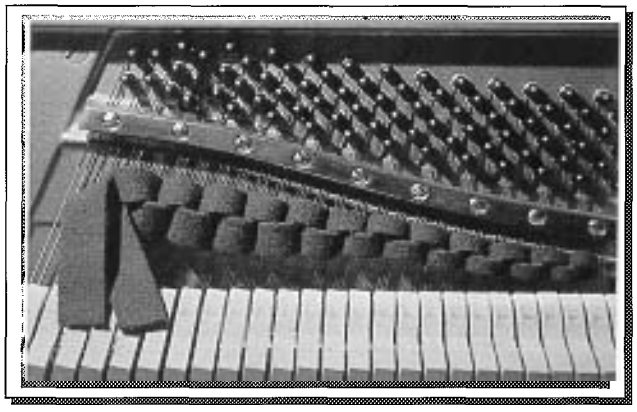


Photo by Sara Matthews

What matters to our clients is not how much we know about tuning and acoustics, or even if we can set a great temperament on single strings. What matters is what pianos sound like when we're finished with them. If we fail to pay adequate attention to our tuning procedures, we run the risk of routinely producing tunings that fall below our own standards. Leaving the piano in such a condition is painful; but it's equally painful to waste time and money going back over work we have carefully produced, acquiring the destructive habit of spending five, ten, fifteen minutes perfecting a tuning after we have supposedly finished it. Addressing this painful situation calls for the same attitude we adopted in addressing physical pain: instead of ignoring it or assuming that we have to live with it, we should look for its causes and for solutions.

Here are some ideas, both general and specific, for sharpening up your tuning procedures. Since I am an aural tuner, these ideas will apply most to aural tuning procedures, but I hope that those who tune primarily with the aid of electronic devices will find some useful suggestions as well. I'd like to acknowledge the many contributions to these ideas from conversations with, and technical presentations by, my colleagues in the Guild, especially Bill Ballard, Lee Dobrins, Evan Giller, Bruce Grieg, Mike Meade, Mike Miccio, Sal Talio and Michael Travis. I thank them, and many others, for helping to make my tuning, and, I hope, yours, easier, more accurate, and more enjoyable.

Divide and Conquer

The first step in rationalizing your tuning procedures is to get into the habit of mentally dividing each piano you tune into small registers. Grouping notes into sections gives you an overview of the whole size of your job and offers you convenient places at which to check time, look back and ahead, switch tests and so on. Your divisions may relate to the physical construction of the piano, they may be purely conceptual, or they may be both. Some obvious physical divisions in the piano are the monochords and the bichords on the bass bridge, the supplement of wound strings, if any, on the treble bridge, and the plate bars, if any, in the treble. One obvious conceptual division is the temperament section, whether it's within an octave, a double octave, or just a diminished fifth. Multiples of that temperament section, especially if that section is an octave, make good conceptual stopping points as well. Areas where you switch over from one type of test to another make another sort of conceptual division.

It pays to keep track, at least occasionally, of the time it takes you to tune through different registers. A good benchmark is the time it takes you to set twelve strings. These can be any twelve strings — the twelve single strings of a strip-muted octave, the twelve strings that make up a minor third's worth of unisons, or even the last twelve monochords in the bass. Your goal should be to move at about the same steady speed over the whole piano, though expect, for various reasons, the wound strings to go a little more quickly than the plain. This includes, by the way, the temperament, because, ideally, the time it takes to put the strings of the temperament into their proper relationships, except on a quick pitch raise, should be in the same order of magnitude as the time it takes to get through any other twelve strings on the piano.

The best way to stabilize your tuning speed at a steady rate is to develop a consistent, repeatable way of setting the string. I mention this here even though setting the string is, strictly speaking, a physical concern because it has such a great effect on the efficiency of your tuning.

It would seem only natural that before tuning a string we would want to determine whether it is sharp or flat in order to be able to then move the pin only the amount necessary to change the string's pitch to the desired one. However, this approach often proves to be inefficient. Especially in unison and octave tuning, it is often difficult to determine whether a string is sharp or flat without stopping to test it. Testing takes time, since it usually involves, at the least, taking your hand off the tuning hammer to play several intervals. The more efficient approach is simply to apply the same sequence of motions universally to every string you tune without wasting time first checking its pitch. For safety's sake, your sequence of motions should begin with flattening the note. Flattening a string is also a good way to give your subconscious valuable information about that particular pin/string/upper termination combination, thereby increasing the precision of the rest of your pin-setting routine.

Of course, if the piano has particularly jumpy pins or is otherwise unusually difficult to tune, you may need for sanity's sake to avoid moving pins any more than necessary. And, if you are touching up a tuning, you may want to destabilize the pins as little as possible, and so you may decide that the safest course is to determine exactly where a note is before touching the pin.

Stick to Your Principles

Just as there is no one right way to set a pin, so too is there no one right procedure to follow in tuning a piano. If we do the same thing to every piano we meet, our tuning procedure is certainly consistent, but it might be consistency of the foolish sort. There's more to strip muting than tuning the whole piano on single strings before bringing in unisons, more to using a single mute than following the mute string by string up the piano, and more to pitch adjusting than quickly going through the same routine we use in fine tuning. More efficient, and more interesting, is the approach of constantly developing and refining our procedures into a flexible and efficient repertoire of methods.

To do so we need a way to judge the worth of various procedures that we have learned or developed on our own. We need, in other words, to develop some basic principles of efficiency in tuning to give us a rational way to assess new ideas and alter our techniques. To me, there are just two basic principles of efficient and accurate tuning; in order of importance:

First Principle — Set each tuning pin only once.

Second Principle — Keep time not spent setting tuning pins to a minimum.

The reasoning behind the first principle should be obvious: setting the pin takes time and mental effort and, therefore, should be minimized. Resetting pins creates unnecessary frustration and increases the physical wear and tear of delivering test blows during pin setting. Three corollaries follow from this first principle:

1) Never set the first pin of a unison (the only pin, in a monochord) until all necessary pitch-adjusting has been completed.

2) Always check the pitch of a unison relative to the rest of the piano (that is, if you plan to check it at all) after setting the second pin of the unison (the final string, in a bichord) but before setting the third and final pin. If tuning the second string of the unison detunes the first, in other words, minimize the damage by correcting the problem before you go to the trouble of setting the final string.

3) Don't check the pitch of a unison relative to the rest of the piano after setting the final pin of a trichord. The first two strings set the string's position; the third simply nails it into place. If you can't pull the third string into unison, then one or both of the other two strings has drifted. Check them immediately before going further.

Our second basic principle simply acknowledges that the productive time in tuning is the time spent setting tuning pins. Any changes in your technique that reduces the time you spend in support activities such as handling mutes, moving the tuning hammer from pin to pin, testing, and pitch adjusting are to be adopted, unless they do so at the expense of forcing you to spend more time setting pins, thereby working against the first principle.

For example, following the second principle, you can save time and trouble by consciously reducing the time you spend testing and checking your tuning. Most of us have acquired a wide repertoire of tests, too many to use practically at each tuning. Decide in advance which tests you want your tuning to pass and stick with them. For example, you might decide that, in the treble, you're only going to check fourths, fifths and single and double octaves. You're asking for trouble if, after you're finished, you decide to listen to your progression of tenths and seventeenths as well.

Another way to reduce the time you spend in testing and checking is to double up your tests. For example, if you are using the m3-M6 test in the bass, you can check the consistency of your work without stopping to play a chromatic series of intervals if you keep the speeds of the major sixths in your mind as you move down the keyboard. By maintaining this extra level of awareness, you can perform two tests at once, the 6:3 octave test and the parallel major sixth test, without adding any extra time to your tuning.

Choose Your Weapons

Let's see how our two principles apply to the question of strip muting versus single muting.

Strip muting has at least the potential for greater speed. It takes less time to insert and remove a strip than it does to handle a mute in the same register. Therefore, all things being equal, under our second principle, strip muting should be the preferred method of muting.

All things, though, are not always equal. Those who prefer using single mutes often say that they have found it produces a more accurate tuning. I believe there are two major reasons for this. The first is that it is possible to leave poorer unisons on a piano that has been strip muted. If a tuner is using single mutes, single strings are being tuned to unisons rather than to other single strings, and therefore unisons are forced to be solid. If the tuner is using a strip mute, on the other hand, it can be removed after all the single strings have been tuned, and so the quality of the individual unisons will not be so crucial. Moreover, most of the unisons on a piano tuned with single mutes will have a longer time to drift, be noticed, and be corrected before the tuning is completed.

The second reason a single-mute tuning can sometimes be more accurate is that there can be a greater tendency for tunings to drift unnoticed under strip mutes due to inadequate pitch adjustment. Using single mutes forces the tuner to be aware of the pitch of the unisons in a register after they are all fully set, and therefore, to notice any slight drift, whether due to movement under test blows or to the small changes in tension involved in pulling in the rest of the unisons in the section. Unisons which are tuned at the end of a tuning do not necessarily have to be checked against the other notes of the piano, and if their pitch drifts due to heavy test blows or insufficient pitch adjustments,

"As our standards rise, the range of acceptable drift we have for each note diminishes, and so the amount of pitch adjusting that used to suffice for us is no longer enough."

Continued on Next Page

Tuning Technique — Part II — Procedural Technique

Continued from Previous Page

the problem may not be noticed, or, if it is noticed, not be considered bad enough to require retuning. If a piano is tuned with single mutes, any drift in pitch forces backtracking and retuning, and this painful violation of the first principle makes it much more likely that the next tuning will be adequately pitch-adjusted.

But there's more to this question than the dichotomy between the speed of strip muting versus the accuracy of single mutes, for tunings done with a strip also have the potential for greater consistency. Using a strip to put each note in a given register on a single string makes it much easier to adjust parallel intervals and correct inconsistencies. This gang approach to tuning appeals to many tuners for the same reason as does the gang approach to much other piano work, such as rebushing keys. We don't find it particularly useful to take an individual key, remove its bushing, cut out a little rectangle of cloth, glue it in, and make sure it fits just right before we move on. Not only would this approach be less efficient than the usual one, it would make it impossible for us to achieve the level of consistency that comes from treating the keys as a group of like parts to which we apply the same consistent set of procedures.

This is the sort of consistency that, in piano work at least, is not foolish. In the temperament, especially, one often wants to increase consistency by returning to notes that have already been tuned and making minute adjustments. For this reason even many tuners who tune the rest of the piano with single mutes like to strip mute the temperament.

Sophisticated Strippers

Let's look at some ways to maximize the advantages and reduce the disadvantages of each muting style. Here's one way to get around the problems of poor unisons and drifting sections that can plague a strip-mute tuning: tune only small registers under the strip and then tune out unisons before going on. If one tunes the temperament under a strip, for example, and then tunes out the temperament unisons before tuning any octaves, the unisons in the temperament will be forced to be as solid, and their pitch as correct, as if the temperament were set with single mutes. Similarly, as each small register beyond the temperament is then brought into tune by octaves, it can be checked and corrected for consistency while the notes are still under the strip and then the unisons tuned out before any further registers are tuned.

> ***"As our standards rise, the range of acceptable drift we have for each note diminishes, and so the amount of pitch adjusting that used to suffice for us is no longer enough."***

The most common way to strip-mute is to insert the strip successively into all the gaps between the unisons of the register that is being muted. After the mute has been inserted and the undamped center strings have been tuned, the mute is then removed gap-by-gap. Each time the mute is removed from a gap, the two strings which have in that way been undamped are tuned.

A more efficient way to mute a register with a strip is to make two passes through it. In the first pass, the mute is inserted into every other gap, and in the second pass the remaining gaps are filled. The center strings are then tuned as before, but when the time comes to tune out the unisons the strip is removed from one entire series of gaps. All the notes of the register now have two undamped strings, the center string and, alternating through the register, either the right- or the left-hand string. These side strings are tuned to the center strings, and then the rest of the strip is removed and the remaining strings are tuned. This month's cover photo shows a strip mute which has been inserted in this way into the lower treble of a small console.

This way of using the strip is more efficient for two reasons. First of all, under our second principle of efficient tuning, it reduces the time spent handling the mutes. The time spent removing the strip gap-by-gap is virtually eliminated, as the strip is removed in two quick steps.

In addition, the second corollary of our first principle of efficient tuning requires us to test the pitch of a unison when it is on two strings, before the third string has been set. To follow this rule when the strip is removed gap-by-gap, we must test each unison's pitch separately as we tune out the unisons to make sure bringing in the second string of the unison did not knock out the center string. If, however, we make two passes with our strip, we can check all the unisons on two strings all at the same time, after we've removed the strip from the first series of gaps. In checking the pitch of these unisons we can simply compare the sound of a test now with our memory of the sound of that same test when the register was still on single strings. Parallel chromatic intervals usually make the quickest and most reliable such tests. Then, when we are satisfied with the two-string unisons in that section, we can remove the rest of the strip, tune out the third strings, and, if we have encountered no problems in tuning unisons, assume they are all right and move ahead to the next register without retesting.

Using the strip in this way also lets us double-up tests, for we can check the quality of the unisons themselves at the same time that we test their pitch with parallel chromatic intervals. Any fuzziness in the beating of an interval is a tip-off that at least one of the two notes of that interval is a sloppy unison.

There are a couple of other advantages to using the strip in this way. One is that it makes it easier to tune when vision is a problem, either because of poor lighting, poor sight lines, or visual impairment. Since the mute is handled with precision only once, the need for fine control of the mute after it is has been inserted is avoided. This way of muting is also advantageous when access to the strings is poor, as in a birdcage action.

If you've never used a strip mute in this way, you might appreciate some suggestions regarding how, practically, it can be done. One approach is to use two separate strips for each section. I'm indebted to my colleague Lee Dobrins for a different approach, which is to take a single strip about an inch wide and slice it down the middle lengthwise, leaving about an inch unsliced at each end. In this way the two halves of the strip stay together as a unit. My own preference is to use a single strip doubled back on itself. I insert the midpoint of the strip at the upper end of a section to be muted and proceed down the scale, inserting it into every other gap. Then I return to the top of the

section and mute the remaining gaps with the other half of the strip. To make the mute fit more easily into small spaces between hammer and upper termination in the treble, I taper the strip down from one inch at each end to about a third of an inch in the middle, using a rotary cutter. For convenience, I mark the midpoint with black magic marker.

The cover photo shows this kind of strip mute. It's made of Schaff's green sticker cloth, #316G (try the thinner APSCO medium gold action cloth, #33888B, in the slightly smaller gaps between unisons in the bass), inserted with the square end of a six-inch steel rule. A mute whose width is either less than a double thickness of the cloth or less than the distance between unisons will not stay well in place. Strips of bushing cloth can be trimmed much narrower than that to fit in tight spots such as the high damper section of small verticals. However, they can only be inserted in the narrow gap between two strings of the same unison.

"... the productive time in tuning is the time spent setting tuning pins."

Whole Tones

Using the strip mute in two passes makes possible a way of tuning out unisons that has advantages in certain situations. After the first section of strip has been pulled out, the unisons are brought in, not successively, but by skipping every other note — tuning first only those unisons, in other words, that are part of a whole tone scale. In this way either all the right-hand strings or all the left-hand strings of the register are tuned first before a second pass brings in the rest of the unisons (the other whole tone scale). After this second pass, all the unisons in the register are on two strings; the register is checked, the rest of the strip removed, and a similar procedure is used to tune out the third strings of the unisons in two more passes. The reason this procedure is sometimes advantageous has to do with the way tuning pins are commonly laid out in the plate.

In the treble, the groups of three pins that correspond to a single unison are commonly staggered across the webbing in the plate by twos. This means that every sixth pin occupies roughly the same position between the upper string termination and the edge of the plate. Each pass through a register using the procedure I've just described tunes every sixth string; in other words, each pass requires us to tune all the strings whose pins are in the same relative position.

One reason this way of moving through a register can save time is that it sometimes makes it easier to locate the next tuning pin. This can help especially if visibility or your vision is poor, or if, on a grand, a high stretcher prevents your seeing the front row of pins. In the bass of a small vertical, often the groups of unisons are not staggered, and, to make matters worse, sometimes the pins and/or the strings that belong to a single unison appear to be farther apart than the pins or strings on either side of the gap between unisons. It is often difficult in such a situation to easily trace the line of the string from the speaking length up to the pin. Tuning the unisons out by whole tones in such instruments can make it much easier to avoid mistakes.

This method sometimes seems especially fast in a pitch raise, when mental focus is low and when one spends relatively little time on each pin, making the distance one moves the hammer between pins more significant. That distance can be greatly reduced with this procedure. Tuning by whole steps, the tuning hammer traces a path around the perimeter of a section of pins, and that distance is usually less than half the distance the hammer traverses in zig-zagging back and forth across the section. This is especially true for the outside pins in the treble of such pianos as the Steinway B, whose groups of pins are alternately staggered into entirely different areas of the webbing. In such a piano, the quickest procedure can be to tune the pins on the perimeter by whole steps and the pins in the interior, which are close together, in the usual way.

Another reason to consider adopting this procedure from time to time is that the feel of a tuning pin changes with its distance from the upper termination. Pins closer to the upper termination have a stiffer, less springy feel that those farther away. The degree of difference is proportional to the percentage change in distance from the pin to the termination, and so is most noticeable on pianos such as the B, where the distance between the pins closest to and farthest from the termination is relatively large, as well as on verticals, where the pins closest to the termination tend to be extremely close to it. Tuning at the same time all the pins which are roughly the same distance from the termination in these instruments, pins which therefore have a more similar feel to one another, may help you maintain your accuracy in pin setting. I leave to you the decision whether or not it's foolish to pursue this degree of consistency.

Single Mutes

Let's turn our attention now to single mutes. Again, there is a wide variety of materials that can be used in single mutes — rubber, wood, hammer skivings — as well as configurations for them — split, stubby, Papp's, and so on. Each kind of mute and mute shape lends itself best to certain procedures, and so it pays to be familiar with them all and to experiment with modifying them on your own. You may find that switching to a different kind of mute will allow you to adopt a certain beneficial procedure.

Keep our first principle in mind when using a single mute — in the treble, always check the pitch of your unison immediately after tuning the second string and before bringing in the third string of a trichord. The easiest way to do this is, after you have tuned the first string, to find a beating interval that uses that string. It can be any interval, not necessarily one that you used as a test. When looking for beating intervals in the treble, aside from the usual tenths, seventeenths, and twenty-fourths, don't forget the very useful twenty-third. Remember the sound of that beat rate, whatever it is. After bringing in the second string of the unison check only that beating interval. There is no need to listen to the same tests that you checked when tuning the first string. If the beating interval sounds the same as before, you can be sure that the pitch of your unison has not changed, and you can go ahead and tune out the third string.

This method of finding a beating interval also allows you to save time by doubling up your tests. By listening to the same kind of interval for each note in a register, you can, at the same time you are checking the pitch of your individual unisons, perform a parallel chromatic interval test spread out over time.

Be creative, also, in the way you use your single mute. You don't have to climb up each section string by string. As just one example, you might tune the left-hand string of one note, and then, before tuning the second string of the same note, tune the right-hand string of the next note, a semitone higher. Now place your mute in the gap between the two notes and tune both

Continued on Next Page

center strings as the second strings of both unisons. Test the notes, remove the mute, and tune the remaining two strings. You'll have reduced your handling of the mute by one-fourth, and at the same time, by ganging up your tests of the two notes, you'll have gained a bit of the advantage of a strip mute.

Pitch Adjusting

I think it's safe to say that one of the hardest things to learn about tuning is to pitch-adjust sufficiently. It's a lesson we are constantly relearning. As our standards rise, the range of acceptable drift we have for each note diminishes, and so the amount of pitch adjusting that used to suffice for us is no longer enough. The problem with pitch adjusting, however, is that it directly pits our first principle against our second principle. We want to avoid the extra time that pitch adjusting entails — the extra muting, moving of the tuning hammer, and rough tuning. But more important is the need to avoid the frustration of resetting notes that have drifted. Pitch adjusting can and should be much more than simply a quick and dirty version of our usual tuning procedure. Just as much as our muting technique, it should be a repertoire of techniques worth our close examination and refinement.

One basic difficulty in pitch adjustments is the uncertainty of reference notes. When we pitch adjust a piano that is severely out of tune, notes we have already tuned tend to drift. When we adjust a piano which is only slightly out of tune, the speed at which we work makes our tuning inexact. In either case, if our procedure is to adjust the entire piano at once, tuning single octaves out from the temperament, as we get farther removed from the temperament we find ourselves tuning to notes that are less and less reliable. As a practical matter, this usually doesn't seem to cause much difficulty in the bass, but it can be very bothersome in the treble. Here are a couple of ways around this difficulty.

The first is to pitch adjust the treble referring as much as possible directly back to the temperament. Unless you have a two- or three-octave hand span, however, you will probably find this difficult to do directly. There are, though, methods that avoid this limitation.

In the case of a piano which is severely off pitch, I suggest you consider chipping rather than tuning. First, lift all the dampers off the strings. In a grand, simply depress the pedal with your foot; in a vertical, use a mute or two to keep the pedal down. Play, with a key, the note in the temperament of the same name as the note you are pitch adjusting. Then chip that note to pitch. Not only does this method allow you to refer directly to the temperament, it also eliminates completely the time spent handling mutes.

Even if you chip only in the high treble you might consider doing so referring directly back to the temperament, before you adjust the lower octaves of the treble. Not only will the flattening effect of raising the lower treble compensate somewhat for the ear's tendency to overshoot the high treble; you will also find the lower treble not drifting so much when it is adjusted after the high treble is in place.

Chipping is not accurate or necessary in the first octave above the temperament. This register should be tuned either on single strings only (using a strip), or after chipping the upper treble in order to avoid as much as possible its detuning the temperament when its tension is changed.

