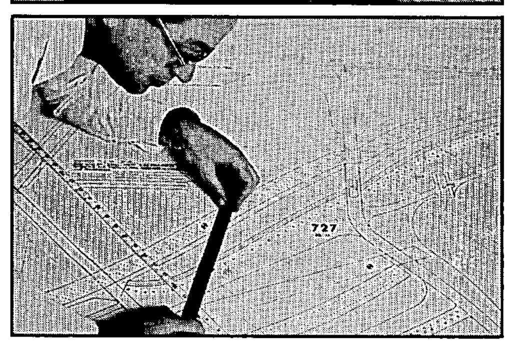
Piano Technicians
Journal
April 1989

The Baldwin Piano...

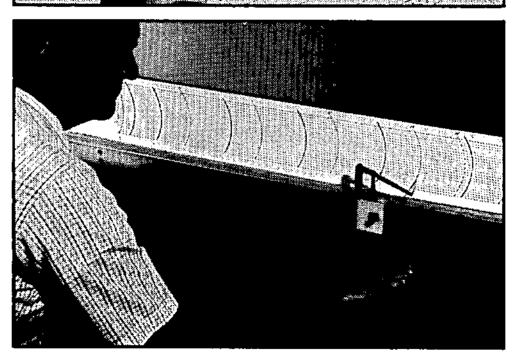
You can see why it sounds better

At Baldwin we believe that perfect piano tone is an ideal shared with all those who design, build, play and service pianos. That's why continuous research in piano tone has always been one of our major commitments. And that's why our piano engineering and research department is one of the largest in the industry. And that's why you'll often find in every Baldwin piano innovations to improve piano tone introduced in our SD-10 concert grand.

RESEARCH shows us why, as well as how, some things work better because we've taken a pioneering approach to piano improvement. We've substituted scientific testing and analysis for the unquestioning acceptance of traditional solutions. Some of the achievements that have resulted are treble termination bars (U.S. Pat. No. 3,477,331), the Acu-Just™ plate suspension system (U.S. Pat. Nos. 3,437,000 and 3,478,635), and vertically laminated bridges. Our patents are the most significant ones awarded for tonal improvements in grand piano tone in recent years.



ENGINEERING translates research into reality. To support our design innovations, we have produced our own testing and construction equipment and have expanded the use of precision tooling to insure that each Baldwin piano built will exactly match established standards of tone and performance. One example of this is a winding machine (U.S. Pat. No. 4,055,038) developed in connection with the SynchroTone™ Strings (U.S. Pat. No. 3,523,480).



MATERIAL STANDARDS insure continuing quality. For example, stringent standards for weight, dimension, taper, and hardness of hammer felt are established, and each sheet of felt is checked to be sure it meets those standards before it is accepted for production use.

First in a series of informative ads on piano tone published by Baldwin Piano & Organ Company exclusively for the benefit of piano technicians.

Baldwin® - *Leading the way through research*

PIANO TECHNICIANS
Journal

APRIL 1989 — VOLUME 32, NUMBER 4

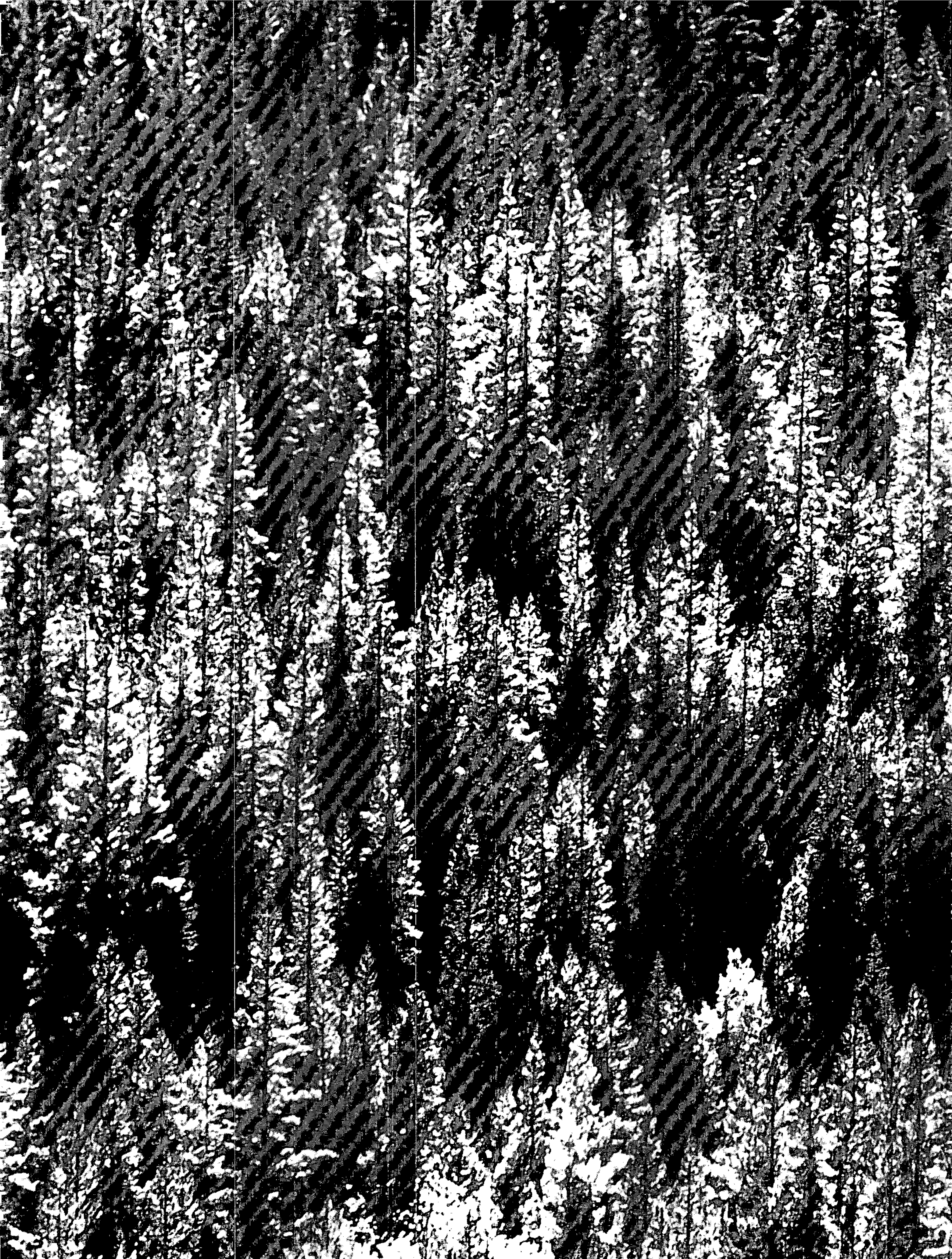
OFFICIAL PUBLICATION OF THE PIANO TECHNICIANS GUILD, INC.

ABOUT THE COVER

What are these critters? They're electron microscope views of broken (left) and cut piano wires. See page 19.

The Piano Technicians Journal (ISSN 0031 9562) is the offical publication of The Piano Technicians Guild, Inc., 4510 Belleview, Suite 100, Kansas City, MO 64111. The *Journal* is published monthly. Second class postage paid at Kansas City, MO., US ISSN 0031 9562 foreign and domestic. POSTMASTER: please send address changes to: *Piano Technicians Journal*, 4510 Belleview, Suite 100, Kansas City, MO 64111.

Annual subscription price: $85 (US) for one year; $155 (US) for two years; $7.50 (US) per single copy. Piano Technicians Guild members receive the *Piano Technicians Journal* for $45 per year as part of their membership dues.



The secret to the Young Chang sound is more of a good thing.

Spruce. Renown for its extraordinary resonating qualities, it's the only material considered for sound boards of fine quality pianos.

At Young Chang, we recognized spruce backposts could elevate our tone from remarkable to unrivaled. So we developed a revolutionary technique to produce plates of unprecedented stability which allows us to use spruce, the most expressive of woods, in our backposts as well as our soundboards.

With every instrument we create, we grow. Our search to discover new ways to refine our pianos continues, and we take great pride that our efforts have been rewarded with an unparalleled sound and peerless performance.

And that's why you'll find the Young Chang sound simply towers over the others. For technical information, write or call our Director of Technical Services, Young Chang America, 13336 Alondra Blvd., Cerritos, CA 90701, (213) 926-3200.

YOUNG CHANG

The best the world has to offer.™

President's Message

The World Community Of Piano Technicians

With the upcoming trip to Japan, Korea, and China, I thought I would write a bit about technician organizations in other parts of the world. PTG is a strong organization but certainly not the only technician organization around. All these organizations strive for the same goal, to educate their members and make them better technicians.