If a piano is closer to pitch, the second way, besides chipping, to pitch-adjust it back to the temperament is to use the following technique: Mute off only one string of the note to be pitch adjusted. Put your hammer on the pin of one of the free strings. Make sure the unison between that string and the other free string is pretty close; quickly retune as necessary if it is not. Play the note to be pitch-adjusted against the note of the same name in the temperament, whether it forms a single, double, or triple octave with that note. Listen to the sound of the beating octave or multiple octave and then try to match that sound by detuning the string on whose pin you have your hammer. Now move your hammer to the other free string of the unison and bring it into tune with the first. Recheck the octave or multiple octave and adjust as necessary, this time detuning the second string and using the first as a reference to avoid moving your hammer more than necessary. Usually two tries at most are all that are necessary to bring the note very close; you can then remove the mute and tune the third string.

This method minimizes your time spent both in handling mutes and in moving the tuning hammer. It is particularly effective on a piano which is only slightly off pitch and whose unisons are still in good shape. If the piano is a grand, a strip can be quickly inserted into every other gap between unisons within a register and the entire register pitch-adjusted without any further handling of mutes except to remove the strip.

Another way to avoid uncertain reference notes in a pitch adjustment is based on the fact that the effects of changing tension are more or less localized. If we change the tension of a string, the strings most affected will be its immediate neighbors; the farther away from the string we go, the less effect we will notice. If the amount we need to adjust pitch is small enough, then, we need not necessarily adjust the entire piano before confidently setting notes; we just need to know, from our experience, that we have adjusted enough of a safety zone around the notes to be set.

When the safety zone of a piano is less than an octave, a good way to ensure that it's safe to set pins in a register is to first mentally divide up each octave into smaller registers, such as major thirds or tritones. At the end of each such register look beyond the next register into the next octave higher, checking the pitch of the notes one octave above the ones you just tuned. As a rule of thumb, these single octaves should sound beatless when they are played quickly.

The most frustrating pitch adjustments are to those registers that are very close to pitch already. One always hopes to get away with not adjusting them, that the change in tension will not be large enough to seriously affect notes already tuned. If the notes are randomly sharp and flat, there may indeed be a chance of that. But if, as is more usual, all the notes are off in the same direction, whether sharp or flat, even to a very small degree, count on the cumulative effect of their tension change to have a noticeable effect.

If the register to be adjusted is just a hair off, it may be almost impossible to make the fine adjustments necessary to adjust without practically setting the pin. In these situations, try pitch adjusting every other note. Chances are you will overshoot, but the overall change in tension in the register may come out just right.

Correction

I've noticed an error in my article on multiple octave tuning in the November 1995 issue of the Journal. *On page 30, in the third column, third paragraph, in discussing tuning notes in the low bass, I recommended tuning single octaves pure or slightly wide at the 10:5 level. I meant to say "pure or slightly narrow" at the 10:5 level. I apologize for any confusion this may have caused. — **D.L.***

samick

Nobody Does It Better

Samick Music was established in 1958 with the purpose of "enriching human life" through music, the universal language. Our ongoing effort is to apply 240 years of piano technology to the careful and thoughtful development of the finest instruments.

Because of the unwavering commitment of our loyal supporters, Samick has grown, in a little over 30 years, into the world's largest piano exporter. We are thankful for this commitment and we pledge to continue earning your confidence by striving for the highest quality and by making your musical needs our top priority.

Photo:
Bruce®
hardwood floors
A division of Triangle Pacific Corp
1-800-722-4647

Samick Music Corp., 18521 Railroad St, City of Industry, CA 91748 • 818-964-4700

The Fairchild Charts:
A New Method for Plain-Wire Rescaling

Steve Fairchild, RPT
Long Island-Cristofori Chapter

Over my 37 year membership in PTG some different forms of charts have passed my way. With all due respect for these pioneers in string scaling, their charts, such as Klepac's, which I considered not detailed enough, or Donelson's (*Piano Rebuilders' Handbook of Treble String Tensions [and Other Characteristics]*, published by James H. Donelson, RPT, 1977) which contain some inaccuracies and are so large as to be overkill, all left something to be desired. I decided to make a simple series of charts that would allow the average technician to calculate the string diameter based on a given tension and length, or to calculate the length based on a given tension and diameter. This can all be done by solving one simple division problem. For this article, I've put all the string formulas in spreadsheet form. This allows a non-mathematician to enter them onto a spreadsheet such as "Super Calc," "Lotus 1-2-3" or equivalent. The calculations are then done automatically.

In Donelson's format his Ic formulas did not operate too well. Perhaps at that time, before the advent of today's high-powered computers and a deeper understanding of how inharmonicity works, it was the best that could be done. Using the Ic formula:

(330 x d)^4/(T x L^2)

you can see how far off his results were.

The above Ic formula restated is: 330 times the steel wire diameter. Take the answer and square it twice. Then divide this answer by, the tension times the length squared. The final result is the inharmonicity constant for steel wires only.

Donelson's error also extended to the calculation of the higher partials of each note. He states, the Ic times the partial number squared will give you the inharmonicity at that partial. When, in fact, the correct formula is, the Ic times the partial number squared minus 1. Example: The Ic for A4 (Note 49) on a Steinway Model B is .6161925. Times the 8th partial squared (8 x 8 = 64 minus 1 = 63) = 38.8. However his calculation would come out Ic times 64 equals 39.4. The higher up the scale you go the larger the error becomes.

My charts are based on a reversal of the tension formula. To calculate tension use this formula:

(d x L x 27.5 x 2^((N-1)/12))^2/434

or

(d x L x 27.5 x Hz)^2/434.

Restated: Take (diameter times length times hertz) and square it. Then divide the answer by the constant 434. This gives you the tension in pounds for one string of that note.

To reverse the tension formula and obtain the power number, use this formula:

(T x 434)^.5/(27.5 x 22^((N-1)/12))

or

(T x 434)^.5/Hz

Restated: Take the square root of (tension times 434) then divide it by the hertz. This gives you the power number for that note.

In case you are not familiar with the designations used in the formulas, they are: T = tension. N = note number. L = speaking length. d = steel diameter. Hz = hertz or C.P.S. ^ = raise to the power. Ic = inharmonicity constant. ( ) = brackets, necessary as separators when using a spreadsheet.

It is my suggestion you avoid rescaling work on a fine piano that has a history of 75 years or more using the same wire sizes throughout. However, companies which are constantly revising their scales and have not reached their zenith and those pianos that were poorly scaled in the first place, are in my opinion fair game for rescaling.

To find the diameter of a given note at the tension you selected, divide the power number by the speaking length. Example: Note 88 at 140 lbs. has a Pn of .05889 and speaking length of 1.9 inches. .05889 divided by 1.9 equals .031 (or #13 steel wire)

Generally, the tension on the average piano may be in the mid tension range. Tension range examples: Low Tension (in pounds): 140 low tenor to 120 high treble. Mid Tension: 165 low tenor to 150 high treble. High Tension: 190 low tenor to 170 high treble. These tension ranges may vary 10 pounds or so either way.

A breaking point percent (BP%) of around 33% is desirable. Start at the first steel wire at the left and proceed up the scale until you find a reasonable size steel wire at a reasonable tension that after calculation gives you a BP% of 33%.

To calculate BP% use this formula:

T/(930 x d^1.667)

Or, in other words, divide the tension by the constant, 930, times the steel-wire diameter raised to the 1.667.

Once you have your starting point, calculate the tension from there to the top of the treble. Any notes that remain to the left of your starting point should be filled in by diameter increases of not more than one full size.

These charts may be used to adjust speaking lengths when bridge work is done. To find the speaking length at a given tension, divide the Pn by the steel wire diameter.

Continued on Next Page

The Steve Fairchild Treble String Charts

NOTE	POUNDS	Power number
N= 21	T= 120	Pn= 2.61388
N= 21	T= 125	Pn= 2.66778
N= 21	T= 130	Pn= 2.72062
N= 21	T= 135	Pn= 2.77244
N= 21	T= 140	Pn= 2.82332
N= 21	T= 145	Pn= 2.87329
N= 21	T= 150	Pn= 2.92241
N= 21	T= 155	Pn= 2.97072
N= 21	T= 160	Pn= 3.01825
N= 21	T= 165	Pn= 3.06505
N= 21	T= 170	Pn= 3.11114
N= 21	T= 175	Pn= 3.15656
N= 21	T= 180	Pn= 3.20134
N= 21	T= 185	Pn= 3.24550
N= 21	T= 190	Pn= 3.28906

NOTE	POUNDS	Power number
N= 22	T= 120	Pn= 2.46718
N= 22	T= 125	Pn= 2.51805
N= 22	T= 130	Pn= 2.56792
N= 22	T= 135	Pn= 2.61684
N= 22	T= 140	Pn= 2.66486
N= 22	T= 145	Pn= 2.71202
N= 22	T= 150	Pn= 2.75839
N= 22	T= 155	Pn= 2.80398
N= 22	T= 160	Pn= 2.84885
N= 22	T= 165	Pn= 2.89302
N= 22	T= 170	Pn= 2.93653
N= 22	T= 175	Pn= 2.97940
N= 22	T= 180	Pn= 3.02166
N= 22	T= 185	Pn= 3.06334
N= 22	T= 190	Pn= 3.10446

NOTE	POUNDS	Power number
N= 23	T= 120	Pn= 2.32870
N= 23	T= 125	Pn= 2.37672
N= 23	T= 130	Pn= 2.42379
N= 23	T= 135	Pn= 2.46996
N= 23	T= 140	Pn= 2.51529
N= 23	T= 145	Pn= 2.55981
N= 23	T= 150	Pn= 2.60357
N= 23	T= 155	Pn= 2.64661
N= 23	T= 160	Pn= 2.68896
N= 23	T= 165	Pn= 2.73065
N= 23	T= 170	Pn= 2.77171
N= 23	T= 175	Pn= 2.81218
N= 23	T= 180	Pn= 2.85207
N= 23	T= 185	Pn= 2.89141
N= 23	T= 190	Pn= 2.93022

NOTE	POUNDS	Power number
N= 24	T= 120	Pn= 2.19800
N= 24	T= 125	Pn= 2.24333
N= 24	T= 130	Pn= 2.28776
N= 24	T= 135	Pn= 2.33134
N= 24	T= 140	Pn= 2.37412
N= 24	T= 145	Pn= 2.41614
N= 24	T= 150	Pn= 2.45744
N= 24	T= 155	Pn= 2.49807
N= 24	T= 160	Pn= 2.53804
N= 24	T= 165	Pn= 2.57739
N= 24	T= 170	Pn= 2.61615
N= 24	T= 175	Pn= 2.65434
N= 24	T= 180	Pn= 2.69200
N= 24	T= 185	Pn= 2.72913
N= 24	T= 190	Pn= 2.76576

NOTE	POUNDS	Power number
N= 25	T= 120	Pn= 2.07464
N= 25	T= 125	Pn= 2.11742
N= 25	T= 130	Pn= 2.15935
N= 25	T= 135	Pn= 2.20049
N= 25	T= 140	Pn= 2.24087
N= 25	T= 145	Pn= 2.28053
N= 25	T= 150	Pn= 2.31952
N= 25	T= 155	Pn= 2.35786
N= 25	T= 160	Pn= 2.39559
N= 25	T= 165	Pn= 2.43273
N= 25	T= 170	Pn= 2.46932
N= 25	T= 175	Pn= 2.50537
N= 25	T= 180	Pn= 2.54091
N= 25	T= 185	Pn= 2.57595
N= 25	T= 190	Pn= 2.61053

NOTE	POUNDS	Power number
N= 26	T= 120	Pn= 1.95820
N= 26	T= 125	Pn= 1.99858
N= 26	T= 130	Pn= 2.03816
N= 26	T= 135	Pn= 2.07698
N= 26	T= 140	Pn= 2.11510
N= 26	T= 145	Pn= 2.15254
N= 26	T= 150	Pn= 2.18933
N= 26	T= 155	Pn= 2.22552
N= 26	T= 160	Pn= 2.26113
N= 26	T= 165	Pn= 2.29619
N= 26	T= 170	Pn= 2.33072
N= 26	T= 175	Pn= 2.36475
N= 26	T= 180	Pn= 2.39829
N= 26	T= 185	Pn= 2.43138
N= 26	T= 190	Pn= 2.46401

NOTE	POUNDS	Power number
N= 27	T= 120	Pn= 1.84829
N= 27	T= 125	Pn= 1.88641
N= 27	T= 130	Pn= 1.92377
N= 27	T= 135	Pn= 1.96041
N= 27	T= 140	Pn= 1.99639
N= 27	T= 145	Pn= 2.03172
N= 27	T= 150	Pn= 2.06646
N= 27	T= 155	Pn= 2.10061
N= 27	T= 160	Pn= 2.13423
N= 27	T= 165	Pn= 2.16732
N= 27	T= 170	Pn= 2.19991
N= 27	T= 175	Pn= 2.23203
N= 27	T= 180	Pn= 2.26369
N= 27	T= 185	Pn= 2.29491
N= 27	T= 190	Pn= 2.32572

NOTE	POUNDS	Power number
N= 28	T= 120	Pn= 1.74456
N= 28	T= 125	Pn= 1.78053
N= 28	T= 130	Pn= 1.81579
N= 28	T= 135	Pn= 1.85038
N= 28	T= 140	Pn= 1.88434
N= 28	T= 145	Pn= 1.91769
N= 28	T= 150	Pn= 1.95047
N= 28	T= 155	Pn= 1.98272
N= 28	T= 160	Pn= 2.01444
N= 28	T= 165	Pn= 2.04568
N= 28	T= 170	Pn= 2.07644
N= 28	T= 175	Pn= 2.10675
N= 28	T= 180	Pn= 2.13664
N= 28	T= 185	Pn= 2.16611
N= 28	T= 190	Pn= 2.19519

NOTE	POUNDS	Power number
N= 29	T= 120	Pn= 1.64664
N= 29	T= 125	Pn= 1.68060
N= 29	T= 130	Pn= 1.71388
N= 29	T= 135	Pn= 1.74653
N= 29	T= 140	Pn= 1.77858
N= 29	T= 145	Pn= 1.81006
N= 29	T= 150	Pn= 1.84100
N= 29	T= 155	Pn= 1.87143
N= 29	T= 160	Pn= 1.90138
N= 29	T= 165	Pn= 1.93086
N= 29	T= 170	Pn= 1.95990
N= 29	T= 175	Pn= 1.98851
N= 29	T= 180	Pn= 2.01672
N= 29	T= 185	Pn= 2.04454
N= 29	T= 190	Pn= 2.07198

NOTE	POUNDS	Power number
N= 30	T= 120	Pn= 1.55422
N= 30	T= 125	Pn= 1.58627
N= 30	T= 130	Pn= 1.61769
N= 30	T= 135	Pn= 1.64850
N= 30	T= 140	Pn= 1.67875
N= 30	T= 145	Pn= 1.70847
N= 30	T= 150	Pn= 1.73768
N= 30	T= 155	Pn= 1.76640
N= 30	T= 160	Pn= 1.79466
N= 30	T= 165	Pn= 1.82249
N= 30	T= 170	Pn= 1.84990
N= 30	T= 175	Pn= 1.87690
N= 30	T= 180	Pn= 1.90353
N= 30	T= 185	Pn= 1.92978
N= 30	T= 190	Pn= 1.95569

NOTE	POUNDS	Power number
N= 31	T= 120	Pn= 1.46699
N= 31	T= 125	Pn= 1.49724
N= 31	T= 130	Pn= 1.52689
N= 31	T= 135	Pn= 1.55598
N= 31	T= 140	Pn= 1.58453
N= 31	T= 145	Pn= 1.61258
N= 31	T= 150	Pn= 1.64015
N= 31	T= 155	Pn= 1.66726
N= 31	T= 160	Pn= 1.69394
N= 31	T= 165	Pn= 1.72020
N= 31	T= 170	Pn= 1.74607
N= 31	T= 175	Pn= 1.77156
N= 31	T= 180	Pn= 1.79669
N= 31	T= 185	Pn= 1.82147
N= 31	T= 190	Pn= 1.84592

NOTE	POUNDS	Power number
N= 32	T= 120	Pn= 1.38466
N= 32	T= 125	Pn= 1.41321
N= 32	T= 130	Pn= 1.44120
N= 32	T= 135	Pn= 1.46865
N= 32	T= 140	Pn= 1.49560
N= 32	T= 145	Pn= 1.52207
N= 32	T= 150	Pn= 1.54809
N= 32	T= 155	Pn= 1.57368
N= 32	T= 160	Pn= 1.59886
N= 32	T= 165	Pn= 1.62365
N= 32	T= 170	Pn= 1.64807
N= 32	T= 175	Pn= 1.67213
N= 32	T= 180	Pn= 1.69585
N= 32	T= 185	Pn= 1.71924
N= 32	T= 190	Pn= 1.74232

NOTE	POUNDS	Power number
N= 33	T= 120	Pn= 1.30694
N= 33	T= 125	Pn= 1.33389
N= 33	T= 130	Pn= 1.36031
N= 33	T= 135	Pn= 1.38622
N= 33	T= 140	Pn= 1.41166
N= 33	T= 145	Pn= 1.43665
N= 33	T= 150	Pn= 1.46120
N= 33	T= 155	Pn= 1.48536
N= 33	T= 160	Pn= 1.50913
N= 33	T= 165	Pn= 1.53252
N= 33	T= 170	Pn= 1.55557
N= 33	T= 175	Pn= 1.57828
N= 33	T= 180	Pn= 1.60067
N= 33	T= 185	Pn= 1.62275
N= 33	T= 190	Pn= 1.64453

NOTE	POUNDS	Power number
N= 34	T= 120	Pn= 1.23359
N= 34	T= 125	Pn= 1.25903
N= 34	T= 130	Pn= 1.28396
N= 34	T= 135	Pn= 1.30842
N= 34	T= 140	Pn= 1.33243
N= 34	T= 145	Pn= 1.35601
N= 34	T= 150	Pn= 1.37919
N= 34	T= 155	Pn= 1.40199
N= 34	T= 160	Pn= 1.42443
N= 34	T= 165	Pn= 1.44651
N= 34	T= 170	Pn= 1.46826
N= 34	T= 175	Pn= 1.48970
N= 34	T= 180	Pn= 1.51083
N= 34	T= 185	Pn= 1.53167
N= 34	T= 190	Pn= 1.55223

UNDS	Power number	NOTE
N= 35	T= 120	Pn= 1.16435
N= 35	T= 125	Pn= 1.18836
N= 35	T= 130	Pn= 1.21190
N= 35	T= 135	Pn= 1.23498
N= 35	T= 140	Pn= 1.25764
N= 35	T= 145	Pn= 1.27991
N= 35	T= 150	Pn= 1.30179
N= 35	T= 155	Pn= 1.32330
N= 35	T= 160	Pn= 1.34448
N= 35	T= 165	Pn= 1.36532
N= 35	T= 170	Pn= 1.38586
N= 35	T= 175	Pn= 1.40609
N= 35	T= 180	Pn= 1.42603
N= 35	T= 185	Pn= 1.44571
N= 35	T= 190	Pn= 1.46511

POUNDS	Power number	
N= 36	T= 120	Pn= 1.09900
N= 36	T= 125	Pn= 1.12166
N= 36	T= 130	Pn= 1.14388
N= 36	T= 135	Pn= 1.16567
N= 36	T= 140	Pn= 1.18706
N= 36	T= 145	Pn= 1.20807
N= 36	T= 150	Pn= 1.22872
N= 36	T= 155	Pn= 1.24903
N= 36	T= 160	Pn= 1.26902
N= 36	T= 165	Pn= 1.28869
N= 36	T= 170	Pn= 1.30807
N= 36	T= 175	Pn= 1.32717
N= 36	T= 180	Pn= 1.34600
N= 36	T= 185	Pn= 1.36456
N= 36	T= 190	Pn= 1.38288

Continued on Next Page

The Steve Fairchild Treble String Charts

NOTE	POUNDS	Power number
N= 37	T= 120	Pn= 1.03732
N= 37	T= 125	Pn= 1.05871
N= 37	T= 130	Pn= 1.07968
N= 37	T= 135	Pn= 1.10024
N= 37	T= 140	Pn= 1.12043
N= 37	T= 145	Pn= 1.14027
N= 37	T= 150	Pn= 1.15976
N= 37	T= 155	Pn= 1.17893
N= 37	T= 160	Pn= 1.19779
N= 37	T= 165	Pn= 1.21637
N= 37	T= 170	Pn= 1.23466
N= 37	T= 175	Pn= 1.25268
N= 37	T= 180	Pn= 1.27045
N= 37	T= 185	Pn= 1.28798
N= 37	T= 190	Pn= 1.30527

NOTE	POUNDS	Power number
N= 38	T= 120	Pn= .97910
N= 38	T= 125	Pn= .99929
N= 38	T= 130	Pn= 1.01908
N= 38	T= 135	Pn= 1.03849
N= 38	T= 140	Pn= 1.05755
N= 38	T= 145	Pn= 1.07627
N= 38	T= 150	Pn= 1.09467
N= 38	T= 155	Pn= 1.11276
N= 38	T= 160	Pn= 1.13057
N= 38	T= 165	Pn= 1.14810
N= 38	T= 170	Pn= 1.16536
N= 38	T= 175	Pn= 1.18238
N= 38	T= 180	Pn= 1.19915
N= 38	T= 185	Pn= 1.21569
N= 38	T= 190	Pn= 1.23201

NOTE	POUNDS	Power number
N= 39	T= 120	Pn= .92415
N= 39	T= 125	Pn= .94320
N= 39	T= 130	Pn= .96188
N= 39	T= 135	Pn= .98021
N= 39	T= 140	Pn= .99819
N= 39	T= 145	Pn= 1.01586
N= 39	T= 150	Pn= 1.03323
N= 39	T= 155	Pn= 1.05031
N= 39	T= 160	Pn= 1.06711
N= 39	T= 165	Pn= 1.08366
N= 39	T= 170	Pn= 1.09996
N= 39	T= 175	Pn= 1.11601
N= 39	T= 180	Pn= 1.13184
N= 39	T= 185	Pn= 1.14746
N= 39	T= 190	Pn= 1.16286

NOTE	POUNDS	Power number
N= 40	T= 120	Pn= .87228
N= 40	T= 125	Pn= .89027
N= 40	T= 130	Pn= .90790
N= 40	T= 135	Pn= .92519
N= 40	T= 140	Pn= .94217
N= 40	T= 145	Pn= .95885
N= 40	T= 150	Pn= .97524
N= 40	T= 155	Pn= .99136
N= 40	T= 160	Pn= 1.00722
N= 40	T= 165	Pn= 1.02284
N= 40	T= 170	Pn= 1.03822
N= 40	T= 175	Pn= 1.05338
N= 40	T= 180	Pn= 1.06832
N= 40	T= 185	Pn= 1.08306
N= 40	T= 190	Pn= 1.09759

NOTE	POUNDS	Power number
N= 41	T= 120	Pn= .82332
N= 41	T= 125	Pn= .84030
N= 41	T= 130	Pn= .85694
N= 41	T= 135	Pn= .87326
N= 41	T= 140	Pn= .88929
N= 41	T= 145	Pn= .90503
N= 41	T= 150	Pn= .92050
N= 41	T= 155	Pn= .93572
N= 41	T= 160	Pn= .95069
N= 41	T= 165	Pn= .96543
N= 41	T= 170	Pn= .97995
N= 41	T= 175	Pn= .99426
N= 41	T= 180	Pn= 1.00836
N= 41	T= 185	Pn= 1.02227
N= 41	T= 190	Pn= 1.03599

NOTE	POUNDS	Power number
N= 42	T= 120	Pn= .77711
N= 42	T= 125	Pn= .79314
N= 42	T= 130	Pn= .80884
N= 42	T= 135	Pn= .82425
N= 42	T= 140	Pn= .83938
N= 42	T= 145	Pn= .85423
N= 42	T= 150	Pn= .86884
N= 42	T= 155	Pn= .88320
N= 42	T= 160	Pn= .89733
N= 42	T= 165	Pn= .91124
N= 42	T= 170	Pn= .92495
N= 42	T= 175	Pn= .93845
N= 42	T= 180	Pn= .95176
N= 42	T= 185	Pn= .96489
N= 42	T= 190	Pn= .97784

NOTE	POUNDS	Power number
N= 43	T= 120	Pn= .73350
N= 43	T= 125	Pn= .74862
N= 43	T= 130	Pn= .76345
N= 43	T= 135	Pn= .77799
N= 43	T= 140	Pn= .79227
N= 43	T= 145	Pn= .80629
N= 43	T= 150	Pn= .82007
N= 43	T= 155	Pn= .83363
N= 43	T= 160	Pn= .84697
N= 43	T= 165	Pn= .86010
N= 43	T= 170	Pn= .87303
N= 43	T= 175	Pn= .88578
N= 43	T= 180	Pn= .89835
N= 43	T= 185	Pn= .91074
N= 43	T= 190	Pn= .92296

NOTE	POUNDS	Power number
N= 44	T= 120	Pn= .69233
N= 44	T= 125	Pn= .70660
N= 44	T= 130	Pn= .72060
N= 44	T= 135	Pn= .73432
N= 44	T= 140	Pn= .74780
N= 44	T= 145	Pn= .76104
N= 44	T= 150	Pn= .77405
N= 44	T= 155	Pn= .78684
N= 44	T= 160	Pn= .79943
N= 44	T= 165	Pn= .81183
N= 44	T= 170	Pn= .82404
N= 44	T= 175	Pn= .83607
N= 44	T= 180	Pn= .84793
N= 44	T= 185	Pn= .85962
N= 44	T= 190	Pn= .87116

NOTE	POUNDS	Power number
N= 45	T= 120	Pn= .65347
N= 45	T= 125	Pn= .66695
N= 45	T= 130	Pn= .68015
N= 45	T= 135	Pn= .69311
N= 45	T= 140	Pn= .70583
N= 45	T= 145	Pn= .71832
N= 45	T= 150	Pn= .73060
N= 45	T= 155	Pn= .74268
N= 45	T= 160	Pn= .75456
N= 45	T= 165	Pn= .76626
N= 45	T= 170	Pn= .77779
N= 45	T= 175	Pn= .78914
N= 45	T= 180	Pn= .80033
N= 45	T= 185	Pn= .81137
N= 45	T= 190	Pn= .82227

NOTE	POUNDS	Power number
N= 46	T= 120	Pn= .61679
N= 46	T= 125	Pn= .62951
N= 46	T= 130	Pn= .64198
N= 46	T= 135	Pn= .65421
N= 46	T= 140	Pn= .66621
N= 46	T= 145	Pn= .67801
N= 46	T= 150	Pn= .68960
N= 46	T= 155	Pn= .70100
N= 46	T= 160	Pn= .71221
N= 46	T= 165	Pn= .72326
N= 46	T= 170	Pn= .73413
N= 46	T= 175	Pn= .74485
N= 46	T= 180	Pn= .75542
N= 46	T= 185	Pn= .76584
N= 46	T= 190	Pn= .77612

NOTE	POUNDS	Power number
N= 47	T= 120	Pn= .58218
N= 47	T= 125	Pn= .59418
N= 47	T= 130	Pn= .60595
N= 47	T= 135	Pn= .61749
N= 47	T= 140	Pn= .62882
N= 47	T= 145	Pn= .63995
N= 47	T= 150	Pn= .65089
N= 47	T= 155	Pn= .66165
N= 47	T= 160	Pn= .67224
N= 47	T= 165	Pn= .68266
N= 47	T= 170	Pn= .69293
N= 47	T= 175	Pn= .70304
N= 47	T= 180	Pn= .71302
N= 47	T= 185	Pn= .72285
N= 47	T= 190	Pn= .73256

NOTE	POUNDS	Power number
N= 48	T= 120	Pn= .54950
N= 48	T= 125	Pn= .56083
N= 48	T= 130	Pn= .57194
N= 48	T= 135	Pn= .58283
N= 48	T= 140	Pn= .59353
N= 48	T= 145	Pn= .60403
N= 48	T= 150	Pn= .61436
N= 48	T= 155	Pn= .62452
N= 48	T= 160	Pn= .63451
N= 48	T= 165	Pn= .64435
N= 48	T= 170	Pn= .65404
N= 48	T= 175	Pn= .66359
N= 48	T= 180	Pn= .67300
N= 48	T= 185	Pn= .68228
N= 48	T= 190	Pn= .69144

NOTE	POUNDS	Power number
N= 49	T= 120	Pn= .51866
N= 49	T= 125	Pn= .52936
N= 49	T= 130	Pn= .53984
N= 49	T= 135	Pn= .55012
N= 49	T= 140	Pn= .56022
N= 49	T= 145	Pn= .57013
N= 49	T= 150	Pn= .57988
N= 49	T= 155	Pn= .58947
N= 49	T= 160	Pn= .59890
N= 49	T= 165	Pn= .60818
N= 49	T= 170	Pn= .61733
N= 49	T= 175	Pn= .62634
N= 49	T= 180	Pn= .63523
N= 49	T= 185	Pn= .64399
N= 49	T= 190	Pn= .65263

NOTE	POUNDS	Power number
N= 50	T= 120	Pn= .48955
N= 50	T= 125	Pn= .49964
N= 50	T= 130	Pn= .50954
N= 50	T= 135	Pn= .51925
N= 50	T= 140	Pn= .52877
N= 50	T= 145	Pn= .53813
N= 50	T= 150	Pn= .54733
N= 50	T= 155	Pn= .55638
N= 50	T= 160	Pn= .56528
N= 50	T= 165	Pn= .57405
N= 50	T= 170	Pn= .58268
N= 50	T= 175	Pn= .59119
N= 50	T= 180	Pn= .59957
N= 50	T= 185	Pn= .60784
N= 50	T= 190	Pn= .61600

NOTE	POUNDS	Power number
N= 51	T= 120	Pn= .46207
N= 51	T= 125	Pn= .47160
N= 51	T= 130	Pn= .48094
N= 51	T= 135	Pn= .49010
N= 51	T= 140	Pn= .49910
N= 51	T= 145	Pn= .50793
N= 51	T= 150	Pn= .51661
N= 51	T= 155	Pn= .52515
N= 51	T= 160	Pn= .53356
N= 51	T= 165	Pn= .54183
N= 51	T= 170	Pn= .54998
N= 51	T= 175	Pn= .55801
N= 51	T= 180	Pn= .56592
N= 51	T= 185	Pn= .57373
N= 51	T= 190	Pn= .58143

NOTE	POUNDS	Power number
N= 52	T= 120	Pn= .43614
N= 52	T= 125	Pn= .44513
N= 52	T= 130	Pn= .45395
N= 52	T= 135	Pn= .46260
N= 52	T= 140	Pn= .47108
N= 52	T= 145	Pn= .47942
N= 52	T= 150	Pn= .48762
N= 52	T= 155	Pn= .49568
N= 52	T= 160	Pn= .50361
N= 52	T= 165	Pn= .51142
N= 52	T= 170	Pn= .51911
N= 52	T= 175	Pn= .52669
N= 52	T= 180	Pn= .53416
N= 52	T= 185	Pn= .54153
N= 52	T= 190	Pn= .54880

Continued on Next Page

The Steve Fairchild Treble String Charts

NOTE	POUNDS	Power number
N= 53	T= 120	Pn= .41166
N= 53	T= 125	Pn= .42015
N= 53	T= 130	Pn= .42847
N= 53	T= 135	Pn= .43663
N= 53	T= 140	Pn= .44464
N= 53	T= 145	Pn= .45251
N= 53	T= 150	Pn= .46025
N= 53	T= 155	Pn= .46786
N= 53	T= 160	Pn= .47534
N= 53	T= 165	Pn= .48272
N= 53	T= 170	Pn= .48997
N= 53	T= 175	Pn= .49713
N= 53	T= 180	Pn= .50418
N= 53	T= 185	Pn= .51113
N= 53	T= 190	Pn= .51800

NOTE	POUNDS	Power number
N= 54	T= 120	Pn= .38856
N= 54	T= 125	Pn= .39657
N= 54	T= 130	Pn= .40442
N= 54	T= 135	Pn= .41213
N= 54	T= 140	Pn= .41969
N= 54	T= 145	Pn= .42712
N= 54	T= 150	Pn= .43442
N= 54	T= 155	Pn= .44160
N= 54	T= 160	Pn= .44867
N= 54	T= 165	Pn= .45562
N= 54	T= 170	Pn= .46247
N= 54	T= 175	Pn= .46923
N= 54	T= 180	Pn= .47588
N= 54	T= 185	Pn= .48245
N= 54	T= 190	Pn= .48892

NOTE	POUNDS	Power number
N= 55	T= 120	Pn= .36675
N= 55	T= 125	Pn= .37431
N= 55	T= 130	Pn= .38172
N= 55	T= 135	Pn= .38900
N= 55	T= 140	Pn= .39613
N= 55	T= 145	Pn= .40314
N= 55	T= 150	Pn= .41004
N= 55	T= 155	Pn= .41681
N= 55	T= 160	Pn= .42348
N= 55	T= 165	Pn= .43005
N= 55	T= 170	Pn= .43652
N= 55	T= 175	Pn= .44289
N= 55	T= 180	Pn= .44917
N= 55	T= 185	Pn= .45537
N= 55	T= 190	Pn= .46148

NOTE	POUNDS	Power number
N= 56	T= 120	Pn= .34616
N= 56	T= 125	Pn= .35330
N= 56	T= 130	Pn= .36030
N= 56	T= 135	Pn= .36716
N= 56	T= 140	Pn= .37390
N= 56	T= 145	Pn= .38052
N= 56	T= 150	Pn= .38702
N= 56	T= 155	Pn= .39342
N= 56	T= 160	Pn= .39972
N= 56	T= 165	Pn= .40591
N= 56	T= 170	Pn= .41202
N= 56	T= 175	Pn= .41803
N= 56	T= 180	Pn= .42396
N= 56	T= 185	Pn= .42981
N= 56	T= 190	Pn= .43558

NOTE	POUNDS	Power number
N= 57	T= 120	Pn= .32674
N= 57	T= 125	Pn= .33347
N= 57	T= 130	Pn= .34008
N= 57	T= 135	Pn= .34656
N= 57	T= 140	Pn= .35291
N= 57	T= 145	Pn= .35916
N= 57	T= 150	Pn= .36530
N= 57	T= 155	Pn= .37134
N= 57	T= 160	Pn= .37728
N= 57	T= 165	Pn= .38313
N= 57	T= 170	Pn= .38889
N= 57	T= 175	Pn= .39457
N= 57	T= 180	Pn= .40017
N= 57	T= 185	Pn= .40569
N= 57	T= 190	Pn= .41113

NOTE	POUNDS	Power number
N= 58	T= 120	Pn= .30840
N= 58	T= 125	Pn= .31476
N= 58	T= 130	Pn= .32099
N= 58	T= 135	Pn= .32710
N= 58	T= 140	Pn= .33311
N= 58	T= 145	Pn= .33900
N= 58	T= 150	Pn= .34480
N= 58	T= 155	Pn= .35050
N= 58	T= 160	Pn= .35611
N= 58	T= 165	Pn= .36163
N= 58	T= 170	Pn= .36707
N= 58	T= 175	Pn= .37242
N= 58	T= 180	Pn= .37771
N= 58	T= 185	Pn= .38292
N= 58	T= 190	Pn= .38806

NOTE	POUNDS	Power number
N= 59	T= 120	Pn= .29109
N= 59	T= 125	Pn= .29709
N= 59	T= 130	Pn= .30297
N= 59	T= 135	Pn= .30875
N= 59	T= 140	Pn= .31441
N= 59	T= 145	Pn= .31998
N= 59	T= 150	Pn= .32545
N= 59	T= 155	Pn= .33083
N= 59	T= 160	Pn= .33612
N= 59	T= 165	Pn= .34133
N= 59	T= 170	Pn= .34646
N= 59	T= 175	Pn= .35152
N= 59	T= 180	Pn= .35651
N= 59	T= 185	Pn= .36143
N= 59	T= 190	Pn= .36628

NOTE	POUNDS	Power number
N= 60	T= 120	Pn= .27475
N= 60	T= 125	Pn= .28042
N= 60	T= 130	Pn= .28597
N= 60	T= 135	Pn= .29142
N= 60	T= 140	Pn= .29676
N= 60	T= 145	Pn= .30202
N= 60	T= 150	Pn= .30718
N= 60	T= 155	Pn= .31226
N= 60	T= 160	Pn= .31725
N= 60	T= 165	Pn= .32217
N= 60	T= 170	Pn= .32702
N= 60	T= 175	Pn= .33179
N= 60	T= 180	Pn= .33650
N= 60	T= 185	Pn= .34114
N= 60	T= 190	Pn= .34572

NOTE	POUNDS	Power number
N= 61	T= 120	Pn= .25933
N= 61	T= 125	Pn= .26468
N= 61	T= 130	Pn= .26992
N= 61	T= 135	Pn= .27506
N= 61	T= 140	Pn= .28011
N= 61	T= 145	Pn= .28507
N= 61	T= 150	Pn= .28994
N= 61	T= 155	Pn= .29473
N= 61	T= 160	Pn= .29945
N= 61	T= 165	Pn= .30409
N= 61	T= 170	Pn= .30866
N= 61	T= 175	Pn= .31317
N= 61	T= 180	Pn= .31761
N= 61	T= 185	Pn= .32199
N= 61	T= 190	Pn= .32632

NOTE	POUNDS	Power number
N= 62	T= 120	Pn= .24477
N= 62	T= 125	Pn= .24982
N= 62	T= 130	Pn= .25477
N= 62	T= 135	Pn= .25962
N= 62	T= 140	Pn= .26439
N= 62	T= 145	Pn= .26907
N= 62	T= 150	Pn= .27367
N= 62	T= 155	Pn= .27819
N= 62	T= 160	Pn= .28264
N= 62	T= 165	Pn= .28702
N= 62	T= 170	Pn= .29134
N= 62	T= 175	Pn= .29559
N= 62	T= 180	Pn= .29979
N= 62	T= 185	Pn= .30392
N= 62	T= 190	Pn= .30800

NOTE	POUNDS	Power number
N= 63	T= 120	Pn= .23104
N= 63	T= 125	Pn= .23580
N= 63	T= 130	Pn= .24047
N= 63	T= 135	Pn= .24505
N= 63	T= 140	Pn= .24955
N= 63	T= 145	Pn= .25397
N= 63	T= 150	Pn= .25831
N= 63	T= 155	Pn= .26258
N= 63	T= 160	Pn= .26678
N= 63	T= 165	Pn= .27091
N= 63	T= 170	Pn= .27499
N= 63	T= 175	Pn= .27900
N= 63	T= 180	Pn= .28296
N= 63	T= 185	Pn= .28686
N= 63	T= 190	Pn= .29071

NOTE	POUNDS	Power number
N= 64	T= 120	Pn= .21807
N= 64	T= 125	Pn= .22257
N= 64	T= 130	Pn= .22697
N= 64	T= 135	Pn= .23130
N= 64	T= 140	Pn= .23554
N= 64	T= 145	Pn= .23971
N= 64	T= 150	Pn= .24381
N= 64	T= 155	Pn= .24784
N= 64	T= 160	Pn= .25181
N= 64	T= 165	Pn= .25571
N= 64	T= 170	Pn= .25955
N= 64	T= 175	Pn= .26334
N= 64	T= 180	Pn= .26708
N= 64	T= 185	Pn= .27076
N= 64	T= 190	Pn= .27440

NOTE	POUNDS	Power number
N= 65	T= 120	Pn= .20583
N= 65	T= 125	Pn= .21007
N= 65	T= 130	Pn= .21424
N= 65	T= 135	Pn= .21832
N= 65	T= 140	Pn= .22232
N= 65	T= 145	Pn= .22626
N= 65	T= 150	Pn= .23013
N= 65	T= 155	Pn= .23393
N= 65	T= 160	Pn= .23767
N= 65	T= 165	Pn= .24136
N= 65	T= 170	Pn= .24499
N= 65	T= 175	Pn= .24856
N= 65	T= 180	Pn= .25209
N= 65	T= 185	Pn= .25557
N= 65	T= 190	Pn= .25900

NOTE	POUNDS	Power number
N= 66	T= 120	Pn= .19428
N= 66	T= 125	Pn= .19828
N= 66	T= 130	Pn= .20221
N= 66	T= 135	Pn= .20606
N= 66	T= 140	Pn= .20984
N= 66	T= 145	Pn= .21356
N= 66	T= 150	Pn= .21721
N= 66	T= 155	Pn= .22080
N= 66	T= 160	Pn= .22433
N= 66	T= 165	Pn= .22781
N= 66	T= 170	Pn= .23124
N= 66	T= 175	Pn= .23461
N= 66	T= 180	Pn= .23794
N= 66	T= 185	Pn= .24122
N= 66	T= 190	Pn= .24446

NOTE	POUNDS	Power number
N= 67	T= 120	Pn= .18337
N= 67	T= 125	Pn= .18716
N= 67	T= 130	Pn= .19086
N= 67	T= 135	Pn= .19450
N= 67	T= 140	Pn= .19807
N= 67	T= 145	Pn= .20157
N= 67	T= 150	Pn= .20502
N= 67	T= 155	Pn= .20841
N= 67	T= 160	Pn= .21174
N= 67	T= 165	Pn= .21503
N= 67	T= 170	Pn= .21826
N= 67	T= 175	Pn= .22145
N= 67	T= 180	Pn= .22459
N= 67	T= 185	Pn= .22768
N= 67	T= 190	Pn= .23074

NOTE	POUNDS	Power number
N= 68	T= 120	Pn= .17308
N= 68	T= 125	Pn= .17665
N= 68	T= 130	Pn= .18015
N= 68	T= 135	Pn= .18358
N= 68	T= 140	Pn= .18695
N= 68	T= 145	Pn= .19026
N= 68	T= 150	Pn= .19351
N= 68	T= 155	Pn= .19671
N= 68	T= 160	Pn= .19986
N= 68	T= 165	Pn= .20296
N= 68	T= 170	Pn= .20601
N= 68	T= 175	Pn= .20902
N= 68	T= 180	Pn= .21198
N= 68	T= 185	Pn= .21491
N= 68	T= 190	Pn= .21779

Continued on Next Page

The Steve Fairchild Treble String Charts

NOTE	POUNDS	Power number
N= 69	T= 120	Pn= .16337
N= 69	T= 125	Pn= .16674
N= 69	T= 130	Pn= .17004
N= 69	T= 135	Pn= .17328
N= 69	T= 140	Pn= .17646
N= 69	T= 145	Pn= .17958
N= 69	T= 150	Pn= .18265
N= 69	T= 155	Pn= .18567
N= 69	T= 160	Pn= .18864
N= 69	T= 165	Pn= .19157
N= 69	T= 170	Pn= .19445
N= 69	T= 175	Pn= .19729
N= 69	T= 180	Pn= .20008
N= 69	T= 185	Pn= .20284
N= 69	T= 190	Pn= .20557

NOTE	POUNDS	Power number
N= 70	T= 120	Pn= .15420
N= 70	T= 125	Pn= .15738
N= 70	T= 130	Pn= .16049
N= 70	T= 135	Pn= .16355
N= 70	T= 140	Pn= .16655
N= 70	T= 145	Pn= .16950
N= 70	T= 150	Pn= .17240
N= 70	T= 155	Pn= .17525
N= 70	T= 160	Pn= .17805
N= 70	T= 165	Pn= .18081
N= 70	T= 170	Pn= .18353
N= 70	T= 175	Pn= .18621
N= 70	T= 180	Pn= .18885
N= 70	T= 185	Pn= .19146
N= 70	T= 190	Pn= .19403