Ronald L. Berry, RTT
President

Let's start close to home: within North America there are several other technician organizations. In the U.S. there is the Master Piano Tuners of America which, I believe, is basically centered on the East Coast but has members throughout the U.S. Many of the members of this group are also members of PTG. They have conventions and seminars and other such educational programs. Also in the U.S. there is a blind technicians organization with our own Stanley Oliver as President. This organization is concerned with political lobbying for blind people to help maintain career training for them. They feel that mainstreaming blind people in regular school systems will produce well-educated but unemployable people who need some direct trade and career training. Piano technology is one of the better paying jobs available to blind people.

In Canada there is the Ontario Guild of Piano Technicians covering the province of Ontario. This group has many of the well-respected technicians in Ontario and some share dual membership with PTG. Further east is the Quebec Piano tuners association. My understanding is that this is a group of French-speaking technicians and has a large contingent of blind technicians. The New England regional seminar in 1990 will be in Quebec City in hope of establishing better communication between PTG and this group of technicians. There are already projects underway to look into producing our *Journal* on tape in French so that these technicians could become members of PTG and share with us. In western Canada is the Canadian Association of Piano Technicians which began with some PTG members who felt that another organization with a different structure and dues rate could better serve the particular needs of western Canada. While this organization is basically centered in western Canada, I understand that they have members throughout Canada. Though Mexico has no technicians organization that I am aware of, efforts are underway to have a South Central regional seminar in Mexico City to help start a Mexican organization since there seems to be interest in one.

There are numerous organizations in Europe which are national organizations for the various countries. They are: Sveriges Pianostammare och Teknikerforening (Sweden); Bund Deutscher Klavierbauer (West Germany); Schweizerishcer Verband der Klavierbauer und Stimmer (Switzerland); L'Association Francaise des Accordeurs-reparateurs de Pianos (France); Associazione Italiana Accordatori Riparatori di Pianoforti (Italy); Dansk Pianostemmer-Union (Denmark); Norges Pianostemmer og Teknikerforening (Norway); Suomen Pianovirittajateknikot r.y. (Finland)

These organization are part of an umbrella organization called Europiano which is more like our organization with the individual country organizations being more like chapters. Europiano produces the quarterly technical journal which is a multi-lingual publication with most technical articles appearing at least in German, French, English, and Italian. Each country organization has a section for information relating to itself in its own language. Europe is headed toward a breaking down of all economic barriers between countries within the next couple of years. This will make it more like the U.S. with free trade between countries. This factor will make Europiano all the more important in maintaining communication between the individual organizations and countries each with its own language, culture, traditions, and style of business. Leo Duricic of Schimmel Piano Company, whom many of you have met at our conventions, is President of Europiano and his leadership and knowledge of languages will lead them through this challenging but exciting time. My understanding is that Europiano has about 800 members throughout Europe.

The English seem to have a certain ambivalence about whether or not they are part of Europe. Since England is an island, this is reasonable. The English organization, the Pianoforte Tuners' Association, is not part of Europiano but is a strong organization. There is also a blind tuners organization in England to serve the special needs of blind technicians.

The Far East has organizations in Japan, Korea, and Taiwan. The Japan Piano Tuners Association is a strong organization comparable in size to PTG. As is true in most

Continued on page 12

A Classic Descendant

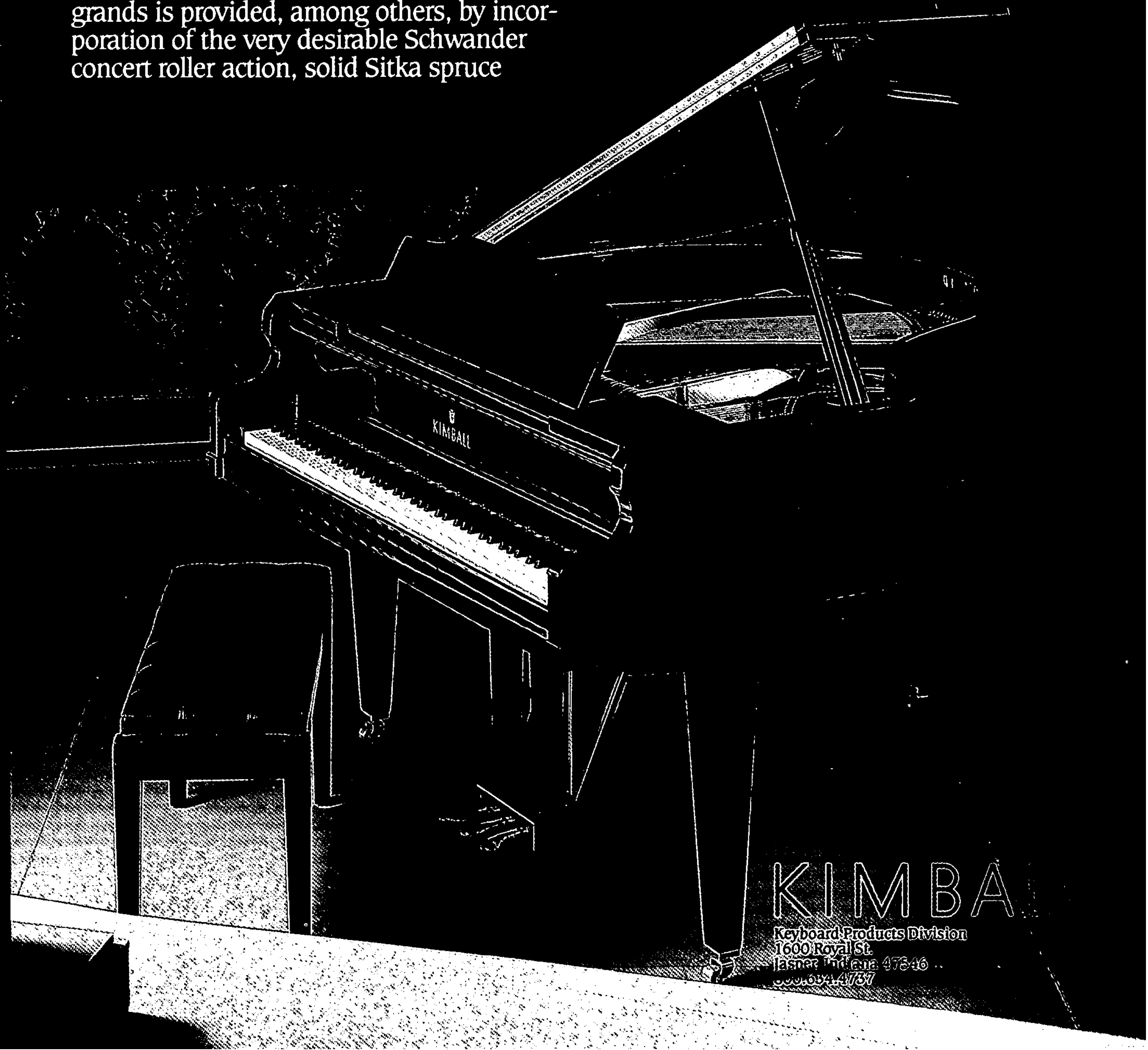
The natural evolvement of a great piano tradition.

The new 5'2" Viennese Classic grand is a prodigy evolving from an elite line of classic instruments; the beneficiary of a heritage that includes the stately 9' Viennese Classic concert grand as well as the incomparable 6'7" and 5'8" grands as its proud pedigree.

Evidence that the new 5'2" grand continues those quality attributes associated with the highly acclaimed Viennese Classic grands is provided, among others, by incorporation of the very desirable Schwander concert roller action, solid Sitka spruce soundboard and heavier professional quality hammers. These beautiful new pianos are offered in five popular wood finishes.

The new Kimball 5'2" grand now takes its rightful place at the side of its forebearers representing the finest in piano architecture, state-of-the-art engineering and production craftsmanship.

The 5'2" Viennese Classic grand . . . a worthy descendant.



From The Home Office

The Importance Of Membership

What's the most important thing we do in the Home Office? You could say that it's the *Journal*, which is the most frequent contact most members have with the organization. Or, if you attend the annual convention and experience the camaraderie there, you might say that helping to plan that activity is most important.

> ***We like to think our list represents the cream — people who are committed enough to their profession to be active in it.***
>
> **Larry Goldsmith**
> **Executive Director**

However, the area that supports all our other activities is our membership department. Maintaining membership records accounts for a good percentage of our Home Office activity. Responding to membership inquiries, processing membership applications and reclassifications, keeping addresses and phone numbers current, collecting membership dues, and a host of similar activities occupy our time. In many cases, these involve telephone calls or correspondence with individual members and chapter officers.

We recently completed the collection of 1989 membership dues for the association and for approximately 50 chapters. Although dues were billed in November, almost 600 members were delinquent on the first of February. Approximately 400 of these cases were resolved in February, many of them through personal contact by mail or phone in cooperation with Regional Vice Presidents or chapter officers. Still, we were reluctantly forced to drop almost 200 members in early March.

Did you know that our second-class mailing permit requires us to account for every single copy of the *Journal* that is printed? We recently completed an audit in which postal inspectors verified the destination of the copies reported on our mailing statements and examined our membership records to verify our mailing list.

These are only two examples of the level of record-keeping involved here. As we increase our efforts to accumulate statistical information about our industry, these activities will become even more critical.

It's more important than simply keeping track of people, however. Our membership list represents the status of an industry. Of course, not everyone who works on pianos is a member of the Guild, but we like to think our list represents the cream — people who are committed enough to their profession to be active in it. Through the increasing professionalism and participation of our members, the Guild is becoming known as a strong voice in the music industry. By participating in the Guild, members strengthen each other. Higher visibility for the piano technician's craft, better pianos, better musicians and a higher level of musical consciousness among the public are the results, and that means more and better work for piano technicians.

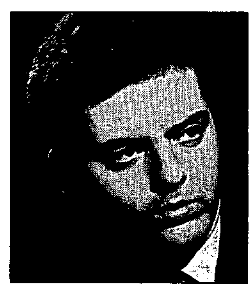
So, while some of our membership activities are less than glamorous, they form the foundation for everything else we do — just as the strength and professionalism of individual members are the foundation on which the Guild's success depends.

No one is paid to play or endorse a Steinway.

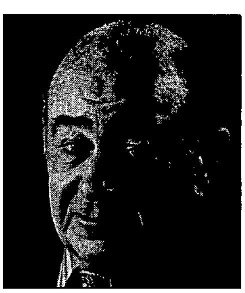
Since 1853, Steinway has been "the standard of excellence" and the resounding choice of over 800 concert artists throughout the world. This concert season, the overwhelming majority of piano soloists with major orchestras will play only Steinway® pianos. They do so because of the incomparable Steinway sound, and because of the unique way in which a Steinway responds to their touch, technique and imagination. To find out more about how to make our Concert & Artist program work for you, contact Frank Mazurco, Vice President of Sales and Marketing, Long Island City, NY 11105, (718) 721-2600.


Claudio Arrau

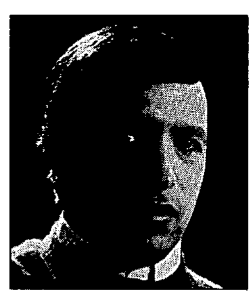

Vladimir Ashkenazy

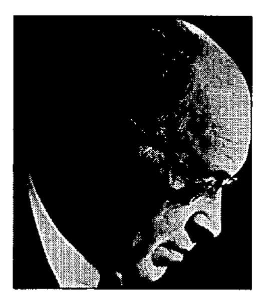

Daniel Barenboim


Alfred Brendel


Shura Cherkassky


Alicia de Larrocha


Murray Perahia


Rudolf Serkin

STEINWAY & SONS

Steinway Place, Long Island City, NY 11105 (718) 721-2600

Follow The Oregon Trail...

The 1989 Technical Institute

Ben McKlveen
1989 Institute Director

This month's *Journal* gives me another opportunity to remind you of our national convention in the beautiful city of Portland, Oregon July 10-14, 1989 and to invite you to attend the educational institute which is part of that convention.

In the past articles I have written about some of the highlights of this year's institute, mentioned that tutoring has been expanded, and introduced you to some of the new instructors that will be featured this year. In this article, I will review for you some more classes.

Every institute features tuning classes. We are presenting **George Defebaugh** and his class, "Basic Piano Tuning," offering everything from muting, setting the "A," beat counting, unison tuning, hammer technique, to the finished product—a finely tuned piano. **Dr. Albert Sanderson** will be on hand again to do his fine class, "Aural Fine-tuning—For Electronic Tuners." Learn how electronic tuners can develop aural tuning techniques, not only for quality tuning control, but to be able to achieve concert quality tuning as well. Check out **Rick Baldassin's** class, "Tone and Friction." Learn how friction—or the lack of it—can influence piano tone.

Are you interested in grand repair and rebuilding? Let **Susan Graham** show you her class called "Support Your Local Grand Piano." It is a class on repairing, refastening or replacing grand legs and lyres. Then watch **Norman Neblett** teach you all about pedals, lyres, trapwork, and damper trays in his excellent class, "From the Bottom Up."

Follow through with **Jack Krefting** and his class, "Doing It Right With Dampers." He will instruct you about damper trays, underlevers, damper wires, damper heads and damper felt replacement, regulation—everything you need to know about dampers. **Bill Spurlock** and **Fern Henry** will show you their unique system for key bushing. **Sally Krefting** will teach you all about hammers—selection, boring, hanging, trimming, and afterhanging adjustments. **Isaac Sadigursky** will show you the "End of Agraffe Aggravation" in expanded three hour versions of his very popular class from last year. **Willis and Dave Snyder** will be back to demonstrate techniques of piano remanufacturing, including soundboard, bridge and case work. More about grand classes next month.

Everyone has to work on vertical pianos sometime during a career, so our vertical classes this year will include a class by our new guy, **Gary Neie**, called "Hospital for Hopeless Pianos." **Jim Hess** is back with "Spinet Repairs." **Carl Root**, another new guy to the national scene, will teach you how to recognize and eliminate those annoying noises that turn up in pianos. **Jim Harvey** drew crowds that flowed out into the hall last year with his class, "Nickel and Dime Quality Tools." You can learn to make these tools to use to improve grands and uprights with techniques learned in the above-mentioned classes. (I promised Jim a larger classroom this year, but you better get there early. I promise you that his class will be crowded.) And, when all the repairing, rebuilding, and regulating classes are completed, let our resident guru of piano moving, **Jim Geiger**, and his crew show you how to move these pianos safely and efficiently.

This is not all that we have for you in Portland during the week of July 10-14. We have not mentioned the manufacturers, who contribute so much to our institute every year. I will talk about them next month along with a few surprises.

Before I leave you this month, there are some thought that I would like to share with you. If you are not sure about your plans to attend the convention in Portland this summer, let me ask you a question. How many of your prize goofs in piano technology can you recall? Maybe "goofs" is too strong a word; let's be more charitable and ask, "How many instruments are there on which you think you might have done better work?" I won't ask for written replies; I ask the question only to make a point and it is this: excellence is an accumulative quality; it needs to be practiced, cultivated and nutured. When we implore you to "Follow the Oregon Trail" to Portland in the continuing quest for excellence we hope that you will respond with your attendance at the convention. A great deal of time, money and effort goes into the making of a PTG Institute. We try to bring the qualified experts in our field to teach at these institutes. Fortunately, we have a wonderful pool of experienced instructors. Time and space allow us to tap only a portion of this instructional wealth each year, but there is something here for everyone. Even the instructors benefit from the classes, and from the association with their colleagues.

Please think about attending! We need your presence. Make some plans. I'll talk to you next month.

...To Excellence!

Combine Business With Pleasure In Portland

Taylor Mackinnon
Portland Chapter Liaison

Portland is located at the north end of the Willamette Valley where the Willamette River blends into the Columbia River. This Valley is a fertile, temperate and beautiful piece of real estate. The region grows everything: strawberries, walnuts, hops, peaches, wheat, grass seed, filberts, cabbages, blue berries, prune plums, apples, all sorts of cane berries, grapes, cherries and on, and on, and on. I think this was what surprised and delighted me most when we first moved to Portland fifteen years ago. I remember my grandmother had a dozen strawberry plants in her garden in Kansas where I grew up, but to see a 40 acre field of nothing but strawberries was a real treat for me. And then to see field after field of strawberries nearly overwhelmed me.

On the east side of the Willamette Valley are the Cascade Mountains. This volcanic formed mountain range shows many outstanding peaks to us. The highest and closest to Portland is Mount Hood at about 11,239 feet. About 75 miles south is Mount Jefferson, then Three Sisters. The first peak we see to the north into the state of Washington is Mount St. Helens, about 75 miles north of the city. Mt. St. Helens became an active volcano in May of 1980 with a rather large explosion. West of St. Helens is Mt. Adams and north is Mt. Rainier. On a clear day, from many points in Portland one can see any one of these mountain peaks, and usually more than one from a view point.

Mt. Hood is the most developed of the Oregon peaks with many fine ski areas. Timberline is open year around for skiing, and historic Timberline Lodge is an hour and a half drive from Portland. In the summer time there is great camping, hiking, fishing on streams and lakes as well as superb sightseeing in the Cascades. If you like the great out-of-doors, this is it!

This year's convention would be the ideal year to combine business with pleasure. Bring your family and plan to spend a little extra time in the state of Oregon. Not only is there the beauty and accessibility of nature, but the Portland Chapter has something planned that will please you. First there is the Carnival on Tuesday evening. This event will be held at Portland's Carousel Museum which is within a block's walking distance from the Convention Hotel. Not only will there be all the food you could want and all sorts of midway entertainment, but there will be the big carousel to ride and two bands to dance to.

Mt. Hood, as seen from Portland's Rose Garden

Also, the Portland Chapter is sponsoring a post Convention tour that may pique your interest. This over-night bus tour will take us north up to the Washington coast town of Hoquiam and the Posey Manufacturing Co. This is where raw Sitka spruce logs are processed into soundboards and ribs. On the way back we will take the loop over to Mt. St. Helens and tour our active volcano. This is another opportunity to combine business with pleasure.