NOTE	POUNDS	Power number
N= 71	T= 120	Pn= .14554
N= 71	T= 125	Pn= .14855
N= 71	T= 130	Pn= .15149
N= 71	T= 135	Pn= .15437
N= 71	T= 140	Pn= .15721
N= 71	T= 145	Pn= .15999
N= 71	T= 150	Pn= .16272
N= 71	T= 155	Pn= .16541
N= 71	T= 160	Pn= .16806
N= 71	T= 165	Pn= .17067
N= 71	T= 170	Pn= .17323
N= 71	T= 175	Pn= .17576
N= 71	T= 180	Pn= .17825
N= 71	T= 185	Pn= .18071
N= 71	T= 190	Pn= .18314

NOTE	POUNDS	Power number
N= 72	T= 120	Pn= .13738
N= 72	T= 125	Pn= .14021
N= 72	T= 130	Pn= .14298
N= 72	T= 135	Pn= .14571
N= 72	T= 140	Pn= .14838
N= 72	T= 145	Pn= .15101
N= 72	T= 150	Pn= .15359
N= 72	T= 155	Pn= .15613
N= 72	T= 160	Pn= .15863
N= 72	T= 165	Pn= .16109
N= 72	T= 170	Pn= .16351
N= 72	T= 175	Pn= .16590
N= 72	T= 180	Pn= .16825
N= 72	T= 185	Pn= .17057
N= 72	T= 190	Pn= .17286

NOTE	POUNDS	Power number
N= 73	T= 120	Pn= .12967
N= 73	T= 125	Pn= .13234
N= 73	T= 130	Pn= .13496
N= 73	T= 135	Pn= .13753
N= 73	T= 140	Pn= .14005
N= 73	T= 145	Pn= .14253
N= 73	T= 150	Pn= .14497
N= 73	T= 155	Pn= .14737
N= 73	T= 160	Pn= .14972
N= 73	T= 165	Pn= .15205
N= 73	T= 170	Pn= .15433
N= 73	T= 175	Pn= .15659
N= 73	T= 180	Pn= .15881
N= 73	T= 185	Pn= .16100
N= 73	T= 190	Pn= .16316

NOTE	POUNDS	Power number
N= 74	T= 120	Pn= .12239
N= 74	T= 125	Pn= .12491
N= 74	T= 130	Pn= .12738
N= 74	T= 135	Pn= .12981
N= 74	T= 140	Pn= .13219
N= 74	T= 145	Pn= .13453
N= 74	T= 150	Pn= .13683
N= 74	T= 155	Pn= .13910
N= 74	T= 160	Pn= .14132
N= 74	T= 165	Pn= .14351
N= 74	T= 170	Pn= .14567
N= 74	T= 175	Pn= .14780
N= 74	T= 180	Pn= .14989
N= 74	T= 185	Pn= .15196
N= 74	T= 190	Pn= .15400

NOTE	POUNDS	Power number
N= 75	T= 120	Pn= .11552
N= 75	T= 125	Pn= .11790
N= 75	T= 130	Pn= .12024
N= 75	T= 135	Pn= .12253
N= 75	T= 140	Pn= .12477
N= 75	T= 145	Pn= .12698
N= 75	T= 150	Pn= .12915
N= 75	T= 155	Pn= .13129
N= 75	T= 160	Pn= .13339
N= 75	T= 165	Pn= .13546
N= 75	T= 170	Pn= .13749
N= 75	T= 175	Pn= .13950
N= 75	T= 180	Pn= .14148
N= 75	T= 185	Pn= .14343
N= 75	T= 190	Pn= .14536

NOTE	POUNDS	Power number
N= 76	T= 120	Pn= .10903
N= 76	T= 125	Pn= .11128
N= 76	T= 130	Pn= .11349
N= 76	T= 135	Pn= .11565
N= 76	T= 140	Pn= .11777
N= 76	T= 145	Pn= .11986
N= 76	T= 150	Pn= .12190
N= 76	T= 155	Pn= .12392
N= 76	T= 160	Pn= .12590
N= 76	T= 165	Pn= .12785
N= 76	T= 170	Pn= .12978
N= 76	T= 175	Pn= .13167
N= 76	T= 180	Pn= .13354
N= 76	T= 185	Pn= .13538
N= 76	T= 190	Pn= .13720

NOTE	POUNDS	Power number
N= 77	T= 120	Pn= .10292
N= 77	T= 125	Pn= .10504
N= 77	T= 130	Pn= .10712
N= 77	T= 135	Pn= .10916
N= 77	T= 140	Pn= .11116
N= 77	T= 145	Pn= .11313
N= 77	T= 150	Pn= .11506
N= 77	T= 155	Pn= .11696
N= 77	T= 160	Pn= .11884
N= 77	T= 165	Pn= .12068
N= 77	T= 170	Pn= .12249
N= 77	T= 175	Pn= .12428
N= 77	T= 180	Pn= .12604
N= 77	T= 185	Pn= .12778
N= 77	T= 190	Pn= .12950

NOTE	POUNDS	Power number
N= 78	T= 120	Pn= .09714
N= 78	T= 125	Pn= .09914
N= 78	T= 130	Pn= .10111
N= 78	T= 135	Pn= .10303
N= 78	T= 140	Pn= .10492
N= 78	T= 145	Pn= .10678
N= 78	T= 150	Pn= .10860
N= 78	T= 155	Pn= .11040
N= 78	T= 160	Pn= .11217
N= 78	T= 165	Pn= .11391
N= 78	T= 170	Pn= .11562
N= 78	T= 175	Pn= .11731
N= 78	T= 180	Pn= .11897
N= 78	T= 185	Pn= .12061
N= 78	T= 190	Pn= .12223

NOTE	POUNDS	Power number
N= 79	T= 120	Pn= .09169
N= 79	T= 125	Pn= .09358
N= 79	T= 130	Pn= .09543
N= 79	T= 135	Pn= .09725
N= 79	T= 140	Pn= .09903
N= 79	T= 145	Pn= .10079
N= 79	T= 150	Pn= .10251
N= 79	T= 155	Pn= .10420
N= 79	T= 160	Pn= .10587
N= 79	T= 165	Pn= .10751
N= 79	T= 170	Pn= .10913
N= 79	T= 175	Pn= .11072
N= 79	T= 180	Pn= .11229
N= 79	T= 185	Pn= .11384
N= 79	T= 190	Pn= .11537

NOTE	POUNDS	Power number
N= 80	T= 120	Pn= .08654
N= 80	T= 125	Pn= .08833
N= 80	T= 130	Pn= .09007
N= 80	T= 135	Pn= .09179
N= 80	T= 140	Pn= .09347
N= 80	T= 145	Pn= .09513
N= 80	T= 150	Pn= .09676
N= 80	T= 155	Pn= .09836
N= 80	T= 160	Pn= .09993
N= 80	T= 165	Pn= .10148
N= 80	T= 170	Pn= .10300
N= 80	T= 175	Pn= .10451
N= 80	T= 180	Pn= .10599
N= 80	T= 185	Pn= .10745
N= 80	T= 190	Pn= .10890

NOTE	POUNDS	Power number
N= 81	T= 120	Pn= .08168
N= 81	T= 125	Pn= .08337
N= 81	T= 130	Pn= .08502
N= 81	T= 135	Pn= .08664
N= 81	T= 140	Pn= .08823
N= 81	T= 145	Pn= .08979
N= 81	T= 150	Pn= .09133
N= 81	T= 155	Pn= .09283
N= 81	T= 160	Pn= .09432
N= 81	T= 165	Pn= .09578
N= 81	T= 170	Pn= .09722
N= 81	T= 175	Pn= .09864
N= 81	T= 180	Pn= .10004
N= 81	T= 185	Pn= .10142
N= 81	T= 190	Pn= .10278

NOTE	POUNDS	Power number
N= 82	T= 120	Pn= .07710
N= 82	T= 125	Pn= .07869
N= 82	T= 130	Pn= .08025
N= 82	T= 135	Pn= .08178
N= 82	T= 140	Pn= .08328
N= 82	T= 145	Pn= .08475
N= 82	T= 150	Pn= .08620
N= 82	T= 155	Pn= .08762
N= 82	T= 160	Pn= .08903
N= 82	T= 165	Pn= .09041
N= 82	T= 170	Pn= .09177
N= 82	T= 175	Pn= .09311
N= 82	T= 180	Pn= .09443
N= 82	T= 185	Pn= .09573
N= 82	T= 190	Pn= .09701

NOTE	POUNDS	Power number
N= 83	T= 120	Pn= .07277
N= 83	T= 125	Pn= .07427
N= 83	T= 130	Pn= .07574
N= 83	T= 135	Pn= .07719
N= 83	T= 140	Pn= .07860
N= 83	T= 145	Pn= .07999
N= 83	T= 150	Pn= .08136
N= 83	T= 155	Pn= .08271
N= 83	T= 160	Pn= .08403
N= 83	T= 165	Pn= .08533
N= 83	T= 170	Pn= .08662
N= 83	T= 175	Pn= .08788
N= 83	T= 180	Pn= .08913
N= 83	T= 185	Pn= .09036
N= 83	T= 190	Pn= .09157

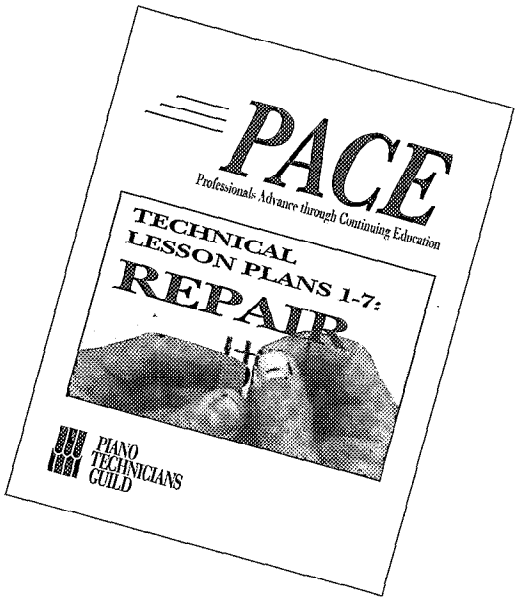
NOTE	POUNDS	Power number
N= 84	T= 120	Pn= .06869
N= 84	T= 125	Pn= .07010
N= 84	T= 130	Pn= .07149
N= 84	T= 135	Pn= .07285
N= 84	T= 140	Pn= .07419
N= 84	T= 145	Pn= .07550
N= 84	T= 150	Pn= .07680
N= 84	T= 155	Pn= .07806
N= 84	T= 160	Pn= .07931
N= 84	T= 165	Pn= .08054
N= 84	T= 170	Pn= .08175
N= 84	T= 175	Pn= .08295
N= 84	T= 180	Pn= .08412
N= 84	T= 185	Pn= .08529
N= 84	T= 190	Pn= .08643

Continued on Next Page

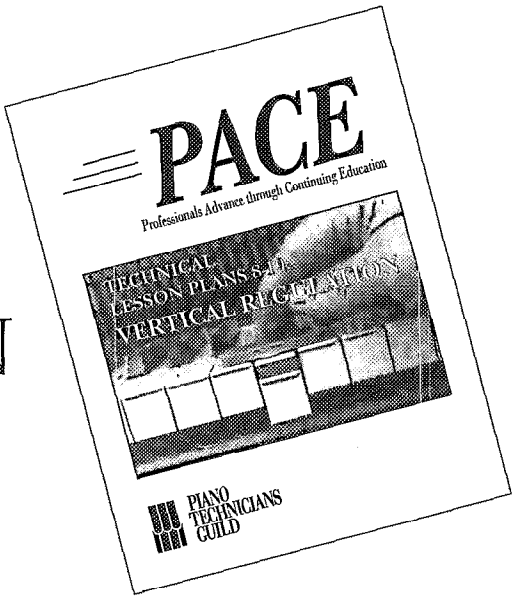
The Steve Fairchild Treble String Charts

NOTE	POUNDS	Power number	NOTE	POUNDS	Power number
N= 85	T= 120	Pn= .06483	N= 86	T= 120	Pn= .06119
N= 85	T= 125	Pn= .06617	N= 86	T= 125	Pn= .06246
N= 85	T= 130	Pn= .06748	N= 86	T= 130	Pn= .06369
N= 85	T= 135	Pn= .06877	N= 86	T= 135	Pn= .06491
N= 85	T= 140	Pn= .07003	N= 86	T= 140	Pn= .06610
N= 85	T= 145	Pn= .07127	N= 86	T= 145	Pn= .06727
N= 85	T= 150	Pn= .07248	N= 86	T= 150	Pn= .06842
N= 85	T= 155	Pn= .07368	N= 86	T= 155	Pn= .06955
N= 85	T= 160	Pn= .07486	N= 86	T= 160	Pn= .07066
N= 85	T= 165	Pn= .07602	N= 86	T= 165	Pn= .07176
N= 85	T= 170	Pn= .07717	N= 86	T= 170	Pn= .07284
N= 85	T= 175	Pn= .07829	N= 86	T= 175	Pn= .07390
N= 85	T= 180	Pn= .07940	N= 86	T= 180	Pn= .07495
N= 85	T= 185	Pn= .08050	N= 86	T= 185	Pn= .07598
N= 85	T= 190	Pn= .08158	N= 86	T= 190	Pn= .07700

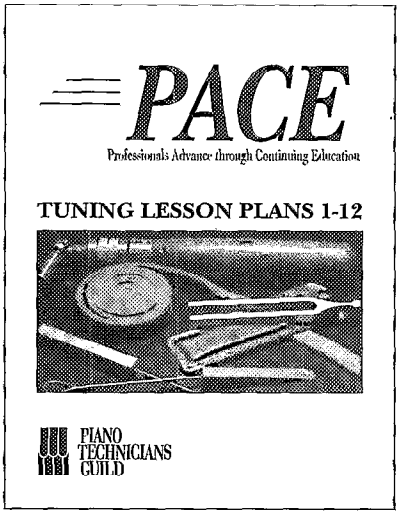
NOTE	POUNDS	Power number	NOTE	POUNDS	Power number
N= 87	T= 120	Pn= .05776	N= 88	T= 120	Pn= .05452
N= 87	T= 125	Pn= .05895	N= 88	T= 125	Pn= .05564
N= 87	T= 130	Pn= .06012	N= 88	T= 130	Pn= .05674
N= 87	T= 135	Pn= .06126	N= 88	T= 135	Pn= .05782
N= 87	T= 140	Pn= .06239	N= 88	T= 140	Pn= .05889
N= 87	T= 145	Pn= .06349	N= 88	T= 145	Pn= .05993
N= 87	T= 150	Pn= .06458	N= 88	T= 150	Pn= .06095
N= 87	T= 155	Pn= .06564	N= 88	T= 155	Pn= .06196
N= 87	T= 160	Pn= .06669	N= 88	T= 160	Pn= .06295
N= 87	T= 165	Pn= .06773	N= 88	T= 165	Pn= .06393
N= 87	T= 170	Pn= .06875	N= 88	T= 170	Pn= .06489
N= 87	T= 175	Pn= .06975	N= 88	T= 175	Pn= .06584
N= 87	T= 180	Pn= .07074	N= 88	T= 180	Pn= .06677
N= 87	T= 185	Pn= .07172	N= 88	T= 185	Pn= .06769
N= 87	T= 190	Pn= .07268	N= 88	T= 190	Pn= .06860



PACE
TECHNICAL LESSON PLANS 1-7
REPAIR



PACE
TECHNICAL LESSON PLANS 8-19
VERTICAL REGULATION



PACE
TUNING LESSON PLANS 1-12
TUNING

Also Available: Bound, reprinted articles from the *Piano Technicians Journal*

- DAMPERS, TRAPWORK & ACTION CENTERS
- GENERAL REPAIR — Reconditioning of Parts, Tools, Felt Work
- HAMMERS & TOUCHWEIGHT —Hammer Filing, Vertical Hammer Hanging, Hammer Boring & Shaping, Grand Hammer Hanging, Toughweight
- KEYS — Key Repairs, Key Bushing, Key Making, Ivory Work, Plastics

PACE Lesson Plan books and Reprint Kits are all available for $15 each, plus shipping and handling from the Piano Technicians Guild Home Office, 3930 Washington, Kansas City, Mo. 64111. Or by phoning (816) 753-7747, or fax (816) 531-0070.

PACE

Professionals Advance through Continuing Education

LESSON PLAN

Technical Lesson #29

Grand Regulation - Part 11: Adjusting Backcheck Angle & Checking Distance

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.

In Brief

This lesson will cover adjustment of the backcheck angle for reliable checking, followed by adjustment of the hammer checking distance.

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, their 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. Action models can also be used. Regulation adjustments, particularly repetition spring tension, should be fairly close.

Estimated Lesson Time

Approximately 1 1/2 hours.

Tools & Materials Participants Must Bring

For this lesson, participants should obtain the following tools:

- backcheck wire-bending tool, (tool with a notch in it for holding the wire while changing the angle of the head, not wire-bending pliers used for side-to-side spacing.)
- parallel jaw pliers
- selection of general regulating tools

Assigned Prior Reading for Participants

PTG Technical Exam Source Book, pg. II.1-II.2; July/1994 *PT Journal*, pgs. 32-34.

General Instructions

The function of the backcheck is to catch the hammer close to the strings as it rebounds. This speeds up repetition by allowing the jack to slip back under the knuckle before the key returns all the way to rest. Ideally, the backcheck should catch and hold the hammer tail reliably, and at roughly the same height, whether the key is played hard or softly. To do this, several things have to be correct:

1) The hammer tails have to be correctly shaped, of adequate length, and slightly roughened.

2) The backcheck leather must be in good condition; not worn, contaminated, or glazed.

3) The backchecks must be the correct height above the keys.

4) Backchecks must be aligned side-to-side to the hammer tails, and rotated square to the tails, for maximum contact area between the two.

5) The backcheck angle (sometimes called bevel) must be correct, so that the hammer tail will wedge against the backcheck with increasing force as the tail slips further into check.

6) The fore-and-aft position of the backcheck must be correct so that it catches the hammer as high as possible during rebound, but without dragging against the hammer tail as the hammer rises.

Items 1–3 are beyond the scope of this lesson, and should not be a problem if the pianos used for this lesson are in good condition. Item 4 was already covered in Lesson #24. Adjustment of backcheck angle and checking distance are described below.

Exercises

- Participants should evaluate the backcheck angle on their action models or pianos using the three tests of: consistent checking distance with varying playing force, the resistance felt as the hammer is pushed further into check, and observing the mating of tails and backchecks.
- To experience how angle affects checking, a single backcheck can be adjusted to stand more vertically as in Photo 1, then angled severely as in Photo 3. Repeat the three tests after each adjustment and note the results. Reset to the correct angle.
- Adjust one backcheck to catch the hammer as high as possible, using the drag test to check for adequate clearance with the hammer tail. Observe that there is still adequate contact between tail and backcheck to catch the hammer reliably on a soft blow.

Continued on Next Page

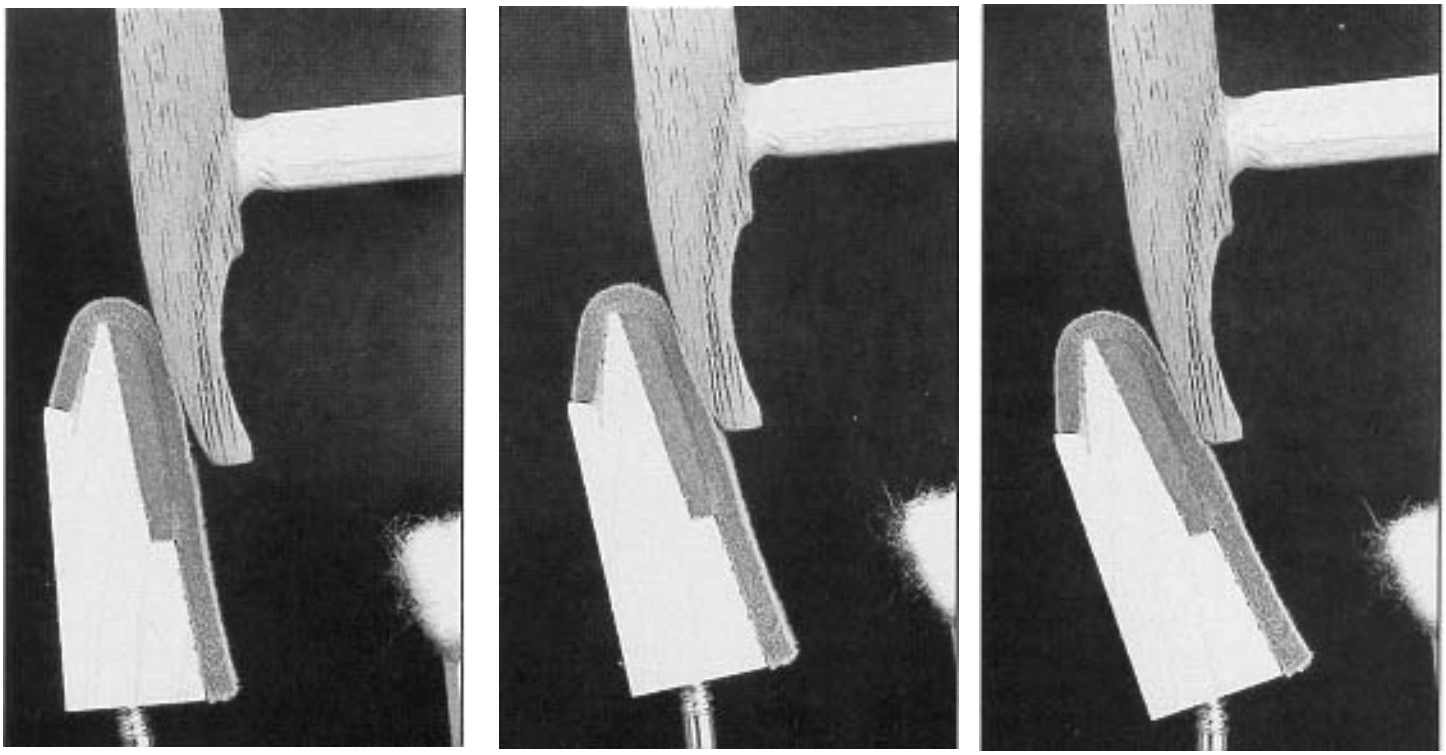


***Photo 1, left:** Backcheck angle too vertical; hammer slips too far into check on a hard blow. **Photo 2, center:** Backcheck angle correct; hammer checks at approximately the same distance on hard or soft blow. **Photo 3, right:** Backcheck angled too far; reduced contact area and dissimilar angles can cause hammer to bounce out of check on a soft blow.*

Evaluating the backcheck angle: The surfaces of the backcheck and hammer tail must wedge together to stop and hold the hammer. This wedging action results from the curvature of the hammer tail and the angle of the backcheck. Since hammer tail shapes vary, there is no single angle that can be applied to every action. However, the correct angle is very easy to determine using the following three tests, performed on a sample note with checking adjusted to 1/2" – 5/8":

1) Test checking distance under varying force: Play a key with increasing force, from very soft to very hard. Hammer checking distance should not increase by more than about 1/4" between a very soft blow and a very hard blow. If checking distance increases drastically as the key is played harder, the backcheck is probably standing up too straight, as in photo 1. Note: Overly-strong repetition springs can be a cause of poor checking on a very soft blow.