Next month I want to share with you the Oregon Coast, which is entirely publicly owned, and the Columbia Gorge with its breathtaking waterfalls and its hydroelectric dams, and I'll tell more about the Portland Chapter's activities.

Industry News

Family Nominations Sought

Members of the music industry are encouraged to nominate musically-active families for the 1989 American Music Conference (AMC) "Amateur Music Family of the Year" award. Nominations will be accepted from now until the August 31, 1989, deadline.

The AMC award honors families that are active amateur musicians who play together—at home and in the community. Judging is based on the degree of individual and collective involvement in school and community music groups.

Members of nominated families should collectively play several different instruments (although *not all* members must be active musicians) and, as a family, should participate in musical activities outside the home, such as church, school and community groups, and performances for civic and social organizations. Families including individuals currently earning a living as professional musicians will not be considered.

AMC and its panel of judges representing the music industry, the music education community and music press will select one national award-winner and several regional winners.

To nominate the outstanding musical family (or families) from your community, send their names, address, telephone number and a brief description of their music activities to: "Amateur Music Family of the Year," American Music Conference, Suite 1214, 303 East Wacker Drive, Chicago, IL 60601. For information, call (312)856-8820.

NPF Offers Library

An audio/visual presentation of over 35 compositions with special appeal for adult piano students is now available from the National Piano Foundation.

The New Music Review Library: Music for the Adult Student contains overhead transparencies of the musical selections and accompanying audio cassettes. In addition, participants will receive a comprehensive list of the compositions, the publishers represented, and a selection of NPF brochures.

For information on renting *Music for the Adult Student*, contact Madeleine Crouch, National Piano Foundation, 4020 McEwen, Suite 105, Dallas, TX 75244, 214/233-9107.

President's Message...

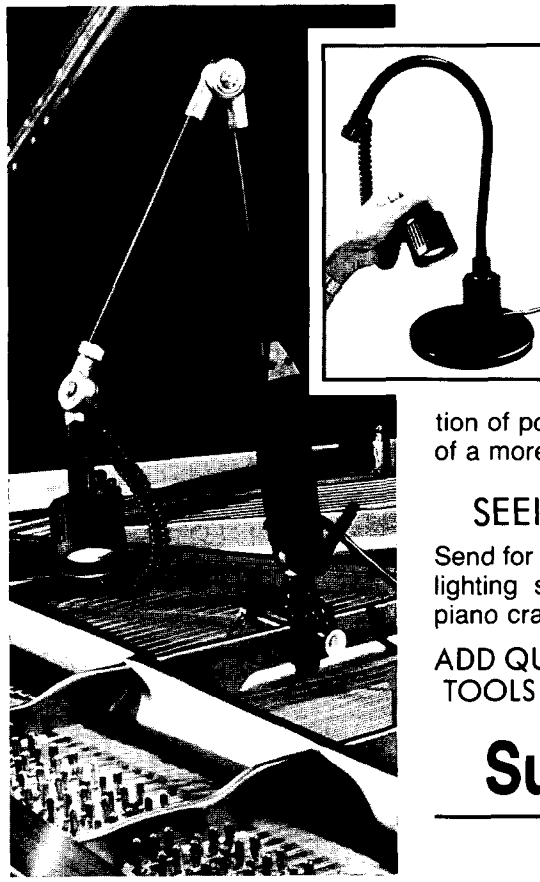
countries, JPTA has strong support from the manufacturers in its own country. Factory experience and training plays a much greater part of a technician's training in most countries outside North America. The JPTA will be host to the next IAPBT meeting in Kyoto.

For those who don't recognize "IAPBT" it is International Association of Piano Builders and Technicians. This organization is an umbrella organization whose members are organizations. Currently its members are the Piano Technicians Guild, Japan Piano Tuners Association, Korea Association of Piano Tuners, Taipei Piano Technicians Association, and Australian Piano Tuners and Technicians Association. There is a provision for individuals to be members if IAPBT has no member organization in their country. This is not to be confused with "Friends of IAPBT" which is PTG's way of getting individual support for PTG's activities in IAPBT. PTG is sponsoring a trip to the Orient in conjunction with the IAPBT meeting. This trip will provide a wonderful chance to meet technicians from other parts of the world.

Also in the Orient are the Korea Association of Piano Tuners and the Taipei Piano Technicians Association. Both these are smaller but active organizations. Their regular support of IAPBT activities shows their dedication to the craft and to the world community of piano technicians.

Australia has a newly formed national organization called the Australian Piano Tuners and Technicians Association which is made up of several state organizations which already existed in Australia. They are the newest members of IAPBT. There is also a New Zealand Piano Technicians Guild.

This quick overview of other organizations gives you some picture of the world community of piano technicians. Just as we have all gained from our association with other technicians in our own countries, further sharing of information among countries can only help all. The piano industry as a whole is rather small compared to many industries, and that fact makes it much easier to be part of the whole industry.



The Pedalbox And Trapwork

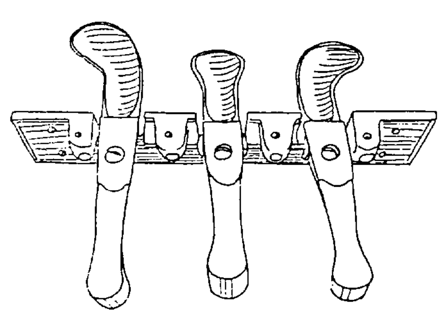
Susan Graham
Technical Editor

To continue this series on grand lyre repair, I'll concentrate this month on the pedal box and trapwork. First, though, a tip for installing lyres which are equipped with wooden braces. The maneuvering required to hold the lyre up to the keybed to engage the lock plate *and* hold the braces so they will fit into both the keybed and the pedal box *and* slide the lyre into its locked position can be extremely frustrating. The solution is duct tape: temporarily fasten the braces to the keybed. The lower ends of the braces will swing free and can be guided into the pedal box with the fingers as the lyre is pushed into place with the thumbs. As detailed in the January installment of this series, fit of the braces must be exact: tight enough to hold the lyre in place without either jamming it forward or permitting it to swing backwards under use. Accomplishing this usually involves several attempts at fitting, each requiring removal and reinstallation of the lyre. When the braces are finally correct, it can make installation even trickier since the free play is eliminated. If there is room, put an object under the lyre which will hold it up almost to the latch plate, reducing the distance you will have to lift the weight of the assembly. If determining the correct locked postion of the lyre is troublesome, install it once without the braces and scribe or chalk-mark a reference mark along the front edge. It also can be helpful to pull the pedal rods out of the back of the pedals and drop them down so they don't bind the trapwork levers (although they may now snag in the carpet). Temporarily fasten the trapwork levers up to the keybed as close as tape (or a tuning mute used as a wedge) will hold them to help clear a path for the lyre.

All this attention to a solid lyre is pointless if the pedals themselves are in trouble. There are several common systems for supporting the pedals within the pedal box. One which we often encounter uses a metal plate with a channel in it to accommodate either individual pedal pins or a continuous rod which supports all three pedals. This plate may screw to metal supports on either side of the pedals, as in some older Baldwin systems, or it may screw directly to the pedal itself, as in the Steinway. There will be a piece of bushing cloth (or, in more modern systems, a nylon or teflon bushing) between the rod or pin and the plate where the rotation *should* take place, and the rod or pin should be fixed firmly everywhere else. If the system is designed so the pin is free to rotate in the support, it should not be loose in the pedal; if the rotation takes place in the pedal itself, the rod or pin should be stationary where it is supported. It is essentially the same principle as an action center: one part fixed, one moving.

Both versions develop looseness with use, quickly detectable by wiggling the pedals side to side by hand. The Steinway-style pedal arrangement is easily removed without removing the lyre: extract the screws holding the metal plate covering the front of the pedal box, disengage the pedal rods by lifting them out of the back of the pedals, and slide the whole plate and pedal assembly forward and out of the pedal box. (Keep the plate screws in order). When you turn the assembly over to locate the plates (fig. 1), you may find several causes of undesirable looseness. The bushing cloth which is wrapped around the rod is often worn through. It needs to be replaced with a new piece of high quality cloth, matching thickness and dimension as closely as possible and lubricating the cloth heavily with VJ lube. Use a hemostat or tweezers to grab the ends of the cloth where they protrude from under the plate, and pull firmly as the plate screw is retightened to avoid creating any folds or wrinkles around the rod. If the support rod is contaminated with remnants of previous lubricants, clean it. If it is badly corroded, bent or damaged, it will need to be removed and straightened, cleaned or replaced. The screws which hold this rod tend to freeze, so apply a rust dissolver such as Liquid Wrench or WD-40 before attempting to remove them. Keep these screws in sequence as well (they can be numbered with a Sharpie permanent marker). If the punchings between the pedal and the supports are badly worn, they should be replaced with a suitable thickness of leather punching. This is done by removing all the pedals, removing the support rod, and threading on the punchings from one end. It is simple and most economical to make

Figure 1: Pedals — Underside



Drawings By Valerie Winemiller

these punchings yourself: purchase an assortment of punches and leather from a local leather supplier or through the piano supply houses. Be nice to punches: back the material with a vinyl mat made for the purpose, or with a chunk of wood turned so the end grain is up and the cutting edge of the punch can sink into it as it cuts through the leather. When installed, the punchings should be lubricated with VJ lube. Although felt punchings are sometimes used, leather lasts much longer. Watch that they are not so thick they pinch the pedal and create sluggishness.

It is important that the machine screws holding the metal plates are tight. They do, occasionally break. Screws in more recently made pianos are 5/8", 12x28. However, older instruments have a bastard thread bolt which is difficult to replace, making it necessary either to retap the pedal to take a conventional screw, replace the pedal entirely, or install a smaller diameter bolt which is just long enough to pass completely through the pedal so a nut and washer can be threaded on (a handy temporary fix).

In a system using conventional pedal pins, fixed in the pedal and allowed to rotate in the the support, the pin must be tight in the pedal. If it becomes loose, it needs to be replaced with a larger sized pin, if available, or epoxied into the pedal, or the pedal can be plugged and redrilled, or the pedal can be replaced. The pedal pin will determine the alignment of the pedal, and can be bent slightly to square up the pedals to each other and to the front of the pedal box. When pedals are replaced, it is sometimes necessary to relocate the pedal pins to accommodate the spacing dictated by the existing supports (drill and install new pins) It is easy to replace the leather punchings which control side alignment in these systems since the pedals are individually accessible. If there is bushing cloth between a support plate and the pin, it must be intact and lubricated, and installed with no wrinkling.

The knurling which holds these pins tightly in the pedal makes them aggravating to remove if necessary. In the shop the pedal can be held in a vise and the pin driven out with a punch. In the field, a pin pusher is used. These are commercially available from our sup-

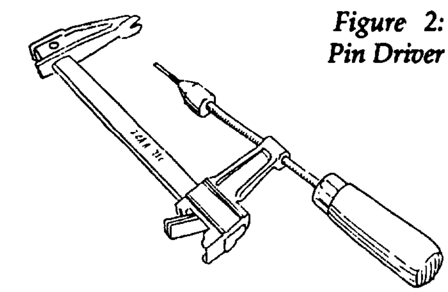


Figure 2: Pin Driver

Figure 3: Pedal With Dowels, Etc.

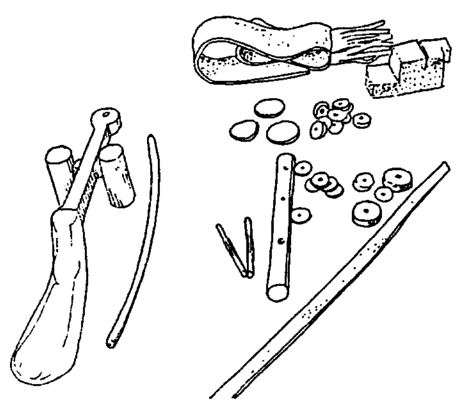
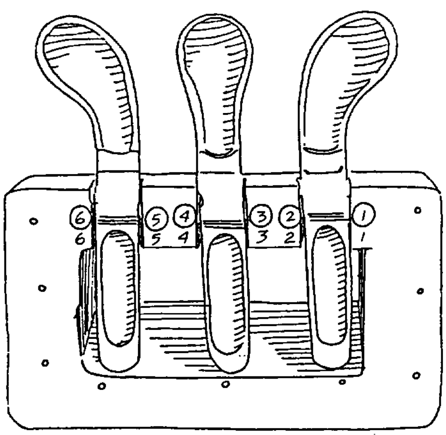


Figure 4: Repaired Lyre



pliers, or they can be made from C-clamps. I seem to encounter a lot of very stubborn trapwork lever pins as well, so I carried the pin driver idea one step farther to create a tool which could be used to disassemble this upper part of the system without having to remove it entirely from the keybed (more on this later). What I came up with is a modification of a 9" Jorgenson clamp (fig. 2). The larger woodworkers' supply outfits which stock these clamps also stock kits from the same company, used to make cabinetmakers' wooden-jawed clamps. These kits include a long threaded rod which fits the threads of the metal Jorgensons as well (conventional threaded rod from the hardware store ran very rough in the clamp, although I expect this could be cured with tapping). I had my machinist fix a collet to hold a machinists' pin on the end of the threaded rod, and saw a groove in the fixed end of the clamp so the pin can be driven out. (It's to remove the rivet in the end of the bar of the clamp to disassemble it for these modifications; replace the rivet or the tool will tend to come apart at inopportune moments). The collet could be fixed to the original short threaded rod of the clamp, although this makes it somewhat less versatile in awkward situations under the keybed. With the adjustable clamp and the proximity of the pin to the edge of the jaws, I can drive out trapwork pins while the system is still fastened to the piano, and the same tool will also push out pedal pins.

Another pedal support system which utilizes a pin fixed in the pedal is the dowel style (fig. 3). It is critical that these dowels be supported firmly by the bottom of the pedal box: whenever such a system is disassembled, save and reinstall any cardboard or cloth shims on the bottoms of these dowels. Obviously, the bottom board itself must be tightly screwed to the pedal box body. Wobble and noise in such systems can be due to worn spacer punchings, a broken dowel, or ovalling of the hole which accommodates the pedal pin. The lyre and the bottom of the pedal box must be removed so the pedal and its dowels can be pulled straight up out of the box. Before removal, however, number the dowels and the holes (fig. 4). It is remarkably time-consuming to determine the correct pairing and location of these dowels if they are scrambled. If the dowel is broken or too worn to perform, it can easily be replaced with the appropriate size of hardwood dowel, drilled to accommodate the pedal pin. For emergency repairs, I carry several sizes of dowelling, predrilled but not cut to length since it is fairly easy to cut off a dowel section with a small hacksaw, but tricky to drill a straight hole in a cylindrical object without a vise and a drill press.

Similar in theory to the dowel mount is the wooden block mount: the same repair principles apply. These blocks are usually screwed to the bottom of the pedal box and can be a source of noise if the screws are not tight. The holes in the blocks for the pedal pins may or may not be bushed: they can be rebushed if necessary, plugged and redrilled if elongated, or the entire block can be replaced (pinblock material is excellent for this purpose).

The pedals are levelled at the correct rest position by supports under the *back* of the pedal. They are placed here rather than above the pedal at the front because this is closer to the rod, the source of pressure against the pedal. Steinway uses a leather-covered front rail punching for this purpose, and it is a nice touch to replace them with duplicates when the system is rebuilt (fig. 5). They can be purchased but are also easy to make (fig. 6a). Drill three one-inch diameter holes in a block of wood, slightly deeper than the thickness of a thick front rail punching, and put a piece of waxed paper across it. Cut three 2x2 squares of fairly thin leather or buckskin and place them centered over the holes. Put a front rail punching in the center of each and apply glue to the leather without actually contacting the punching (fig. 6b) The next layer may need to be another piece of thin leather, followed by a piece of thicker leather. This intermediate piece is sometimes omitted: there is a recess in the bottom of the pedal box that these pedal buttons extend into—use the appropriate thickness or combination of thickness to match that space. In either case, after the thicker leather is laid on top of the buckskin, covering the punching, put waxed paper over it and clamp a flat piece of wood tightly across the top so the punching is forced down into the hole (fig. 6c). When dry, this will yield three leather pedal buttons which are attached to the bottom board of the pedal box with tacks, being sure they line up and fit in the recesses made for them. This creates a very stable and noise-absorbing support for the pedals.

A similar thing is accomplished by cutting hammer felt blocks to shape and installing them under the pedals. Since it is these blocks that keep the pedals level with each other and since stability is critical for lasting pedal regulation, be sure the blocks are uniform and dense.