2) Test by feel: With the hammer in check, hold the key down firmly and push the hammer farther down into check with the other hand (action out of the piano). You should feel increasing resistance, and see the backcheck flex backwards as the hammer tail slips about 3/8" lower. If the hammer slips farther down very easily, the backcheck is probably too vertical as in photo 1. If it only slips down about 1/4" and then suddenly meets much higher resistance, the backcheck might be angled more than necessary as in photo 3.

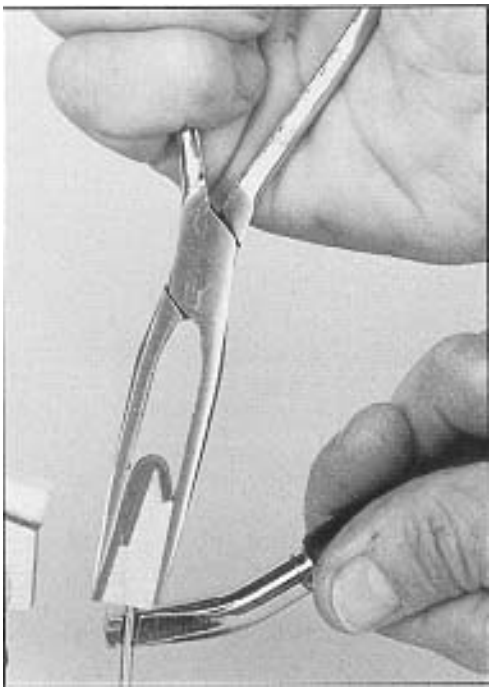
3) Visual test: With the hammer in check, hold the key down firmly and look at the mating surfaces of the backcheck and hammer tail. Compare to photos 1, 2, and 3.

Notice that in Photo 1, there is moderate contact area between the two, but it is high up on the straighter part of the tail, and the lower part of the tail curves away from contact with the backcheck. This tail will slide easily into check, but will not wedge much tighter against the backcheck as it slips lower. This situation is also less forgiving; checking distance changes rapidly with wear, and it is very touchy to adjust since the slightest bend changes the checking distance drastically.

- In Photo 2, the hammer tail has maximum contact with the backcheck. Because the backcheck is not angled excessively, the tail will slip easily into check on a soft blow, but will wedge tightly and not check lower on a hard blow. Adjustment of checking distance is easily done.
- In Photo 3, the severely angled backcheck contacts only the lower end of the hammer tail. The limited contact area and steep angle may cause the hammer to bounce off of the backcheck on a soft blow. Backcheck wear will also be greater.

The lengthy descriptions above are not meant to imply that backcheck angle is a difficult adjustment. As long as tail length and shape and backcheck height are correct, there will be a fairly wide range of backcheck angles that will work fine.

Note: Don't be too concerned if the first few hammers in the bass fail to check on a soft blow. This seems to be the result of the hammers rebounding too slowly off of the long single strings, so they are not forced down into the backchecks hard enough to check. You can prove this by moving a low bass hammer up to the upper bass; you should find that it checks easily there. Another useful demonstration is to press down slightly on a low bass string near the strike point. This extra stiffness usually causes the hammer to check more easily.



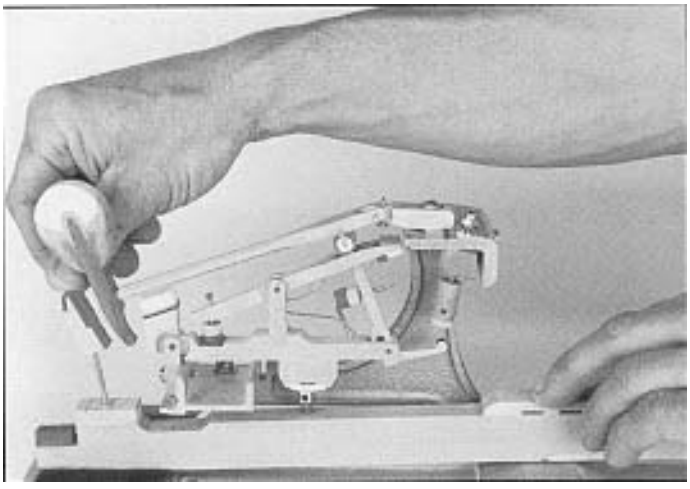
PACE

Professionals Advance through Continuing Education

Adjusting the backcheck angle: Adjust the backcheck angle by holding the wire stationary just below the head with a wire-bending tool, then tilting the head forward or backward with the fingers or parallel pliers. The goal is to make the wire bend just where it enters the head. This maintains the straightest wire, and minimizes changes in the fore-and-aft position of the backcheck while changing the angle.

A change in angle is seldom needed unless backchecks or hammers have been replaced. When it is necessary, adjust two or three samples per section, then adjust the others to match. A ruler can be laid flat against the wooden backs of the backcheck heads every so often to compare them to the samples.

Photo 4, left: Adjusting the backcheck angle.



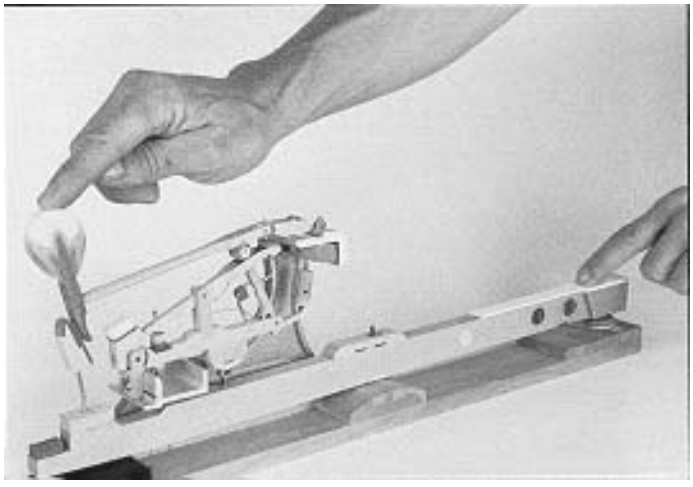


Photo 5, left: Adjust checking distance by nudging backchecks forward or back with the fingers. Photo 6, right: Test that the tail will not drag on the backcheck on the way up.

Adjusting checking distance: Most manufacturers specify a checking distance of 5/8" or slightly less. Others specify "as high as possible," the limiting factor being that if adjusted too far forward, the backchecks will drag against the hammer tails as the hammers rise.

Checking distance will usually be slightly different with the action in the piano than out. Therefore a typical procedure is to identify (or set) samples in the piano that check correctly. Then, with the action pulled part way out and supported on your knees *(or on the keybed mounted action support shown in Lesson #28)*, adjust the remainder to match the samples. Starting with a sample key, play the sample and three neighboring keys in sequence, holding them all in check. Visually compare the three to the sample, and adjust as needed. When these are correct, advance up the keyboard three more keys, using the top key from the previous set as your new sample. Adjustment is done simply by bending the backchecks forward or back with the fingers, as shown in Photo 5. Note that when bending a backcheck away from the tail, one hand holds pressure on the key button to prevent the key from lifting up in front.

Test for dragging: During a hard blow, the hammer lags behind the key somewhat due to compression of the wippen felt and knuckle, and because of hammer shank flexing. If clearance between the backchecks and hammer tails is minimal, this lag can cause the tails to drag against the backchecks as the hammer rises. The symptom is a very heavy feeling and great loss of power on a hard blow. To avoid this, always test your samples for dragging as shown in Photo 6. Repeat the test occasionally while adjusting the remaining backchecks.

To test for dragging, hold moderate pressure on the hammer with one finger while depressing the key with the other hand. Watch and feel that the hammer tail can rise past the backcheck without touching it. This simulates the lag that occurs during a hard blow. If there is contact, bend the backcheck away from the tail just enough to eliminate it.

Note: In some cases, even though the backcheck can be made to catch the hammer very high without dragging, only the bottom tip of the hammer tail will be engaging the backcheck. In this case, it is better to adjust checking lower to provide adequate contact area between tail and backcheck. PTJ

Troubleshooting Piano Problems, Part 2

By Ernie Juhn, RPT
Long Island Nassau Chapter

Third-Party Problems

This time I would like to explore a different category of trouble shooting. I call them "third-party complaints."

Here is a scenario: The little girl is taking piano lessons. The piano teacher comes to the house and remarks to the student that she does not like the way the middle of the piano sounds. As you know, things can get lost in the translation. What the little girl said to her mother was that the piano teacher complained about middle C. After all, middle C is the most popular note in the beginner's vocabulary. The tuner/technician comes to service the piano and is told by the customer that something is wrong with middle C. It is quite possible that, since nothing unusual is heard, the tuner may ask the customer to describe the problem a little more in detail. Quite often this brings on an embarrassing situation which may well lead to something which complicates matters even more. The customer may keep on striking the note and say repeatedly "don't you hear this? ... don't you hear this?" Unfortunately, I do not have a good and reliable solution to this problem. I know someone who cures problems of that nature by doing something almost similar to what the customer did: after "fixing" it, saying "there ..., now try it — any better?" There is a good chance that it will be fixed.

The Story Is True — The Names Have Been Withheld To Protect The Innocent.

A famous pianist likes his piano *very* brilliant, brittle, almost unbearably shrill. Why? Simple: his repertoire is such that perfect technique for fast runs and blinding repetition is essential. It so happens that our pianist is quite aware of the fact that the harder the hammer, the better the repetition and "faster" the action. (Remember the bouncing ball in last month's article?) So far so good. The other side of the coin, however, is that most likely the critics will complain about the tone quality of the piano. If the concert is to be televised or on radio, it will make matters even worse. There is even a possibility that the maker of the "famous" piano may complain about the way the instrument was prepared.

At this point I will say clearly that working for famous artists brings with it a certain dose of martyrdom. Trying to satisfy all parties is desirable but impossible. Often the "players" have to be evaluated. I have leveled with the pianist when I thought that it was the right thing to do, and I have taken the blame in other cases where it seemed necessary. When you represent a manufacturer the picture changes again. Priorities may change. In short, all-around satisfaction is a rare commodity.

Tuning Stability Problems

Complaints like "my piano goes out of tune as soon as the tuner leaves the house" have to be analyzed carefully. We also may come across some customers who have consulted many tuner-technicians (whether they tell us about it or not), because they are convinced that there a is problem with their piano. There well may be one, but on the other hand, there may not. Let us look at the problem from various standpoints. First, the customer's, assuming that he/she knows what "out of tune" means, and that we are dealing with dramatic changes. The first thing I would do is to determine *what* went out. If the unisons are fairly well intact, but the octaves are out, I would rule out loose tuning pins. After all, it is most unlikely for three tuning pins to slip down and stop slipping at the same pitch to form a good unison. If the entire unison is sharp, it is certain that we are not dealing with loose pins; no pin ever "slipped up!"

So what is going on? There is a good chance that the problem has to do with climatic changes — in certain parts of the country. If, on the other hand, the unisons are out, there are a couple of possibilities. The first and most obvious one would be loose tuning pins. Before jumping to conclusions, however, it might be a good idea to check up on the piano tuner who has been tuning the instrument. How does one do that? Well, it is fairly simple to determine how well the tuner "set" the pins. My method is to find a few fairly good unisons. A couple of hard test blows will soon reveal the stability of these notes. If this test reveals a suspicion about the quality of the tuner who worked on the piano in the past, I would still continue testing before jumping to conclusions. My next step is to tune some of these unisons myself and see how they stand up to my test blows. Quite often I have discovered that it was not at all the tuner who was at fault. The unisons went out after I tuned them as well. What happened?

Under certain conditions the strings do not "slide" smoothly over termination points. Places like the capo d' astro bar, pressure bar, etc., may cause more friction than desirable and, as a result of it, it is difficult to "set" it where needed. Very often we literally pull up too much or release more than we want to in order to get the string to "settle." This has often been referred to as the string not "rendering." Consequently, the string has a tendency to move later. I've found that a good way to remedy this situation is to apply some Liquid Wrench® (available also deodorized in hardware stores). Naturally, we have to be careful not to make it spill over into areas where it may do some damage, like near the tuning pins. It is a good idea to perform this treatment before the tuning and wait for a

few minutes before tuning the piano. You may be surprised how much easier it will be for you to "set" the pins. There's no need to do that at the bridge pins. I've found that area never to be the cause of this problem, simply because the polished steel moves rather freely over hardwood material — even without graphite. Some European piano makers did not even use graphite on their bridges for a long time.

A word about loose tuning pins. European and Japanese manufacturers tend to favor less torque resistance than American piano makers. The theory is that it is a lot easier to "manipulate" pins which are not so tight that one has to "brace" himself/herself against the keybed in order to turn the pins. I believe that as long as the pin remains in place even through climatic changes, it is tight enough.

And then there is the story of the moving pin block. Another theory many technicians subscribe to is the poorly fitted pin block (against the plate flange). Although I am not going to dispute the need for a well-fitted block, I am convinced that most tuning instability problems have more logical explanations. If we have a block far from the flange, and for some reason or another that block moves toward the flange until it rests against it, I refuse to believe that this pinblock will ever move away from the plate flange again. Yes, I know this is oversimplified. I know the argument about "rocking block" and so forth. All that is true. But I honestly feel that in most instability problems we will ultimately find more logical and "provable" causes. I have seen too many cases with poorly fitted pinblocks, where suddenly the same instrument stabilized after a different heating system was installed, the customer moved, a climate control system was installed, or a different tuner/technician worked on the piano. Mind you, ***no doubt*** a well-fitted pinblock is desirable. Tight screws are a must and yes, there are cases where the above theory does not apply.

Can You Make The Action Lighter? Or, Barking Up The Wrong Tree — A Short Mystery Story

"Can you make this action lighter?" or "Can you make this action heavier?" are frequent requests piano technicians have to deal with. This time I would like to cover a scenario with a different twist. The instrument is a tall, fairly new, well-known make upright. The customer is a pianist who suffers from arthritis and wants a lighter action. She plays quite well and knows about good regulation. The action is rather well regulated and the average downweight, as well as the upweight, is about where it should be. I was told that another technician added some weights (under the front of the keys); it made the action lighter, but it "did not feel right," and the customer made him take the weights out again. I was also told (don't laugh!) that the action is not always too heavy, " it depends on what I play," she said. I thought that she seemed otherwise perfectly normal, and I decided to apply my motto: "if there is a complaint, there must be something to it." So I asked my customer if she would be able to demonstrate this, and sure enough, she agreed to show me. She sat down and played a short piece for me, quite well, and said: "see, now the action feels fine to me." Going along with the whole thing, I said: "and when does it feel heavy?" She went on to play another piece and when she finished she said: "now it feels real heavy."

If you think that I am kidding, I am not! It is the truth! And the lady is perfectly normal. She is also right. And now that I have had you in suspense for a while, here are some clues. The first thing she played was part of a Beethoven Sonata and the second one was an English Suite by Bach. I had no explanation. Then suddenly it dawned on me. In the Bach she did not use the sustain pedal!

Proof: first I had to confirm my theory. I asked her to play the same part of the Beethoven without using the pedal, she did, and guess what?, the action became heavy! So much for the diagnosis, now — the rest of the story.

There was a need for me to explain to my customer what was going on, and I also told her that I would be able to "make the action considerably lighter." I weakened the damper lever springs and she was happy. End of story ... (not quite).

I believe that there is a need for a little more tech-talk about dampers. We have had some excellent articles on dampers in recent issues of the *Journal.* Here is something I would like to add. Many of you may remember me from damper classes I taught for more than 25 years. One little fact that I always thought worth remembering: when the damper is in the right place, it needs very little spring pressure to do its job. On the other hand, when the damper is in the wrong place — increasing the spring pressure hardly ever does the trick. I have to add that due to "the nature of the beast" not all dampers in the piano are "in the right place." *(**Warning!** Those who will challenge me on that one, brace yourselves for a lot of theory.)*

Behold The Upright

Don Valley, RPT, MM
Western Carolinas Chapter

New Hammers, New Shanks, New Butts

Going a step beyond the previous article where the original parts were rebuilt and retained; the usual procedure when using new shanks is to supply new butts as well. This is not mandatory, however. You may wish to re-drill the existing butts to fit the new shanks.

Hammer head preparation is usually needed prior to installing them on the shanks. Unless the set has been "pre-skinned," you will save time by doing this in groups rather than one hammer at a time on the action. This also serves to remove the "cupping" often created when the set is cut in the factory into individual hammers. New hammers, as you first unwrap them, usually appear to be covered in soft "fuzz;" this is what you need to skin off. Take an octave or so from the set and clamp it in something such as your wood vise, making certain the heels are in perfect alignment so the crowns are also even. Now prepare your sandpaper sheet so you can sand a wide group simultaneously. Cut a sheet of 80- or 100-grit paper in half lengthwise so you now have two pieces 4 1/2" by 12". Place the paper between the hammers and one hand, getting ready to pull it with the other hand. With your pressure hand low on the shoulders, press the paper against the hammers and pull the paper through. Keep moving your pressure hand upward until you have skinned up and through the striking point. Move to the opposite shoulders and do the same and finally remove any tuft of felt left on the tip of the crown. You may also wish to polish the hammers a little smoother by going to a finer grade of paper and end up with about a 280-grit. Please understand two things about this process: 1) The sandpaper only removes felt from the area pressured under your hand; 2) The finer you go in grit to polish your hammers, the brighter the tonal result.

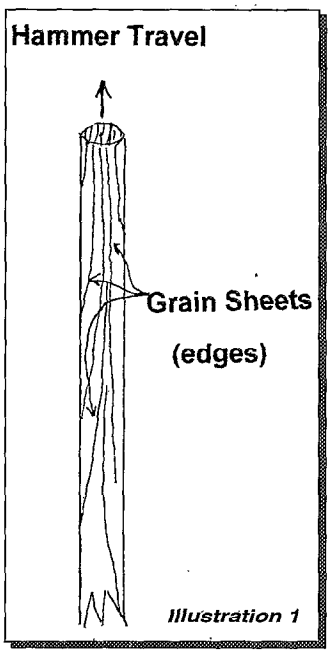


Illustration 1

At this point, I suggest that you establish the proper strike point for each section, set up the jigs introduced in the previous article, and then set your guide hammers to get everything in order so that when the following preparations are complete, you can progress right into an efficient procedure of hammer hanging.

Assuming you have placed the new butts on the rail, some pre-alignment is wise here in order to save time and more tedious work later on. I suggest placing unglued shanks in the butts, working with one section at a time. This will allow you to determine the alignment and spacing. Space the shanks by repositioning the butt flanges on the rail. When this alignment is generally good, check for shank travel — for those that may be moving from side-to-side as they are worked from rest toward the string. Using your travel paper, correct this so you can reasonably guarantee the hammers will strike the unisons squarely.

Attention now must be given to the new shanks. You will need several items: a piece of glass or marble about 12" square and at least 1/4" thick; an awl or other firm, fine-pointed tool; a pencil; a scoring block. Quickly identify any warped shanks by rolling them on the marble. Discard these. Next, check for density of each shank. By dropping each shank on the marble from eight or so inches above, you will hear pitch variations. Arrange the shanks in four or five groups, from low to high pitch. This is done so you can graduate the shanks from bass to treble, using the lowest-pitched shanks in the bass, and so on.

At this point, the shanks must be cut to proper length. We are going to insert each shank all the way into the hammer head, but not all the way into the butt. The butt is drilled to an approximate depth of 5/8", giving plenty of freedom for vertical adjustment to accommodate a precise striking point. It is assumed you have determined your strike point and have your guide hammers all in place. If not, this is the time to do so. An easy way to do this is to put an unglued shank in the butt. Cut the top end down so that when it is fully inserted into the head, you have the tip of the crown at the exact strike point. You can now remove the shank, cut off 3/16" to 1/4" and use this as a measurement for all your shanks.