Figure 5

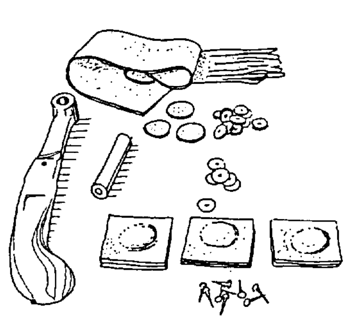
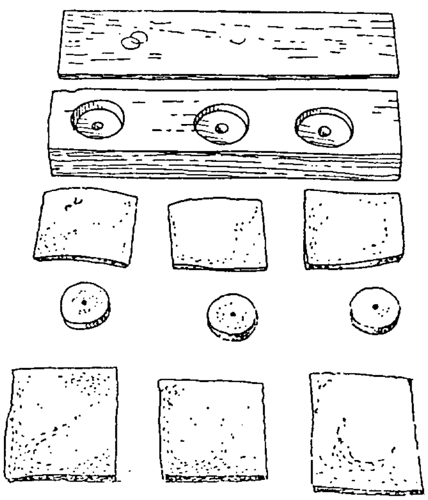
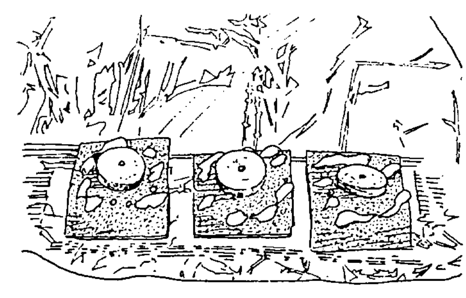


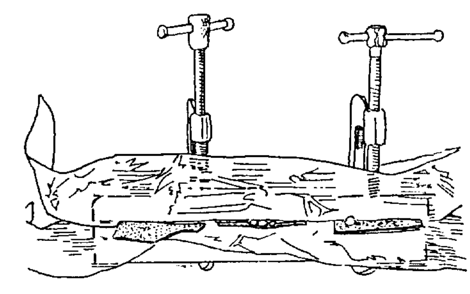
Figure 6: Making Leather Buttons
A. All The Pieces



B: Glue In Place



C: Clamping Together



Line the apertures for the pedals with cheap bushing cloth. Blocks of soft felt may be placed above the pedals, front and back, if desired, but they are for cosmetic reasons and noise reduction only. Regulation for limiting pedal travel is done elsewhere: be sure these blocks do not alter pedal travel or rest position.

There will be some sort of bushing where the rod contacts the back of the pedal, often a piece of tubing. Purchase an assortment of tubing from an auto supply store (it is used for fuel lines, etc, and is usually found in 1/4", 3/16" and 1/2" sizes — get some of each, and any others they may have). Clean out the old tubing thoroughly, and replace the leather punching at the bottom of the hole. Cut off lengths of tubing to fit and use super glue to fasten them in place; after the glue has dried, lubricate the inside of the tubing where the rod fits with VJ lube. If it is the style of rod which ends in a small pin, I cover the pin with heat shrink tubing and also rebush the hole in the back of the pedal which accommodates the pin.

New Baldwin grands (and there may be others) have "captured" pedal rods which are pinned to the back of the pedal. Although advantageous when the piano is moved (prevents loss and scrambling of rods) these are something of a nuisance since the pin must be driven out if the rod ever has to be removed. They shouldn't squeak but they do: the quickest solution I've found is to work a glob of VJ lube in around the top and use a quick zap of heat from a hairdryer to melt it and let it run down into the problem area. Some of the modern liquid lubes such as Tri-flow or TFL -50 Wet are also useful here.

Traveling on up the pedal rod, we come to the rod guide holes. These should be rebushed if necessary, using a good quality cloth. Try to find a smooth rod of some sort which fits tightly into the bushing and can be left in place while the glue dries size the bushing and keep it flat: among your drill bit shanks (especially Irwin speedbores) you can usually find a fit. You will occasionally find a rod guide with badly aligned holes, creating a precarious situation between the top of the rod and the trap lever: these can be plugged and redrilled. It may be useful to know that if the wood of the rod guide is insubstantial, it may resonate and groan as the rod passes up and down: make a heavier replacement and the noise will disappear.

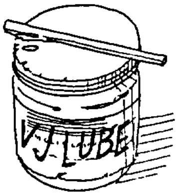
The trapwork levers are usually pinned into wooden blocks which are fastened to the keybed. These pins too can cause noise and sluggishness. They should be removed—and it is here that you will often need a driver, or must resort to unscrewing the support blocks (not an easy task, either) and pulling the system apart to remove the pin. Clean or replace it. Apply VJ lube once and insert the pin, remove, reapply lube and insert again. There are felt punchings as spacers between the parts: these should be lightly glued to the support blocks. Check the condition of any leather or felt on the levers where pitmans or springs contact; replace if worn, lubricate if necessary.

This brings us to our friend, the pitman. It is the dowel, brass rod, flat wooden piece or whatever which passes through a hole in the keybed and forms the connection between the trapwork lever and the damper tray. The plain dowel style is particularly inclined to create noise. It rises and falls in a fairly straight vertical path, but the tray itself is rotating. This creates slipping between the top of the pitman and the leather underneath the tray at the contact point. Several things can be done to minimize the resultant groan. Be sure that the leather pad on the tray is securely glued in place; if this needs to be replaced for regulation, completely remove the old leather and clean off any residue so a good glue joint again can be established. Do not sandwich new leather over old, here or anywhere; regulation will be unstable and noise is likely to result. Be sure that the pitman is clean and smooth, and in the case of wood, lubricated with a substance which dries thoroughly without leaving any gummy residue: DAG instead of grease graphite or VJ lube. The hole in the keybed is usually bushed: this bushing needs to be intact. The hole can be enlarged and rebushed if the pitman is binding or rubbing. Enlarging the hole is particularly helpful if the pitman is wood: a center pin can be driven into both ends and clipped off so a small, sharp stub remains. This sinks into the leather on the trap lever and under the tray and helps to keep the pitman in place. Otherwise, it does tend to wander over to the edge of the hole. Sheet teflon can be used both to line the hole and to replace the tray leather, but it is sometimes difficult to glue in place. There is a leather pad which the pitman contacts on the trap lever; this also needs to be replaced from time to time to reduce noise. These leathers at the top and bottom of the pitman are heavily lubricated with VJ lube. This can be done without removing the lyre, by dropping the pedal removing the safety which holds the lever in place during moving, and letting the lever drop down so the pitman falls out. Apply VJ lube to the ends and replace it.

The flat wooden pitman is pinned to both the trapwork lever and the damper tray. These pins need to be removed and lubricated with VJ lube from time to time. They usually have a small cotter pin in the end, since they tend to walk to one side. If you do disassemble such a system, replace the cotter pin with a clipped-off "hairpin" cotter pin which is soft and easily removable. Please don't put a twist of music wire here, rendering the system virtually impossible to disassemble....

While this doesn't cover every type of pedal and trapwork system, it outlines some of the basic principles, tools and materials for this kind of work. These procedures prepare the system for regulation, which will be covered in the next *Journal*.

Making VJ Lube



Slowly melt a quantity of petroleum jelly (vaseline) over water in a double boiler (it has a very low flashpoint so direct heat is *not* recommended). Work in as much talc as it will hold (preferrably, unscented, high-grade talc from a chemical supply house; talc can also be obtained from a pharmacist). Add a quantity of anhydrous lanolin, also available from a pharmacist: up to an equal quantity of lanolin to vaseline is suitable. Use where heavy lubrication is required on parts which are operated or returned by a spring: pedal pins, trapwork contacts and pins, etc.

Technical Tips

Once in awhile we encounter a client who wants to preserve his chipped ivory keyboard, for historical and/or artistic reasons. Frankly, I'm all for it. There's nothing on earth like the wonderful feel of an ivory and ebony keyboard. With this in view, I have devised a method of filling cavities in these elephants' teeth, just as a dentist fills cavities in human teeth. It's not hard or time-consuming, and the satisfaction that comes with restoring ivory is truly rewarding.

The tools and supplies I use are: Scotch Magic Mending tape, an X-Acto knife with #11 blade, a 6" by 8" piece of plate glass, Elmer's Super-Fast epoxy, and Mohawk white powdered Blendal stain.

I work with 5 keys in one work lot. Clean the key tops free of dirt and grease. Using the X-Acto knife, clean all areas inside the chip with the point of the blade. These areas are almost always dirty, and if you use a strong light you can see the dirt being scraped off the ivory. If ivory is chipped all the way back onto the top of the key/glue wafer, clean this thoroughly, also. Brace the key top against the edge of the bench, and scrape all of the underside of the key top, where it hangs over the key front. Do not clean the key front. After all areas inside the chip are scraped clean and rough, put a piece of tape over the top of the ivory head, with tape overhanging the front of it by an eighth inch or so.

Make sure the tape is contacting the top of the ivory head in all areas by running your thumbnail over the tape, to work out all air bubbles. You can see the tape contacting the ivory securely.

After all five keys are cleaned and taped, place them upside down on the plate glass. Devise some method of having them level to the glass. I put the glass on a two-foot piece of 4x4 lumber, put the keys on the glass, then prop the ends up with another piece of 4x4, and weight the keys down with a box of tuning pins. Use any method you choose; the object is to have the tape on top of the keys level to the plate glass.

Squeeze out equally-sized small globs of epoxy onto another piece of glass. Put a few grains of white Blendal stain in the resin gob, and mix it in. The epoxy should remain somewhat transparent. When it's white enough, mix in the hardener gob , and mix the two for 30 seconds. Working fast, glop the white epoxy onto the keys where they are chipped. You must work when the epoxy is still runny. If it has started to set at all, it won't flow into the chips all the way, and it *won't stick to the ivory securely.*

Don't try to be neat. Glop the epoxy onto the keys thick and fast. It should cover all areas thoroughly. It will stick to the key fronts, the ivory head overhang, and the tape. After it has set up for five minutes, do the next batch of keys.

After the epoxy has set up for 10 or 15 minutes, carefully remove the tape, peeling from side to side. Bracing the key top against the edge of the work bench, and using a new #11 blade, position your blade just a hair below the ivory head overhang, and cut the epoxy down to the key front. Two or three passes with the blade will do the trick. Use the edge of the blade to lift the epoxy off the keyfront. The old dirt and grease on the front keeps the epoxy from sticking. Using your blade, rough-cut the epoxy to within a hair of the front of the ivory head. After an overnight dry, the key top can be sanded with 400 wet or dry paper to get it as white as possible. The epoxy section can be evened with the front of the ivory head with fine paper on a flat sanding block, or a fine ivorine file. The key should be buffed by hand. The epoxy is slightly softer than the ivory and will wear away faster on a buffing wheel. If you're careful, you can use a buffing wheel on the key top, but avoid the epoxy area. Finish off this small section by hand.

The pure white patch might not exactly match the color of the surrounding ivory, but it's a small matter. Our purpose is to restore the feel of the keyboard. We still have evidence of chips, but the keys all now feel smooth.

As regards sanding ivory for color, scraping ivory is just fine if the top is flat. Old keys seldom are. I find it quicker and safer to scrape the tails, then sand the heads with the paper folded and placed under my fingers. That way, I know I'm touching all the surface evenly. Using my fingers, I naturally tend to sand the edges of the head more, and this helps level it.

I have restored several ivory keyboards with this method, and the client has always been delighted. A knowledgeable and discriminating pianist won't demand snow-white perfection, so long as the feel of the ivory can be preserved. It can.

Bob Waltrip, Levelland,TX

I'm writing to encourage all technicians to carry in their car, and to take into the home when needed, a HALON non-residue type fire extinguisher.

Just think of all the flammable things we work with. We treat actions with naphtha (lighter fluid), acetone and ether, alcohol, lacquer, and who knows what else. Just a spark could set it ablaze. We apply flame to wood with cloth, hammers, and bridle straps right nearby.

It seems to me the chance of fire is rather high. Certainly it makes sense to have a small fire extinguisher right at hand. But the normal ABC ones emit a powder. I'd sure hate to cause a fire, put it out with powder, and then have to clean every little piece! Embarrassing, to say the very least.

The HALON fire extinguisher emits a gas which smothers the flame. It's tiny and costs only about $15 from a reputable dealer. I go out to the car and bring mine in any time I work with flame or solvents.

William A. Magnusson

A flexible line with interchangeable nozzles is available for blowing cooling air at drill bits, clearing sawdust from router tables, etc. Made of snap-together sections of plastic with a 1/4" pipe thread on one end, one of these units can be screwed into a small brass valve (from hardware store) and mounted or C-clamped to the tool table. The plastic sections pivot like ball joints but have enough friction to hold their setting so the nozzle can be aimed exactly where desired. Model 200-2000, $4.95, is available from Enco Mfg. Co., phone (800)338-3626, or from some local industrial and tool supply houses.

Bill Spurlock

Is There A Better Way?

From time to time I have to replace the plastic elbows in certain spinet pianos. You know the problem. Over the years, the plastic has gone brittle and easily breaks on a hard blow.

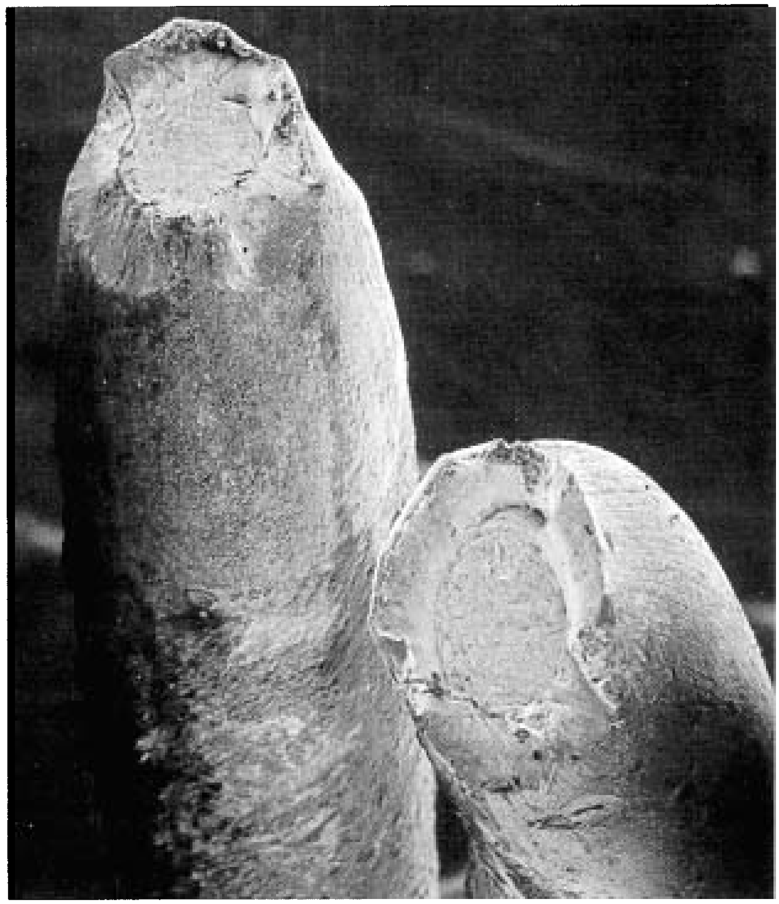
My problem is how to remove the elbows safely and easily. I have used my needle nose pliers to crunch the plastic, but it is easy to get in big trouble if the wood around the center pin splits. I have used a soldering iron to heat the plastic for easy removal, but it takes forever. Is there another way?

Name witheld by request

Is there a good way to clean or lubricate the understring felt between the tuning pin and the capo or agraffe? I know it is suggested to brush or wipe a very light application of something like liquid wrench on the metal contacts, but is it safe to apply it to the felt? Sometimes this cloth is several inches wide and the strings seem very rusty and don't render well. Is there a better way?

Send comments and questions to:
Susan Graham
Technical Editor
2967 Madeline St.
Oakland, CA 94602

Taking A Closer Look



These eerie-looking creatures are actually piano wires enlarged and photographed in a modern electron microscope. (The two single photos on the cover are at 70X and 100X magnification, while the view on this page is at 40X.)

Notice a couple of interesting things. The wire broken in tension (left) reveals the characteristic "necking down" just before fracture. Also, in the broken string closeup, the outer rim of the break looks traumatized — even burned. The cut wire shows neither the necking-down nor the brutalized condition of fracture.

The photos also show something of the composite molecular distribution of the steel. Easy to see is a silver-grey skin enclosing a core of more coarsely arranged material.

Thanks to my friend Angela Welford at the University of New Mexico for both her interest in the subject matter and skill at the electron microsope.

Nick Gravagne

The Stretch Calculator

Rick Baldassin
Tuning Editor

Our first letter this month comes from Patrick Poulson of the Sacramento Valley Chapter. Patrick writes:

Recently two other Associate members and I took the tuning test from the Northern California Examination Committee at a local university. All three of us have been in PTG for two or more years, and involved professionally in piano service for even longer.

We all came out of the test with similar results, having passed with good scores on pitch, stability, unisons, bass, treble, and aural retesting. We all used electronic aids (two used Accu-Tuners, and one used a Sight-O-Tuner) and we all failed the temperament and midrange sections by approximately the same amounts. We compared notes afterward, and agreed that we had all used the standard procedures we had learned, including measuring and storing the stretch number and using the Stretch Calculator to tune the section from C3 to F6. The piano that was used for the exam was a nine-foot Steinway grand. The stretch tuning we had used produced excessively wide octaves from A3 down to C3 when compared to the Master Tuning, and as shown in subsequent aural verification. Some of the widest octaves were measured and proved to be over two cents wide at the 6:3 level.

Obviously, we examinees had not done sufficient aural verification. We were under the assumption, however, that both the SAT and SOT, when used in the correct fashion, would produce a tuning that would easily pass the PTG test. In fact, I heard Jim Coleman make this assertion in a convention class in 1987 where he used a stretch tuning as a master tuning to check his aural temperament during his "How to Pass the Tuning Test" class. Therefore, we examinees concentrated on the other sections of the test, particularly the stability, bass and treble sections, which we all passed easily. We had assumed that the Stretch Calculator tuning would give us no problems. As the test results showed, this assumption was not correct. In fact, the results puzzled our testing committee so much that they re-checked the master tuning to see if it was at fault. They found a few small discrepancies, but not enough to change the test results to any great extent. They also tried out a Stretch Calculator tuning of their own on the same piano, and the same problem of excessively wide octaves in the lower midrange was apparent.