With your shanks cut to length, the next step is to determine the position of the grain. You will want the edges of the grain sheets to be in the direction of the hammer travel (see Illustration 1). From your experience with broken hammer shanks you will recall, no doubt, the bevel of the break in most

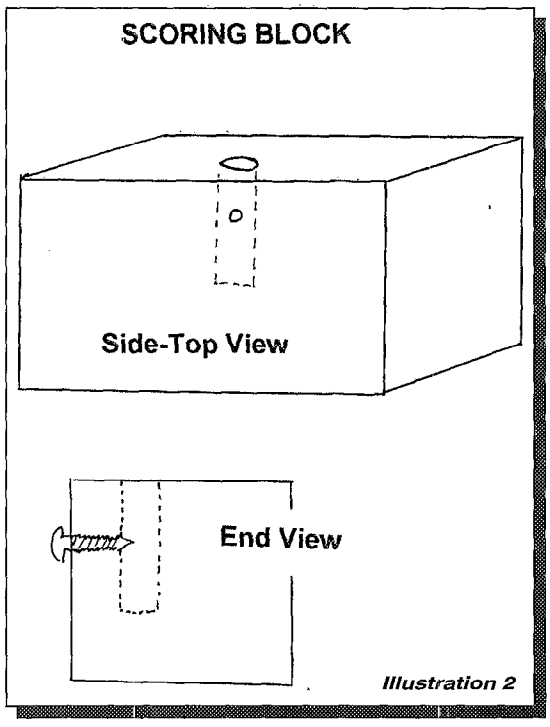


Illustration 2

instances is just the opposite. Once you determine the grain direction, you will want to mark it for proper insertion in the hammer head when glued in. By using a scoring block, you perform two tasks at once: you mark the grain direction as well as make a glue release so excessive glue can escape. A scoring block can easily be made from a piece of excess pinblock stock. About 1/2" in from one edge, drill a 1/4" hole to a depth of 3/4". Drill into this hole, from the edge 1/4" down from the top, a 1/8" hole. Choose a 3/4" screw or bolt to go into this side hole. File or grind the end to a point. Screw it in far enough that it makes an indentation on a shank as it is forced down to the bottom of the hole and pulled out (see Illustration 2). Determining the grain direction on each shank, rotate it so that the edge grain is aligned to the scoring point, and run each shank into and out of the scoring block. You only need to mark the grain direction on the end you will glue into the hammer head.

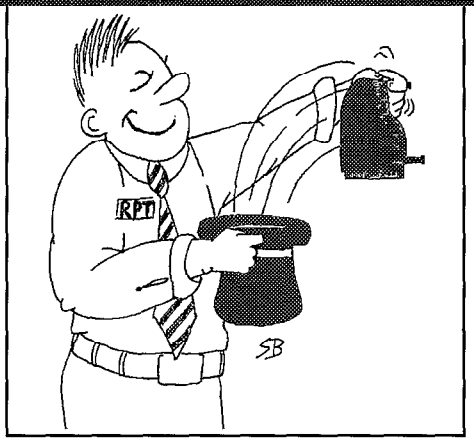
Proceed to glue the shanks into the heads. Hot glue is best here and is easiest to use because the shank tip can be dipped into the hot glue just enough to provide that glue collar indicating there is an even spread of glue over the surface. Remember, either swivel the head onto the shank or swivel the shank into the head, lining your mark up with the felted end of the hammer. Once you have glued the entire set of shanks into the heads, you can at once go back to the first one and glue into the butt. Prior to gluing, make certain you have made a glue release on the butt end of the shank, or have knurled it. In the event you need some freedom for lateral positioning of the hammer for accurate alignment, the knurling will often do this for you. It is not uncommon to trim the sides of the base of the shank in order to do the same. Whatever works, do it, while at the same time making sure your final fitting is solid.

The action rebuilding process is getting near completion. Next time, attention will be given to replacing the upright action springs as well as the felts and leather we haven't already discussed.

Grand Illusions ...
The Page for Serious Cases

That Poor Old Piano

By Doug McKay



When a person lives with an old upright for 20 years he gets attached to it. Even when he replaces it with a new grand, he doesn't feel quite right about getting rid of it. That's why we are now offering the Dearly Beloved Piano Cremation Service. For a moderate fee, we will disassemble your customer's piano and reduce all the wooden parts to a fine ash. Then we return the ashes to the customer in an attractive urn in the shape of a Great Composer Bust. (Chia Pet® Composer Busts also available.)

For no additional charge, a Valley Hi employee will go to your customer's home and perform a ceremony in memory of the loved one.

Many thanks to Mr. Jim "Sparky" Soloviev, who returned a lost wallet which he found inside his Stencil & Sons piano. For his honesty, he will be receiving a lifetime subscription to the Valley Hi Piano Supply Catalog. ∞

Piano Wisdom

Just as we choose our own parents, pianos choose their own manufacturers. Why would a piano choose to be a miserable spinet? Because it has a serious lesson to learn in this life. Keep learning. Grow. Buy my book.

— Dr. Bob Frappels

Bang and Crash Expert

- Piano Wire in Eye
- Falling Grand Lids
- Falling Uprights
- Falling Fallboards
- Dog Bites
- Insect Bites
- Child Bites
- Vermin in General
- Customers Who Tell that "Tuner Fish" Joke

If you're injured on the job, *I'm your lawyer!* No matter how it happened, I'll drive you personally in my luxurious ambulance to see my personal doctor. Together we'll see that someone pays for it, *big time.* You'll receive a full 15 % of the damages, *plus* a complimentary copy of my two-volume *Tuner Injury Handbook.*

Sam Goniff, J.D., Ph.D.
Your agony is my ecstacy

The 200-Step Grand Regulation
fifth in a series

Step 41 — Reach down to get spring hook from toolbox.
Step 42 — Pick up pen that has fallen from shirt pocket.
Step 43 — Replace pen in shirt pocket.
Step 44 — Repeat steps 41 - 43.
Step 45 — Toss pen into toolbox.
Step 46 — Realize spring hook is in other toolbox.
Step 47 — Go outside to car, get spring hook.
Step 48 — Realize house is locked.
Step 49 — Sit on stoop until customer returns home.

You can order the complete set of 200-Step Grand Regulation articles in a decorator binder. Available in Ebony, Walnut or Country Goose.

[Doug McKay, Sam Goniff, and Dr. Bob Frappels may be contacted through Mark Stivers, RPT, of Sacramento, California.]

PTG Review
Dedicated To PTG News • Interests & Organizational Activities
PIANO TECHNICIANS GUILD

Salesman(ship)

By Alan B. Hallmark, RPT
Marketing Committee

What comes to mind when you hear the word: salesman? Does its utterance form an image of "a fast-talking, high-pressure, 'eye of the vulture,' get-the-sale-at-any-cost con artist"? If this is your impression of what a salesman is and does, then it is easy to see why any reputable human being would avoid association with such a disgustingly loathsome profession. And here within lies the dilemma ... because, whether you like it or not, if you are in business you are a salesman!

As Webb Phillips aptly stated in the May 95 PTJ (Working in the Real World), "The best mechanics will not be financially successful with an empty schedule pad or empty work bench ... Nothing happens until something is sold." In manufacturing, the formula for these statements is Production–Sales=Scrap.

However, before you get the wrong impression and trade in your PTG code of ethics for a "gyp you once shame on me, gyp you twice shame on you" mentality, remember that believing in yourself and maintaining the highest level of technical skills and ethical business practices is the cornerstone of successful selling. As piano technicians we can get so caught up in the detailed aspects of technical repairs that we may forget that it is the customer whose needs we are primarily fulfilling — selling takes care of the customer's needs. Whether it is selling the desire to make music (SPELLS Program), to increase the enjoyment of making music with a beautiful new or rebuilt piano, or just servicing the old klunker — we are salesmen.

One professional selling approach is the "Need Satisfaction Selling Process." The goal is to help the client make informed, mutually beneficial decisions.

The Buying Process

The buying process starts when an individual or group determines that a problem exists and that it can be solved with some outside product or service. Your goal is to identify with the prospect's problems and then show how your service can solve their problem. A simplified sales process involves: an opening; needs assessment; supporting facts; closing; and courtesy after-sale follow up.

Opening

When you meet a client for the first time there is a certain amount of apprehension that exists. An opening serves as a moment of relaxation. Arriving late for an appointment will only add to the customer's anxiety, so be on time. And, as your customer's first impression of you may be through a window or peep hole, dress in a professional manner, otherwise you may not get past the front door. Once inside, both new customers and old alike are more receptive after a few friendly remarks. Ice-breaking chitchat should be interesting, pleasant and in some way related to the reason for the call. Topics can be as familiar as the weather, sports, local concerts, family, a vacation, or a compliment ranging from their home decor to their personal successes. If you have served the customer before, the topics for the icebreaker are easier to choose if you keep a record of past conversations. Bringing up the same subject time after time will give the impression that you really don't care, as you are not listening. During the opening you do need to be aware of the time spent in chitchat and move into the real reason for the call ... servicing the piano.

Assessing Needs

Gathering information as to the customers' needs involves a degree of investigative and listening skills. As technicians we may know what the piano needs, but it is the customers' requirements that will determine our approach to selling service. By asking questions and responding to the answers using reflective listening skills you will validate the customers' concerns and come across as sensitive to their needs, i.e.:

"Mrs. Jones have you noticed any sticking keys?" (The action centers may be tight or repetition may be slow due to poor regulation.)

"Why, yes, there does seem to be a few keys that are slow."

"It certainly is frustrating to try to play when the keys don't respond."

"As a matter of fact, little Johnny hasn't been wanting to practice much because of those keys ... is there anything you can do for that? ..."

Finding out the amount of use and who plays the piano by asking questions will help to determine the level of service the customer requires. Don't assume that the customer wants only the bare minimum. If possible, offer them different levels of service, pointing out the benefits of the full service and the limitations of lesser choices, and allow them to choose the option that suits their price range, desired quality or delivery schedule.

Supporting Facts

Overcoming objections to buying is in essence what a skilled salesperson is able to do. Resistance by the customer is natural, so be prepared. Write down a list of the typical objections that you encounter, study the list and determine which objections can be overcome by facts.

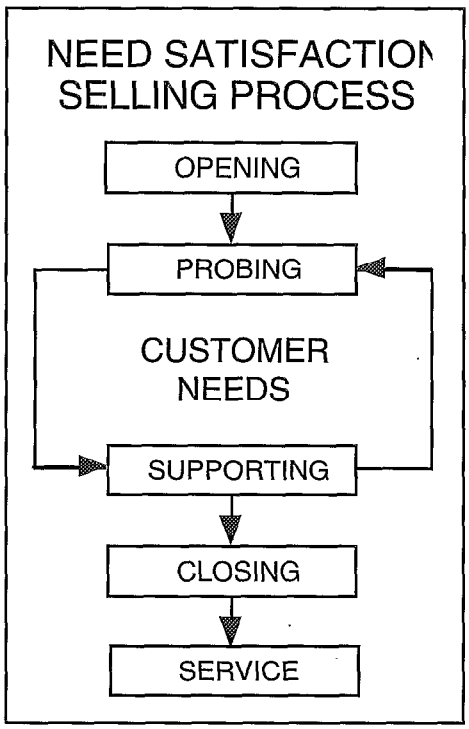
Continued on Next Page

Salesman(ship)

Continued from Previous Page

Work your response to objections in a "Yes-But" method. This first involves agreeing with the customer and then proceeding to point out the additional facts he or she should consider.

"Yes Mrs. Jones, Johnny is only a beginner and may not be able to get the most out of a quality instrument. But, a quality instrument with good tone and



touch will get the most out of Johnny. These PTG technical bulletins on regulation and voicing further explain the procedures I'm recommending."

If resistance continues, it is necessary to analyze your sales presentation and ask yourself these questions.

- Have you clearly presented the benefits of the product or service?
- Have you identified the real reason for their objection? Ask questions to get at why the customer feels as he does. A simple question often works, like "Why do you feel the price is high?", or "Don't you deserve to play on a piano that responds to your touch?"
- Is the customer making the right comparisons? If your prospect is comparing your services to others of a lower cost, than point out the benefits of using your service that are worth the difference in price.
- Can you combine the benefits with price? "A humidity control system will help preserve the life of your piano. Isn't the cost of a system worth maintaining the value of the instrument?"
- Can you minimize the difference? Show that a difference in price is insignificant over the useful lifetime of the item when compared to the added benefits. "The difference between full service and just a tuning is only $xx. That's less than $xx/6 per month over the 6 months between appointments to keep your piano sounding and playing its best."
- Have you emphasized the service? Don't forget to mention the added benefits that come when buying from you. Emphasize your qualifications as an RPT member and the many PTG seminars and conferences you attend to provide them with competent piano care.

"Ya Want Fries With That?"

Closing the sale is simply taking the order. In many cases, when the customer sees a benefit to buying a service or desires to own a product, your job is simply to be on hand to provide the product or services. However, if you don't ask for the order you may not get it. Have you ever noticed that at restaurants the waiter will ask if you would like additional items ..."Ya want fries with that?", "Make that a large?", "Would you like the dessert bar?" ... how many times have you changed your mind and decided to buy simply because someone asked for the sale. Be aware of buying signals. Watch for favorable body language such as a smile, wide-open eyes, open arms, or, in general, an overall relaxed body. Also listen for questions such as "Can you fix it?", "Will it take long?", or "When can you work it into your schedule?" — these are tip-offs that it's time to close.

After the Sale Customer Service

After your service has been provided you now have a resource for future sales. By keeping in touch with your client on a regular basis, between service appointments, you present the attitude that you care about their needs and provide yourself a means to keep your name in front of the customer. A phone call two to three days after the service call will give you feedback on your work. If they say, "The piano sounds and plays great," then you have the opportunity to get positive encouraging feedback that will add satisfaction to your work, and the customers will be reassured that their decision to use your services was a wise one. As time passes between service, the immediate follow up call eliminates the embarrassing statement, "The piano quit working right after you tuned it." If there is a problem, you have an opportunity to correct it quickly, elevating your integrity in the eyes of the customer.

Mailings of service reminder cards or company newsletters which introduce new products or services will also keep your name in front of the client and they allow an opportunity for interest to build in your business — planting the seeds for future sales.

Learning the skills of salesmanship requires just as much study and practice as learning technical proficiency. By possessing genuine concern for your customers needs and offering your value-added services through the selling process you can keep your schedule book and work bench filled.

In addition to the resources Webb mentioned in his May 95 *Journal* article, I would recommend the publication MASTER SALESMANSHIP®. It is published biweekly by Clement Communications, Incorporated, Concord Industrial Park, Concordville, PA 19331-9987, 1-800-345-8101 for $98.80 per year per single copy subscription. Each four page issue contains valuable information that will benefit your business by increased awareness in selling techniques.

PTG Marketing Tools which can aid in your sales presentation

FOR SUPPORTING FACTS

Brochures:

- How Should I Take Care Of My Piano
- How Often Should My Piano Be Serviced
- Special Care and Maintenance of the Teaching Piano.

Technical Bulletins:

- Pitch Raising
- Regulation
- Humidity Control
- Voicing
- Finish Care
- Rebuilding

FOR CUSTOMER SERVICE

- Business Resource Manual-A guide to Planning, Marketing, Customer relations, Resources
- Reminder Cards
- Business Cards
- RPT Book Mark

At Twice The Price — Dearborn Is A Bargain

Are you trying to decide as to whether or not you will be attending the PTG Convention in Dearborn July 17 - 21? Is the expense a deterrent? Are you thinking the travel costs, lodging, meals, and registration, let alone the lost time from your business is a greater expense than you want to expend? Think again! The money spent on an educational opportunity such as this is well worth it. The money is not really an expense but an investment, and all worthwhile ventures require an investment of some sort. Whether it be time, money or both, an investment is basic to reaching full potential.

At this year's convention you can learn how to perform your work more efficiently using less time, obtain ideas to expand your business, and gather tips and tidbits on tools and tricks of the trade. The business classes alone will pay for the convention expenses, that is if the knowledge gained is applied. Take a look at the following business classes and see if you don't agree.

"They Plan Vacations Don't They?" is a business planning class taught by Jim Bryant of the Northeast Florida Chapter. Just a few of the items covered are formulating financial plans, marketing plans and setting goals. If you are new to the business world or you find yourself stressed and overworked just to maintain status quo, this class is for you.

Are you new to the computer or thinking about computerizing your business? Choosing the most useful software is always a dilemma. Whatever we start with we are usually stuck with, and making a change is often more trouble than it is worth. *"Piano Technician Software Review,"* organized by Ron Berry, is a class that will review available software geared for piano technicians and will allow the opportunity for comparison before making a purchase.

"The Cost of Being in Business" is a class that will point out business expenses and considerations that you may never have thought of before. Vivian Brooks shares an enlightening look at business expenses that will give you a realistic look at what your income really is. This is a most beneficial class that can help to restructure your expense and income categories to put more money in your pocket.

Randy Potter will be teaching an interesting class this year called, *"Business Cents and Nonsense: If You Did Not Earn $60K..."* How can I earn more?, how can I limit expenses?, and what are my potential earnings? These questions and more will be discussed in this informative and motivating class.

Have you ever considered expanding your business, diversifying or adding employees? Ruth Brown and Webb Phillips of Webb Phillips and Associates will conduct a class called *"Business — Expansion & Diversification."* The ins and outs of employees, training, keeping control, advantages and disadvantages are among the topics discussed. Learn and gain insight from two who have one of the most successful piano rebuilding, tuning, and supply companies around.

Bruce Genck may not be familiar as an instructor but he is familiar for his Genck cases. You may not know that Bruce also has a successful tuning business and has shared his business prowess at chapter and regional conferences, but this will be the first time he has taught at an annual convention. Bruce has developed a unique class that everyone should attend. *"50 Ways to Make More Money Now!"* is a fast moving class that will give you many ideas to make more money. After Bruce's introduction and a question and answer period you should get an idea a minute.

This is just another small sample of what is to take place in Dearborn and to take advantage of such opportunities is money well spent. PTG conventions are great values, so invest in yourself and join us July 17 - 21 in Dearborn.

— Paul Olsen, RPT
Institute Chairman

1996 PTG Convention and Institute — Dearborn

A city in the metropolitan area of Detroit, Dearborn was named after Gen. Henry Dearborn, who served in the War of 1812. Michigan Avenue, designated as U.S. 12, was an Indian trail that lead to Chicago. Dearborn was settled in 1795 as a coach stop between that city and Detroit. The early farms all had frontage along the Rouge River, named by the French settlers for its reddish color. The farms were long and narrow and called ribbon farms. Much of the area was low and swampy and regarded as unusable for habitation.

Henry Ford's birthplace is not too far from where the Hyatt Regency Hotel stands today. Later, his home was moved to the historic Greenfield Village, which is located adjacent to the Henry Ford Museum.

It wasn't until the 1920s that Henry Ford began to purchase land to manufacture automobiles there. Dearborn is the home of Ford Motor Company's River Rouge plant, where iron ore, limestone and coal are converted to steel, and along with other raw materials are transformed into finished automobiles in one giant facility.

One factor helping to make this year's annual Convention and Institute a success is its accessibility to major highways. I-75, I-94 and I-96 connect directly to M-39 (the Southfield Freeway), which is alongside the hotel. Canadian highway 401 leads to Windsor, just across the river from Detroit.

By car, Dearborn is less than 7 hours from Louisville, Lexington, Waukegan and Milwaukee. It is also less than 6 hours from Chicago, Toronto, Indianapolis and Pittsburgh. It is no more than 5 hours from Youngstown, Cincinnati, Columbus and Dayton, and about 4 hours from Cleveland.

A most welcome bonus this year to those who are driving — there is ample free parking at the hotel.

From Detroit Metropolitan airport, the Hyatt Regency is about 20 minutes away by hotel shuttle bus.

See you in Dearborn in July!

— Richard Bittner, RPT
Host Chapter President

1996 Convention & Technical Institute

Hyatt Regency in Dearborn

Reservation Deadline - June 21
Rates: $88 - Single / $98 - Double
PHONE — 313-593-1234

Guthrie Goes the Distance

Pacific NW RVP Ward Guthrie

When Pacific Northwest RVP Ward Guthrie joined the Montana Chapter of the Piano Technicians Guild more than 20 years ago, the chapter met on a yearly basis.

He joined the PTG "for the camaraderie and the opportunity to learn — when I started in the Montana Chapter it consisted of a yearly meeting to get together for dinner and share ideas," he said. "It was an opportunity to talk with people who spoke the same language."

When he joined the Guild, Ward joined as a Student. "That was the terminology back then," he said. At the time, PTG had several categories, among them: Student, Apprentice and Registered Craftsman, and Ward upgraded to registered craftsman a year later.

Because of the travel distances involved in crossing the Big Sky state — one of the chapter's members travels 450 miles one-way to attend meetings — the chapter still meets only two to three times a year, usually twice for all-day technical sessions and then another meeting for a business session.

Living in Bozeman, Ward only has to travel 90 miles to attend his chapter meetings. "We consider that close," he said.

He was elected to represent his region during the 1995 Convention in Albuquerque. "I thought I would run for RVP in eight or 10 years, and I thought that five years ago," Ward said.

"Then Taylor (Mackinnon) and others suggested I run when Taylor retired, and my time schedule got pushed way forward," he said.

Ward had wanted to delay a run for the RVP's post until near the turn of the century for two reasons: one, to build more time up with PTG, and two, more importantly, to be with his children until they were older. His three daughters and son range in age from 9 to 20.

"It takes a lot of time (being an RVP), time away from your family, and I wasn't sure I wanted to make that sacrifice," he said.

"I'm still trying to find ways to make it work well, but when I started, someone was sacrificing their time to help me along, and now it's my turn to sacrifice to help others along," Ward said.

Piano tuning was a natural progression for Ward, who began developing his love of tinkering in the third grade when he repaired a clock for his mother.

While at Oberlin College Conservatory of Music in Ohio, Ward majored in music education and minored in clarinet. As part of his studies he applied to take a senior-level piano technicians course, but the course was dropped before he could take it.

After college Ward taught music and band at a public school in northern Montana near the Canadian border before going on to Montana State University.

While teaching at MSU, the university's technician encouraged Ward to try piano work. "He said I was young enough, and I had my degree so I could always go back (to teaching)," Ward said. "He said try it for a year. I loved it, and I never went back to teaching."

One advantage for Ward was self-employment. As the father of four children, he was able to balance his work schedule with the school functions and meetings of his children. "Not having to ask a boss for time off is great," he said.

When he started piano work his clients ranged anywhere from 90 to 100 miles in any direction from Bozeman. "Now, I rarely leave town. Every month I have a regular client call-back list with 120 to 200 names on it, so I don't think I'll ever catch up."

But Ward may have some help in the near future. His 17-year-old daughter, Melanie, helps him out in the shop, and this summer she will start learning piano work.

In addition to Melanie, Ward and his wife of 23 years, Eileen, have three other children, including Diana, 9, Angela, 13, and Stan, 20, who is majoring in physics and builds harps for a summer income.

Industry News

Glenn Service Manager for Young Chang

Philip B. Glenn

CERRITOS, Calif. — Philip B. Glenn, RPT, has been appointed national service manager of Young Chang America's Acoustic Piano Division. In this position, Glenn is responsible for answering all service-related questions from Young Chang's nationwide dealer network. Glenn also manages Young Chang's service department and acts as a liaison with Young Chang's technical staff in Korea.

"Phil has an outstanding background in piano technical service and customer support and we are certain his knowledge and expertise will be a significant contribution to our company," said executive vice president, Lloyd Robbins.

Glenn comes to Young Chang from Yamaha where he was in the Acoustic Service Division for six years. He has toured throughout the United States as a concert technician and received technical training in Japan. For 15 years Glenn had his own piano tuning business and is currently an active member of the Piano Technicians Guild, Inc.

"I came to Young Chang for the greater challenge I would have here, as well as the opportunity to utilize my skills to a larger extent with such a fantastic company," said Glenn.

Glenn lives nearby in Buena Park, CA, with his wife Susan, a piano teacher, and their four children, Emma, Evan and twins Larah and Caroline.

1995 N.C. Regional Conference a Success

Once again the North Carolina Regional Conference transcended regional barriers as it drew to its assembly a total of 160 participants. Thirty nine PTG Chapters from 20 states were represented in Durham, N.C., during two-and-a-half days of educational opportunities that ranged from basic tuning and regulation (some featuring hands-on participation) to more advanced subjects of touch weight analysis and rebuilding. The Research Triangle Park, N.C., Chapter hosted the November '95 event, which attracted 42 non-members to realize the value of the PTG experience.

1995 Director Richard Ruggero, RPT, continued the tradition of educational excellence at the 14th annual North Carolina Regional Conference.

The Omni Durham Hotel and Durham Civic Center provided a comfortable backdrop to the constant activities. Besides the 20 technical classes, activities included an exhibit hall with 19 vendors who displayed for sale the finest in tools, equipment and parts and supplies for the professional piano technician; a luncheon and historic tour of Durham for spouses; an evening concert in the beautifully renovated Carolina Theater, which featured concert pianist John Ruggero; a special one-hour Friday morning presentation, "All About Pianos," by Scott Jones from Steinway & Sons, which was open to the public, with several school groups were in attendance; and the dedication of a rebuilt Chickering grand to a local middle school choral program provided media coverage for the Research Triangle Park Chapter and The Piano Technicians Guild.

This year's North Carolina Regional Conference will be held Oct. 25-27, 1996, at the Sheraton Airport Hotel in Charlotte, N.C. 1996 Conference Director James Baker, RPT, and the NCRC committee guarantees you an abundance of educational opportunities that will add a wealth of skills to your professional tool box.

"You'll be caught in Charlotte's web of PTG excitement."

Quad Cities Piano Celebration

The Quad Cities Chapter of PTG decided to make the residents of our area aware of pianos and National Piano Month by organizing what we referred to as a *Piano Celebration.* What is a Piano Celebration, you ask? We didn't know either, but we made it up as we went along.

We had excellent cooperation from our local piano teachers and their students. One of the piano dealers was extremely helpful in this endeavor. He provided the pianos, and was very active in getting publicity for the occasion. (He began by calling it a Piano Playathon, but we felt that the word celebration more accurately described our concept).

On a Sunday afternoon in the middle of September we arranged to have our event at three of our area's major shopping malls. At each location we had a piano, and all through the afternoon, people were scheduled to come and play. The object, of course, was to demonstrate that playing the piano can be fun for everyone.

We had many children who played, and a number of adults also played. Some well known people, including one city mayor, came and played the piano. Our chapter president, and other chapter members took a turn at the piano, too, to prove that playing the piano can be fun!

We also had an additional piano at each location so that we could show people what the inside of a piano was like, with plenty of the Guild brochures available for hand-outs.

Our *Piano Celebration* received newspaper and television coverage. We learned a lot about what to do differently next year. The teachers are enthusiastic about repeating this again, so we are confident that there will be a *Piano Celebration* in the Quad Cities next year.

— Richard Hassig, RPT
President, Quad Cities Chapter

Visually Impaired Committee Report

My dear friends, here is a note from the Visually Impaired Committee. Last July at the Albuquerque Convention, when I was appointed as Chairman, my goals were to work hard and make no mistakes. In the very next October issue of the *Journal* I forgot to mention one of our committee members, Richard Hassig. Richard, I would like to apologize and let you know that you are still on the committee and still on the payroll!

At this time I would like to encourage all visually impaired members of PTG to make plans to attend the 1996 Convention in Dearborn, Mich. All the classes are going to be great. We are very pleased and thankful that the PTG has been responding to all of our requests.

A special thanks to our prompt and hard working *Journal* reader, Ben McKleveen.

In my next report I will have further news about the convention. I am asking members to let us know in what way we can improve our Guild. You suggestions will be appreciated, and feel free to call me at the residence after 6 p.m. central standard time at (713) 460-1146. Take care and see you in the next issue.

— Roy Escobar
Chairman, Visually Impaired Committee

PMAI Code of Ethics Enacted at NAMM

Representatives of eight piano manufacturers signed an 11-point code of ethics in ceremonies during the Winter NAMM Market, January 17-21 in Anaheim, Calif.

The manufacturers, members of Piano Manufacturers Association International, developed the code of ethics to strengthen the piano industry and to encourage retailers and other industry members to adopt more ethical practices.

PMAI member companies and the officers who signed the code of ethics were: Baldwin Piano & Organ Co. — Karen Hendricks and Steve Brock; Boston Piano Co. — Bruce Stevens and Bob Dove; Kawai America Corp. — Jun Ando and Brian Chung; PianoDisc — Scott Nelson and Jan Kiser; Samick Music Corp. — Bob Jones and Kyo Chu; Steinway & Sons — Bruce Stevens and Frank Mazurco; Yamaha Corporation of America — Terry Lewis; and Young Chang America — Lloyd Robbins and Tom Miller.

Signing the PMAI Code of Ethics during NAMM show ceremonies were, from left, Frank Mazurco, Steinway & Sons; Jun Ando, Kawai America Corp.; Terry Lewis, Yamaha Corporation of America; Brian Chung, Kawai America Corp.; Lloyd Robbins and Tom Miller, Young Chang America; Kyo Chu, Samick Music Corp.; Karen Hendricks, Baldwin Piano & Organ Co.; Bob Jones, Samick Music Corp.; Steve Brock, Baldwin Piano & Organ Co.; Bob Dove, Boston Piano Co.; and Scott Nelson and Jan Kiser, PianoDisc.

"It really was a historic moment," said Don Dillon, PMAI executive director, who also announced the appointment of James Gass to facilitate PMAI's SPELLS (Study of Piano Enhances Learning and Life's Success) program.

Gass Named PMAI SPELLS Facilitator

Jim Gass

The Piano Manufacturers Association International recently announced the appointment of Jim Gass as PMAI SPELLS Facilitator. Mr. Gass assumed his new role January 15, according to Bob Jones, PMAI President.

Acknowledged as a leading music industry market development activity, the SPELLS Program strives to get more children and adults involved in active piano participation through cooperative activities within the piano community. SPELLS brings together piano retailers, teachers and technicians, working in cooperation to promote the benefits of piano playing, study and ownership.

Jones said: "Jim brings to the program extensive experience in piano teaching, studio management, and retail sales, as well as a comprehensive background as a district manager and sales representative for various piano and keyboard manufacturers. We believe his experience and creativity make him the perfect candidate to maintain and expand the SPELLS Program as we continue our efforts to bring the piano back as a center of family life."

Mr. Gass says he is excited about the opportunities offered by SPELLS, and believes his background has prepared him for the challenge.

"My broad experiences in all facets of the piano community will prove very valuable as I face the diverse opportunities and challenges SPELLS offers. My goal now is to apply that experience to the success SPELLS has already enjoyed, and move it forward — working in cooperation with retailers, teachers and technicians throughout the country — to new levels of accomplishment. I'm eager to get started."

The Piano Manufacturers Association International is a non-profit trade association representing those acoustic piano manufacturers who

See "Gass," on Next Page

Piano Manufacturers Association International

Code of Ethics

We pledge to champion the vision of expanding piano participation through the sales and marketing strategies of our companies, with our dealers and within the piano community.

We pledge ourselves to open communication with member companies based on mutual trust and respect.

We pledge ourselves to do our best to resolve conflict as it relates to the PMAI vision, whether such conflict is within our respective organizations, within PMAI, or within our respective dealer organizations.

We pledge to maintain respect for competitors' products at all times, and insist our employees and dealers do the same.

We pledge to lead by example, and to be open to constructive criticism for improvement.

We pledge to engage in ethical conduct and avoid rumor and innuendo.

We pledge to be fair and honest in sales and marketing efforts, and insist our dealers do the same.

We pledge to support only those dealers who represent our products to the public in an ethical and honest manner.

We pledge to take an active role in encouraging high ethical standards within the piano community of teachers and technicians.

We pledge ourselves to honest, accurate and timely reporting of industry statistics.

We pledge our support to maintain the spirit and letter of all Federal and State laws.

PMAI Produces "A New Vision"

The Piano Manufacturers Association International has produced a video that casts *"A New Vision"* for piano industry cooperation.

The ultimate goal of the video is to make the buying experience for the consumer more positive. PMAI believes that a path to achieving this goal is to curtail deceptive advertising, brand bashing and other negative practices that can sour the customer's desire to purchase a piano. The first step on this path is to develop a cooperative spirit between and among the piano community, including manufacturers, retailers, teachers and technicians.

The piano manufacturers have taken a major step on this path with the development of a *PMAI Code of Ethics,* which is included as a part of the *Vision Video.* It is hoped that other members of the piano community will follow suit, developing their own codes of ethical business practices and personal relationships. Competition for piano students, piano consumers and piano sales does not come from within — it comes from without. We must learn to work together to promote the benefits of active piano participation rather than misdirect our energies inward toward our colleagues who have the same long-term goals as we.

Although not produced for general distribution, the *Vision Video* will be available to the piano community, and will be premiered to retailers this spring by district managers from PMAI member companies. Copies are available to retailers, teacher groups and technician's organizations at a cost of $5 to cover postage and handling. For more information, contact PMAI, 4020 McEwen, Suite 105, Dallas, TX 75244-5019.

Gass

Continued from Previous Page

sell their products in the United States. PMAI supports the SPELLS Program, other market development activities, and the National Piano Foundation, as well as gathers statistical data on the industry, and sponsors the McGill University Research Project to determine the true benefits, both academic and social, of piano study and participation.

For more information about SPELLS, please contact Jim Gass, SPELLS Facilitator, at 24680 Golf View Drive, Valencia, CA 91355-2301, (805)255-3765 or PMAI at 4020 McEwen, Suite 105, Dallas, TX 75244-5019, (214)233-9107.

Associates Pass The Test

REGION 1

021 BOSTON, MA

IAN BURGESS-SIMPSON
12 AMBERLEY WICKLOW ROAD
PLUMSTEAD CAPE TOWN 7800
SOUTH AFRICA

REGION 4

601 CHICAGO, IL

JEFFREY R. GROSSER
992 CHIPPEWA DRIVE
ELGIN, IL 60120

REGION 6

851 PHOENIX, AZ

LEE J. STOCKER
4223 N. 31ST PLACE
PHOENIX, AZ 85016

New Members
In January

REGION 1

080 SOUTH JERSEY

SHAWN QUIGLEY
1601 SHORE ROAD
PALERMO, NJ 08230

REGION 2

296 WESTERN CAROLINAS, NC

KOSTAS KECHAIDIS
95 IASSONOS AVENUE
VOLOS 382.21 GREECE

395 MISSISSIPPI-GULF COAST

MICKEY K. TEUBNER
1717 HACKBERRY LANE, #5
TUSCALOOSA, AL 35401

REGION 3

741 TULSA, OK

HERMAN E. JENKINS
RT. 3, BOX 44
MOUNDS, OK 74047

761 FORT WORTH, TX

DEBRA P. SCHILLER
8301 BOAT CLUB ROAD, #818
FORT WORTH, TX 76179

767 HEART OF TEXAS

ERNEST AMMON
1204 WEST 26 1/2
CAMERON, TX 76520

REGION 5

683 NEBRASKA

DAVID J. CARLSEN
1209 S. 16TH STREET
BLAIR, NE 68008

REGION 6

921 SAN DIEGO, CA

PIL SOO JEON
5156 CANOSA AVENUE
SAN DIEGO, CA 92117

941 SAN FRANCISCO, CA

DAVID M. PARKHURST
806 1/2 SHOTWELL
SAN FRANCISCO, CA 94110

REGION 7

011 VANCOUVER, BC

STEPHEN THOMAS
1021 4TH AVENUE, #301
NEW WESTMINSTER, BC V3M 1T3
CANADA

972 PORTLAND, OR

RON E. NUNN
100 BELTON ROAD
ST. HELENS, OR 97051

993 CENTRAL WASHINGTON

HARRY O. WHITAKER
3411 LOOK ROAD
ELLENSBURG, WA 98926

Passages

Cincinnati Loses Friend, Colleague

Michael Bany, RPT
January 29, 1954
December 29, 1995

The Cincinnati chapter lost a good friend and colleague with the death of Michael Bany on December 29, 1995. Michael had been a tuner-technician in the Cincinnati area for the last thirteen years, making his living before that time as a musician with local bands. Even after he began tuning he never gave up his role as a musician, and it was in this role that he died. He was robbed at gun point, then shot, as he left an Over-The-Rhine nightclub after playing a job.

Michael was a person with an eternally optimistic outlook. His life took a tragic turn in his early teens when the family broke up and he was placed in a foster home. He turned this into a positive change by forming a successful band with his foster brothers. This is but one example of the many ways Michael chose to take the high road.

As a tuner, his ability came as naturally as his musical talent had. In just a few years he moved through the ranks from apprentice to craftsman, mentor, and teacher. His first love in tuning was the concert scene, tuning for most of the rock concerts that came to town. He loved the pressure, the excitement, the festive atmosphere of the pre-show tuning.

As a musician, his talents were widely acknowledged and admired. His bass playing brought a special excitement to the bands he played with. He never tried to steal the spotlight. He was just a really great team player. He sang beautifully and harmonized naturally. The songs he composed expressed universal emotions, forming a bond between him and his audience that created a very large and loyal following. One of his songs played on a nationally broadcast soap opera. At one time he was signed by a national recording label.

Love and laughter were the focus of Michael's life, and the many who knew him miss him terribly. Michael is survived by brothers John and Dave of Chicago, Mark of Cincinnati, sister Mary Murray of North Carolina, nephews Tommy and Marlin, nieces Lisa, Brittany, Hope, Nicole, Brandi, Claudia, Rebecca, Martha and Julie, and a special friend, Betsy Henkel. His parents preceded him in death.

— Barry Heismann, RPT

In Memory...

WILLIAM J. PURA
CONNECTICUT CHAPTER

LES S. WARD
SAN FRANCISCO, CA CHAPTER

MICHAEL W. BANY
CINCINNATI, OH CHAPTER

JOHN E. SWETT
BOSTON, MA CHAPTER

CLIFFORD J. WHEELER
BOSTON, MA CHAPTER

RICHARD W. HOWENSTINE
YOUNGSTOWN, OH CHAPTER

RICHARD VON BERNEWITZ
RICHMOND, VA CHAPTER

Calendar Of Events

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.

March 14-16, 1996
PACIFIC NORTHWEST CONFERENCE
Seaside Convention Center, Seaside, OR
Contact: Randy Potter
61592 Orion Drive, Bend, OR 97702
541-382-5411

March 16, 1996
BLUEGRASS SEMINAR
Transylvania University, Lexington, KY
Contact: Ben Griffith
101 Crestwood, Frankfort, KY 40601
502-875-2297

March 21-24, 1996
PA STATE CONVENTION
Sheraton of Bucks, Langhorne, PA
Contact: Webb Phillips
Box 543, Hatboro, PA 19040
215-674-2555

March 29-31, 1996
PACIFIC NORTHWEST REGIONAL CONVENTION
West Coast Tyee Hotel, Olympia, WA
Contact: Mitch Kiel
11326 Patsy Dr. SE
OlympiaWA 98501
360-264-5112

April 12-14, 1996
FLORIDA STATE SEMINAR
Holiday Inn Crown Plaza, Tampa, FL —
Contact: Robert Carr
320 West Rich Avenue, Deland, FL 32720
904-736-0551 - E-mail: rvcarr@aol.com

April 26-28, 1996
CENTRAL WEST REGIONAL SEMINAR
University of Nebraska, Lincoln, NE
Contact: Richard West
5 Westbrook Music Bldg., University of Nebraska,
Lincoln, NE 68588-0100
402-472-2568

April 27, 1996
HOSPITAL FOR HOPELESS PIANOS
Sherman Clay, LA, Los Angeles, CA
Contact: Jon Longworth
6926 Bellingham Avenue, N. Hollywood, CA 91605
818-982-2431

May 3-5, 1996
NEW ENGLAND/EASTERN CANADA REGION
Westin Hotel, Waltham, MA
Contact: Anthony Malionek
23 Winthrop Ave, Beverly, MA 01915
508-922-0711

May 10 & 11, 1996
UTAH INTERMOUNTAIN SEMINAR
Brigham Young University, Provo, UT
Contact: Vince Mrykalo
694 N. 100 E, Provo, UT 84606
801-375-1987 or 378-3400

July 17-21, 1996
PTG CONVENTION & TECHNICAL INSTITUTE
Hyatt Regency Dearborn, Dearborn, MI
Contact: PTG Home Office
3930 Washington, Kansas City, MO 64111
816-753-7747

AUXILIARY EXCHANGE

Dedicated To Auxiliary News and Interests

More Than a Volunteer

Our hearts were greatly saddened to learn of the untimely passing of our Historian, Ginny Schwinn. Ginny was a warm and wonderful person. She gave a lot to our members in the short time she had been with the Auxiliary. I looked forward to seeing her at the Annual Conventions each year because of her cheerful, friendly and helpful ways. Ginny volunteered. She wanted to be involved. We will surely miss her.

Please read the article about Ginny on the following page to learn more about this fine person. Then, if you would like to help the Auxiliary, too, as she did, please let me know. Where she will be impossible to replace, we will need someone to take over her position as our Historian. Everything that gets done in the Auxiliary is done by volunteers. We don't ask anyone to sign on for a long term, so we are always looking for new helpers. Won't you lend a hand, too?

The Annual Convention is not far away now, July 18-21. We are planning a wonderful program for all Auxiliary participants. Besides our schedule of breakfasts and luncheon, we will hold the annual Council session with the election of new board members including a new president. My two terms will be up this year. It has been an honor to have been chosen to be your president. You took a chance electing your first male president. I think this had a positive effect in dispelling the notion that the Auxiliary is for females only. Both are welcome. We will also offer some fine classes on business, communication and health — things that we all need to know about. Details are still being worked out at the time of this writing. I'll tell you more next month.

L. Paul Cook
PTGA President

A very exciting tour is planned, too. After a look at the city, we will stop at the Ford Mansion for a walking tour through Henry Ford's home. I was there last September and can tell you it is quite a place. You will enjoy seeing this. Then it's off to a luncheon in a private, air conditioned room at the Ford Museum. After lunch you may go to either the Ford Museum (inside) or Greenfield Village (outside) for the rest of the day. Both offer some of the most interesting and unique antiques and pieces of history, only available there. For instance, they have moved the Wright Brother's bicycle shop to this location. The real thing, not a resemblance or copy, but the real bicycle shop, as well as many historical buildings, were moved to this charming, authentic 1900s village. Anyway, come to Dearborn Mich., you'll be glad you did, and so will we.

By now I hope you have received your copy of the PTGA newsletter. Apparently there was a major problem with the computer disk that held all the members names and addresses. Today, in the computer world, things are outdated and replaced almost by the time you get back from the store from buying it. Which reminds me of a comic I saw of a computer store salesman explaining the difference between a computer for $2,100 and one for $2,700. He was telling the customer the cheaper computer would be outdated the next day where the more expensive computer wouldn't be outdated for six months.

Anyway, the information on the membership disk had to be redone. Carolyn Sander, our Vice President and Membership Chairman, put in a heck of a lot of time to get this straightened out. "Thank you," to Carolyn Sander and Ed Morgan, our newsletter Editor and Publisher and Mailing House Person. Remember, if you have anything you would like to submit for inclusion in our newsletter, please send it to Ed Morgan. His address is just to the left of this story. You will also see our *Journal* Editor, Karen Dickson's, information there, too. Your contribution to either publication is encouraged and welcome.

Have a nice Palm Sunday, March 31st and Easter Sunday, April 7th, too.

Recognition of Scholarship Gifts

From: Anne and Richard Doerfler

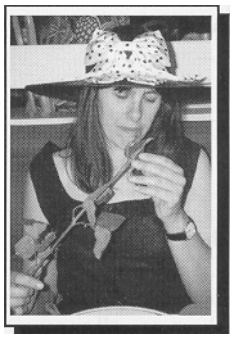
In Honor of L. Paul Cook's 50th Birthday

Amount: $50

All gifts of $10 or more will be recognized in the Journal. Please send your contributions directly to the PTG Home Office and a copy of your correspondence to the PTGA President. Thank you.

God Calls An Angel Home

Ginny Schwinn, 1948-1995



Ginny Schwinn

Although our hearts are heavy with the loss of our dear friend, Ginny Schwinn, we thank God for the brief, happy time she was a part of our lives. There is a purpose in everything that God has his hand in, so we know our tears have a greater purpose than our understanding can comprehend. Even now, we can feel her watching over us all, helping us to overcome the pain we feel at her passing.

Totally selfless, Ginny was forever looking to the welfare of the less fortunate. She was a soul mate and help mate to her husband, Richard, and a devoted, loving mother to Elizabeth, Richard Jr. and John. Her time on Earth was totally dedicated to her family, her friends and her fellowman.

Ginny liked everyone. Her capacity to forgive the frailties of human character was as boundless as her generosity. She saw the potential good in everyone, and we became more tolerant of others by her example. She had devoted a lot of effort to the PTG Auxiliary in the past three years and, as our chapter's Auxiliary organizer, she never stopped recruiting. She understood the importance of spousal support in our craft and worked tirelessly to encourage members to become more involved in the PTG. She volunteered her enthusiasm to the Auxiliary's "Scholarship Store" and was working on the history of the PTG Auxiliary. It was her nature to find a task that needed doing and to assume the responsibility for its completion. She did this with such grace that it appeared almost effortless. Her reputation as a "giver" and "doer" is well-known among her many friends in her community, in her church and in her PTG work. Without calling attention to herself, she quietly comforted and consoled those whom she knew were hurting and asked for nothing in return. This concern for others was her mission in life, it seemed.

May the road rise up to meet you,
May the wind be always at your back,
May the sun shine warm upon your face,
And the rains fall soft upon your fields,
And until we meet again,
May God hold you in the palm of His hand.

Ginny Schwinn inscribed this Irish Prayer on a gift she presented to her husband, Richard, on their wedding day.

During parts of the last three summers, we had the pleasure of spending time with Ginny and her family on trips to Milwaukee, Kansas City, Albuquerque and Santa Fe. She was a delight to travel with, full of fun and eager to see new sights and hear new sounds. We have lots of golden memories to sustain us in the sadness we feel today.

Ginny never complained about her illness, which seemed to bring her closer to God. She showed no fear of the future, though she knew it might not be a long one. She lovingly tried to prepare her family for that eventuality and taught all of us courage in acceptance of God's will.

On November 29th, 1995, at a little after three in the afternoon, the angels took another angel home. Broken-hearted as we are, we rejoice that she is at peace in heaven, and we look forward to seeing her on those golden streets. May God grant his peace to her family in their loss.

For our part, Ginny will be here as long as we have our warm memories. We love you, Ginny. You will be in our prayers until we meet again.

— Betty and Bob Bullock
Waukegan Chapter #600

March is the Best

Everyone says, "What's good about March?" The winter winds can still be very cruel and the days are still short and dark, and worst of all, there are no holidays in March to celebrate unless Easter, once in a while, happens to fall in that month. And then it's too cold and damp to even wear your new spring suit.

Well, I think March is the best month of the year. Why? Because our whole family has their *Birthdays* in March — that's what's good about March. You see, since there is nothing else to celebrate in that month, you get more attention on *your* day. I really feel sorry for my father who had his birthday two days after Christmas. He always got presents wrapped in Christmas wrapping. Kind of an afterthought, don't you think? The nice part about my birthday and my husband's is that his is the day after mine and so we can celebrate together. We can go out for diner to a really nice restaurant and spend a little more because we know we will only be doing this once a year instead of twice.

Then the very next best part about March is having a baby in March. You don't have to carry a baby to term in the hot, hot summer. I just can't imagine being nine months pregnant in August, especially last August 1995! So we had our first baby, Douglas Stephen, in March just one week before my birthday. That was fun! But the really fun part is when his little brother, Stephen Douglas, came into the world on Douglas's second birthday. What a birthday present! Someone to play (argue) with. So there is another economic advantage. One birthday party for the two of them. And they will never forget each other's birthday as long as they live!

But you know what the really great part of this all is? While they were growing up, I could make a real German Chocolate Cake for the week and it took care of all of our birthdays. Now is that planned parenthood or what?

All kidding aside, I really like March because I finally live in an area where my birthday flowers are in bloom in my front yard. I have dozens and dozens of jonquils in bloom in my front yard on my birthday down here in Kentucky, and that just doesn't happen in Chicago or in northern Illinois where I have lived most of my life. They are beautiful, sticking their little yellow heads up in the snow and announcing to the world that winter is over and it's time to wake up.

So that's why I like March so much and I do hope that you will enjoy this month also, even though it may not be your birthday. It's just a great month to be alive. Oh and, yes, I will always celebrate my birthday no matter how old I get. It's *my* day and I'm going to live every minute of it. I hope you celebrate yours the same way. Enjoy the spring.

— Phyllis Krahmer Tremper
Morehead, Kentucky

FOR SALE

SANDERSON ACCU-TUNERS from Authorized distributor. Consignment sale of used Accu-Tuners and Sight-O-Tuners or new Accu-Tuner customers. Call for details. Rick Baldassin, 801-292-4441.

NOW AVAILABLE: FINEST QUALITY ENCORE GERMAN SHANKS AND FLANGES. Made by Abel. (Available in all specifications as per page 8 of our catalog). Exceptional woodworking, consistent hand pinning. Abel knuckles, highest quality buckskin, finest quality graphited bushing cloth. Encore hammers and action parts available only through Wally Brooks, Brooks, Ltd., 376 Shore Road, Old Lyme, CT 06371. 1-800-326-2440.

A new book! DIFFERENT STROKES: Hammer Techniques for Piano Technicians. 109 pages of techniques, illustrations and humorous anecdotes. Endorsed by Owen Jorgensen, Daniel Bowman, Taylor Mackinnon and Ron Giesbrecht. $13.95 plus $3.50 for shipping. Write Ken Burton, 1 Willow Cres SW, Calgary, AB, T3C 3B8.

STEINWAY K52, Serial #518851, walnut, $7000 o.b.o. Ph. 813-932-6745.

PIANO TECHNICIAN MANAGEMENT SYSTEM New! ***PTMS—LITE*** Only for a limited time $125 W/ Mini Manual IBM compatible 1.44 disk, 5.25 disk. Write or call: Coleman & Sons, (602) 966-9159 at 4 W. Del Rio, Tempe, AZ 85282.

SANDERSON ACCU-TUNERS NEW & USED. BOB CONRAD 800-776-4342.

ATTENTION!! CORY POLISH EAST COAST FACILITY is now opened to service all your ordering needs. Save on shipping! Our East Coast warehouse will handle all orders East of the Mississippi. East Coast 24 hr. TOLL FREE ORDER LINE: 1-800-582-3783.

PETERSON STROBE TUNER Model 420. Used less than 5 hours. Excellent condition $175. Call (954) 963-3652 Hollywood, Florida.

CLASSIFIEDS

Classified Advertising rates are 35 cents per word with a $7.50 minimum. Full payment must accompany each insertion request.

Closing date for placing ads is six weeks prior to the month of publication.

Ads appearing in this publication are not necessarily an endorsement of the services or products listed.

Send check or money order (U.S. funds, please) made payable to Piano Technicians Journal, 3930 Washington, Kansas City, MO 64111-2963.

GRAND PIANO STRING covers. Are you ready for an item that can keep the piano clean, prevent corrosion, improve tuning stability, make your clients happy and make you money besides? Custom made, it rests above the strings, covering soundboard, tuning pins and plate for complete protection inside the piano. Made from finest quality woven wool, available in black, light brown, brown, burgundy, and white. Personalized name applique also available. No inventory or investment required. For free brochure and samples call: Edwards Pianos, 408-426-1295, 145 S. River Street, Santa Cruz, CA 95060.

HAMMER BORING GUIDES. All metal, weigh 15 lbs. Accurate and easy to use. $180.00. Instructions and photo available on request. Kent Gallaway, 709 Thorne, Ripon, WI 54971; 414-748-3265.

JIM GEIGER'S famous Piano Moving Dollies — $250 plus shipping. 1-800-588-8511.

HANDCRAFTED SOUNDBOARDS BY NICK GRAVAGNE. Ready to install crowned boards or semi-complete. Your choice. Ordering and installation instructions $15.00. 20 Pine Ridge; Sandia Park, NM 87047; 505-281-1504.

COMING SOON! NEW BOOK BY NICK GRAVAGNE. "Downbearing: Theory and Practice" — A handy, no-nonsense shop guide for setting bearing on old or new soundboards.

FREE "I Love to Play My Piano" Bumper Sticker. Hurry, limited time offer! Send S.A.S.E. to B.A.S.S./HALLMARK, 9102 Huron Avenue, Richmond, VA 23294-5800.

WONDERWAND: Try the Tuning Lever you read and hear about. Enjoy Less Stress; Better and Faster Tunings: $65.00 p.p. Charles P. Huether, RPT, 34 Jacklin Court, Clifton, NJ 07012

"SALE OF PIANOS" — All models and styles. Specializing in players, art case and conventional pianos. Floor ready and as is pianos available. We also specialize in one of a kind and hard to locate pianos. Call collect Irv Jacoby 216-382-7600/FAX 216-382-3249. Jay-Mart Wholesalers — Pianos since 1913.

FOR SALE—Three restored reproducing pianos: Welte Mathushek 5'2" grand, Haines Ampico upright, Schubert upright, heavily carved rosewood case, with Pianocorder system. Del Lohuis, Phone 770-992-3592.

COMPONENT DOWNBEARING GAUGES (bubble type) give readings in degrees (string angle) and thousandths of an inch (dimension). Available at supply houses. Box 3247; Ashland, OR 97520

PROBLEM PIANO? Changes in humidity could be the problem. Protect your customer's piano with DAMPP-CHASER humidity control systems. Instructional video demonstrates grand and vertical installation procedures for $10.00 (includes shipping). Call DAMPP-CHASER at 1-800-438-1524.

BUCKSKIN for recovering grand knuckles and backchecks, upright butts and catchers. The "original equipment" supplying the industry for 140 years. Richard E. Meyer & Sons, Inc., 11 Factory Street, P.O. Box 307, Montgomery, NY 12549; 914-457-3834

KEY LEVELING SYSTEM — As seen at National. Unique straight edge and calibrated gauge plus all parts to improve and simplify your leveling jobs. Includes video tape. $100 plus $15 S&H. Carl Meyer, 2107 El Capitan Ave., Santa Clara, CA 95050, 408-984-0482.

PIANOS FOR SALE — Spinets, consoles, studios, grands. One or a carload. Excellent brand names. As is or rebuilt. Lowest possible prices. Owen Piano Wholesalers; 2152 W. Washington Boulevard, Los Angeles, CA 90018. Telephones 213-732-0103, 818-883-9643.

PIANO SCALING SOFTWARE for DOS. Plot inharmonicity, Tension, Break %, and more. Automatic Bass Rescaling, String Winding Sheets, Detailed Manual, and much more. Decimal & Metric. $80.00. Tremaine Parsons, Box 241, Georgetown, CA 95634, 916-333-9299

PTOOLS - COMPUTER TOOLBOX FOR TECHNICIANS. WIN & DOS Client Management, Mailmerge, Correspondence, Import/Export, Labels, Envelopes, Autodial and more. Measurement Conversions. Trade Specifications, Zipcode, Supplies, and Resource Databases. Conversions, Specifications, Calculations, Repair Formulas, and more. User: $30.00. Update Status: + $50.00. Tremaine Parsons, RPT; 916-333-9299.

PIANO COVER CUSTOM MADE to your specifications. Rehearsal covers now available. Specializing in custom colors and fabrics. Call or write for brochure. JM FABRICations; 10516 Ohop Valley Extension Road, Eatonville, WA 98328, 360-832-6009.

SOUNDBOARD PRESS - Designed and built by Chris Robinson and his welder, Ned Lisella. Only two in existence, all custom clamps and bolts included. No reasonable offer refused. Call Brad at: 914-358-6995.

CONCERT GRAND PIANO. Mason & Hamlin CC 9". Circa 1974. Professionally owned/maintained. In perfect condition at high performance level. Ebony matte finish. $25,000. Curtis Jordan. 512-442-9323.

RELIABLE ACCU-TUNER NOTESWITCH! One year guarantee! Includes coiled cable, thumb switch and attaching hardware. Fits all tuning hammers. $49.00 includes s/h. Dean Reyburn, RPT, Reyburn Piano Service; 2695 Indian Lakes Road, Cedar Springs, MI 49319, 616-696-0500

*Bluthner 6'4" 1910 Ebony, ornate plate w/clouds and angels $12,995; 1917 Steinway A, 6'1" Mahogany, $12,000; *Steinway 7' B, 1896, Ebony gloss, $19,500; *Steinway 5'10" 0, Dark Mahogany, $13,500; *Steinway 5'10" 0, 1920, Light Mahogany, $16,000; *Steinway D, 9', 1899, Ebony, $28,900; *Mason & Hamlin 5'8" A, 1916, Brown Mahogany w/Piano Disc, $16,000; *Baldwin 7', Ebony gloss w/ Pianocorder, $15,000; *Baldwin 6'3" L, Ebony gloss, $14,995; *Mason & Hamlin 5'8" 1926 "A" Brown Mahogany, $4,500; *Fisher Bby Grand, 5'4" 1915 Circasian Walnut, $4,895; *Baldwin 6'3" L Model, 1982, Walnut, $8.500. Call SCHROEDER'S PIANOS for a complete list of used pianos, 800-923-2311.

VICTOR BUYS & SELLS FINE GRANDS. LARGEST selection in USA, Over 400. Need Piano Tuner/Technician. VICTOR PIANOS, 300 NW 54 St, Miami, FLA 33127, 305-751-7502.

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

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

REPAIR CHIPPED IVORY IN 20 MINUTES. "AcryliKey" ivory restoration system produces a strong, color-matched, nearly invisible repair. Kit contains material enough for 50+ repairs plus pigments, mixing utensils, sanding pads, and complete instructions. $39.95 ppd. Richard Wagner, RPT; 7709 S.W. Pfaffle, #40; Tigard, OR 97223; 503-624-7360.

SERVICES

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

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

ADD ADDITIONAL $'s to your income. Rebuild player pianos for your clients. Send us the player parts. You restore the piano and we will return the mechanism in restored condition. We guarantee our work. For more details, call or write: Jim Brady, 2725 East 56th Street, Indianapolis, IN 46220, 317-259-4307

FOR THE HIGHEST QUALITY GRAND PIANO REFINISHING call 'ADEPT of Ft. Myers, FL. Bill Collins proprietor, 32 years in the craft. Licensed for 11 years at this same location. Specializing in exquisite, high quality and high gloss, lacquer finishes. Color and natural finish matching, case restoration, and invisible repairs. PH. 813-275-7170.

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

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

I WILL RESCALE your next restringing project. Lower inharmonicity, increase power, make voicing easier. $40. For measurement requirements call Paul McMillin, RPT. (800) 820-9014.

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

FABRICATION OF DISCONTINUED OR HARD-TO-FIND WOODEN PARTS (action or case). NO MINIMUM QUANTITIES. Call Paul Revenko-Jones 312-666-7440 or Brian Newell 312-226-2540.

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

PIANO KEY SERVICE—
.075 tops with fronts - $95.00
.095 Premium Tops with Fronts - $125.00
High Gloss Sharps (3 1/2") - $50.00
Keys Rebushed- Premium Cloth - $75.00
Custom Keys Made - Call for Price.
Many other services available. Call or write for price list. FREE return freight on pre-paid orders of $75.00.
WALKER PIANO SERVICE
554 State Route 1907, Fulton, KY 42041
1-800-745-6819.

SIGHT-O-TUNER SERVICE: Repairs, calibration & modifications. Fast, reliable service. Richard J. Weinberger; 18818 Grandview Drive; Sun City West, AZ 85375. PH. 602-584-4116.

We buy and repair Oslund Piano Key Machines, replace missing parts, new blades for sale. Charles A. Wilson. 1841 Kit Carson, Dyersburg, Tenn. 38024. 901-285-2516 or 285-4046.

TRAINING

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

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

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

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

PIANO TUNING COURSE — July 8-July 26, 1996. Three-week hands-on instruction in Tuning, Regulating and Repairing Vertical and Grand Pianos. Instructor Arthur R. Briggs, RPT, (716) 665-5699 and/or contact: Continuing Education, Edinboro University of Pennsylvania, Edinboro, PA 16444. Phone: (814) 732-2671 or 1-800-526-0121.

VIDEOS

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

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

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

WANTED

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

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

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

WANTED: Case parts for a Steinway A2 (6'1") Grand (1912). Need complete lid, fallboard, keyslip & pedal lyre braces. Any color or finish. Jerry Raz (510) 526-9294.

WANTED: Old tuning hammers (preferably Hale) for a collection, especially older hammers in good condition. Also wanted: factory hammer with quick-change heads involving tapered rod to tapered hole in head. Jerry Raz (510) 526-9294.

WANTED TO BUY— Piano Tuning Business servicing Hampshire & Franklin Counties of Massachusetts and/or surrounding areas. B. Snook, RPT. 516-928-8123.

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

HELP WANTED

GENEVA INTERNATIONAL CORPORATION, the exclusive U.S. distributor of Petrof Pianos, is wishing to hire a full time Piano Technician for shop work in the Chicago area. Prefer RPT with rebuilding experience. Polyester finish experience would be a plus. Contact Alan Vincent at 1-800-533-2388 for more information.

DISPLAY AD INDEX

Baldwin Piano	IFC
CA Geers	13
Dampp-Chaser	43
Decals Unlimited	9
Dryburgh Adhesives	9
Intermountain Seminar at BYU	13
Inventronics, Inc.	43
Jaymart	13
Kawai	11
Lunsford-Alden	13
Majestic Piano Company	41
New England/E. Canada Seminar	17
New England Classic Restoration	10
New England Conservatory	9
Onesti Restorations	3
PianoDisc	IBC
Pianotek	60
Randy Potter School	3
Renner USA	35
Reyburn Piano Services	9
Samick	25
San Francisco Piano Supply	13
Schaff Piano Supply	1
Shenandoah Univ. Conservatory	13
Yamaha	BC
Young Chang	7

PianoDiscussions™

March 1996

News From The World of PianoDisc

New Product Profile

New covers and P-O-P displays boost disk sales

Music Systems Research debuted its new CD/diskette covers at the '96 NAMM show in Anaheim in January. At the same time, it introduced new point-of-purchase display stands to showcase the dynamic new packaging. Both received rave reviews from PianoDisc dealers.

"The new covers are very exciting. They are fun to look at and will draw the customer's attention. I've ordered the complete library and the new stands. They will make selling the disks easier than ever," commented Steve Bird of the Piano Gallery in Austin, Texas.

"The packaging is absolutely beautiful, very tastefully done. I've shown a sample to several people on my staff and customers in the store and they all raved about it. The bright colors have lots of eye appeal. The P-O-P displays provide a dramatic backdrop for the disks," commented Karen Winney of The Piano Man Music Center of Kansas City. "This is great stuff!"

The new covers are in full color, with photo montages that depict the theme of each musical category. The new Artist Series covers feature the inventive portraits of each artist which were commissioned by MSR.

"We're pleased with dealer reaction to the new designs. They should provide high visibility for the software in the dealers' showrooms," commented Gary Burgett, President/Marketing of Music Systems Research.

The new point-of-purchase displays come in two configurations. The floor model can hold in the neighborhood of 120 disks. The countertop display holds 30. Either version provides a dealer with an effective means of generating interest in software sales in the store.

"The redesign of the disk covers came about as a result of dealers' comments and suggestions. We undertook this major change to support their efforts to market the software in-store," commented Burgett.

'81 Cliburn winner Andre Schub joins PD Artist Series

Noted Steinway Artist and 1981 Cliburn Competition winner, Andre-Michel Schub recently took time out from his busy concert schedule to record for the PianoDisc Artist Series.

The *New York Times* has called Mr. Schub "pianistically flawless ... a formidable pianist with a fierce integrity."

Since winning the prestigious Cliburn prize he has earned public and critical acclaim for his hard-driving, controlled and altogether brilliant performances. He currently performs as many as 100 concerts a year and has played with major orchestras both here and abroad.

In October, Mr. Schub recorded what is sure to be a premier disk in the Artist Series. His repertoire included Liszt's *Paganini Etudes,* Schumann's *Arabesque Opus 18* and the Mozart *Sonata In F Major K332.* Rimski-Korsakoff's *Flight of the Bumble Bee* serves as a rousing encore. In his varied and interesting program, listeners will experience the power, control and lyricism for which Mr. Schub has become world renowned.

PianoDisc to give class at PA State PTG Convention

Don Dusenbury, MSR/PianoDisc's installation training instructor has announced he will conduct a special seminar at the Pennsylvania PTG State Convention. The event will be held at the Sheraton of Bucks, Langhorne, Pennsylvania on March 21-24, 1996.

The title of the seminar is "Troubleshooting the PianoDisc System." It's an intense six-hour class covering the basics of diagnosing system problems and valuable tips on how to resolve them in the field. Attendees are encouraged to use video cameras or tape recorders during the class, since a great deal of valuable technical information will be covered in a short amount of time.

The aim of the class is to provide technicians with skills which can lead to income opportunities.

For information about the convention, call Webb Phillips at 215/674-2555. For class information call Don Dusenbury at PianoDisc, 916/567-9999.

MSR/PianoDisc

4111 North Freeway Blvd. • Sacramento, CA 95834

Phone: (916) 567-9999 • Fax: (916) 567-1941

Tech Support: 619-258-1460 or 916-567-9999

Telephone lines are open

M-F 8 a.m.-5 p.m. Pacific Time

Tuition for the installation and Continuing Education seminars is **free**, however 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 the seminars, call PianoDisc during our office hours.

INSTALLATION TRAINING SCHEDULE

March 25-30 April 22-27

May 6-11

CONTINUING EDUCATION

April 1-3 April 29-May 1

Fact: PianoDisc is America's Number One Selling Player System.

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.

YAMAHA®