The upshot of all of this to me is to point out the apparent limitations of the Stretch Calculator as it is presently incorporated in the SAT and SOT, and that this fact should be brought out, especially in regards to the tuning test, so that a person taking the exam using one of these instruments would be wary of relying on the Stretch Calculator to the degree that many of us have been led to believe. I should point out that all three of us had our tuning critiqued and approved by RTT members prior to undertaking the test. I would appreciate any comments you have on this matter.

Our thanks to Patrick for his letter. Patrick assumed that because points were missed in the lower midrange, the Stretch Calculator was at fault. This, of course, may have been the case, but there could be other possible explanations. Since I was not at the test site at the time, and am not privy to the full details of the situation, I can only speculate as to the reasons for this problem, based on my own experience giving the tuning test, using the Stretch Calculator, and tuning Steinway D grand pianos.

It has been my experience giving tests over the past six years on a Baldwin concert grand piano (which very closely resembles the Steinway concert grand) that examinees who have taken the test using the Stretch Calculator have passed the temperament and midrange sections easily, usually in the high 80s to low 90s, some as high as 100 percent. I checked with Jim Coleman to see what his experience was, and he stated that he had experienced one case where the examinee failed because the Stretch Calculator procedure was not followed correctly. Besides this case, he has never examined anyone who failed to pass using the Stretch Calculator. He also stated that he was quoted correctly by Patrick from his class in the above.

My experience using the Stretch Calculator has shown me that it is the most accurate, simple electronic tuning system which I have ever seen or used. When this system is used, the notes are very close, and with slight and very minor adjustments, a very fine temperament can be tuned. Some have commented that the octaves which the Stretch Calculator creates are too wide for their tastes. This is usually in reference to very low inharmonicity pianos such as Kawai, Walter, and some Yamahas. For this reason Jim Coleman created tables for Stretch tunings with slightly narrower octaves, which were published in the October 1988 issue, page 20. I have never heard this comment in reference to a Steinway. In fact, Dr. Sanderson told me that the Stretch Calculator was formulated with data taken from Steinway pianos, satisfying the tastes of faculty members for whom he tuned at Harvard.

My experience tuning the Steinway D concert grand has shown me that the Stretch Calculator gives the right amount of stretch for the octaves in the midrange, with the M10ths beating faster than the M3rds, and such that the descending M3rds do not slow down too quickly. I have honestly never measured to see how wide the octaves are at the 6:3 level, but do know that tuning slightly wide 6:3 octaves into the section below C3 produces a nice progression of parallel intervals. If the Stretch Calculator was tuning excessively wide octaves from notes A3 down to C3, this would not be the case.

All of my experience points to the fact that Patrick's problem should not have happened. Yet it did, so why? A few possibilities come to mind. One is that Patrick made no mention of rechecking the notes in the midrange to see if they stayed where he originally tuned them. With the de-tuning which precedes the tuning test, chances are good they did not. My advice to anyone taking the test is to go through the piano quickly to undo the de-tuning. The likelihood that the piano will stay in tune after this will be greatly enhanced.

With so many large errors in the low midrange over the 10-note span from A3 to C3, there would need to be between two and four cents deviation on each note to score below 80 percent. There were no errors mentioned in the bass. The tolerance is greater in octave two, which may account for this lack of errors. In addition, with so many "flat errors" in the lower five notes of the temperament, there should be roughly the same number of "sharp errors" in the remainder of the temperament to offset them. There were no such errors mentioned. Since I do not have the test score forms or master tuning records, I cannot comment as to whether the test was scored properly, or the master tuning read properly. I have to assume that they were; however, a miscalculation of the pitch correction number, or misreading of the master tuning in the third octave could cause these problems.

Since Patrick stated that these errors were verified aurally by the testing committee, it would seem a legitimate problem did exist. It could be that the committee which did the Master Tuning preferred narrower octaves than those set forth by the Stretch Calculator. If the committee tuned the temperament within an octave where the M3 beat at the same speed as the M10, and the octaves downward were tuned in like fashion, the resulting master tuning could be skewed sharp in the low midrange enough to create a discrepancy such as this. Perhaps the testing committee could provide further information which would help solve this mystery.

In any case, there are some important lessons to be learned here. First, go through the piano quickly to undo the de-tuning. This will help the piano to stay in tune better. Second, go back several times to re-check your work. This will insure that your tuning has not drifted. Finally, never turn your ears off! Since all three examiners passed the aural re-testing, these problems would have been detected if careful listening had taken place. Best of luck to each of you in your next attempt.

Our final letter comes from Norman Neblett of the Los Angeles Chapter. It is in response to the article entitled "Some Thoughts on Unstable Tuning" by Daniel Bowman, which appeared in the February 1989 issue. Norman writes:

Daniel Bowman refers to the "mushy, dragging springiness that you feel in the tuning pin and string system when moving the tuning hammer in either direction before the pin actually turns in the wood." He calls this phenomenon the "Marshmellow Zone." He correctly describes this as being caused by pin friction, pin twisting, and string friction at the bearing points.

His belief is that the pin must be put in its natural resting place, which is a new position in the wood. This is only part of the technique to accomplish stable tuning. When it comes to tuning stability, setting the string is of primary importance. Without touching a tuning pin, it is the string movement that alters pitch. It is the string that has to be settled, not equalized, to make the tuning stable. It has often been assumed that the string tension is equalized over its entire length. This is virtually impossible due to the forces that lock the string in place, i.e. bearing points in the string segments, understringing felt between the capo, agraffe, bearing bars, and tuning pins, and steep upper bearing bar and agraffe string angles. I used to believe the idea of equalized tension until it was proven incorrect by technicians such as Jim Coleman, Sr.

So, how do we set the string? The string is driven into stable position with blows just as it can be driven out of position by essentially a spring threaded in a hole. It is under many tensions, and has a memory to which it tries to return. The tuning pin acts as a medium to get the string close enough to be driven into place. When close, pressure is applied up-pitch or down-pitch on the tuning pin, and the string is then literally shocked into position with heavy blows to the key. It is then tested the same way without any pressure on the tuning hammer. If the pitch stays, great! If not, you are forced to start over again.

There are some other points to remember. Use a heavy tuning hammer with a tip that fits the pins tightly. A worn tip is useless. If the humidity is changing within the piano when you tune, it will not tune well or stay in tune. A piano which is way out of tune requires two tunings to be stable. For high level work, a piano must be in tune before it is tuned. The more you move the tuning pin, the more unstable the tuning. This is the nemesis of beginning tuners. They cannot move the pin in fine increments. They are inept at settling the string with key blows, and they create tuning instability with too many pin movements.

The most important tuning in a piano is unison tuning. Unison errors are easily discerned by both untrained and trained listeners. Unisons are the first to go out of tune. During the tuning process, if a unison is in tune, do not move the tuning pin. Merely give the note a test blow, and if the unison stays, go on to the next note.

The above are basic principles. Refined tuning skills need to be taught privately and practiced. Bad techniques are hard to change. Remember that tuning and listening skills emanate from the brain, not the tuning hammer. The tuning hammer should never be moved unless the tuner knows which direction he needs to move it. Electronic tuning devices are helpful in this area as they tell you which way to go.

Each of our readers has a unique opportunity through PTG at the Annual Piano Technicians Guild Convention, where Private Tuning Tutoring is taught by recognized leaders in the field. I encourage each of you to take advantage of this opportunity, whatever your skill level.

Our thanks to Norman for his response. Tuning stability is a combination of good hammer and string settling technique. Jim Coleman has taught that it is necessary to move the bottom of the tuning pin in the hole. He has demonstrated this by devising a tuning pin which protruded from the bottom as well as the top of a pinblock. With this device, he was able to demonstrate that moving the top of the pin did not necessarily move the bottom, and that when the bottom did move, the pointers no longer lined up. This showed that there had to be a settling back of the top of the pin to make the pointers line up. This is true no matter which way the pin is turned. If we do not settle the pins back, eventually the pin will settle itself back, causing tuning instability as the result of poor tuning hammer technique. Moving the top of the pin without moving the bottom is what Daniel Bowman describes as the "Marshmellow Zone." He advocates that once the entire pin has moved, we must "actively settle the pin/string unit back into its new resting place." This essentially makes the "pointers line up" as in Jim Coleman's demonstration.

In addition to the tuning instability caused by poor hammer technique, there can also be instability caused by failing to properly set the string with hard blows, as Norman has stated. Daniel made reference to this when he stated, "An essential element in this settling procedure is a healthy banging of the key in coordination with tuning hammer movements to insure complete freedom of string rendering across the various bearing points." If the string is not settled properly, it will eventually creep across the bearing points on its own, causing tuning instability. Worse yet, during the first hard playing, the string settling which should have taken place during the tuning process will occur. The result is a freshly tuned piano which has immediately gone out of tune. Most customers do not like this.

The trick in all of this is to leave the tuning pin in a stable state, with the string properly settled, and at the proper pitch, all at the same time. Do not be tempted to make a final pass to clean up the unisons with hammer technique alone. This, of course, makes the job easier, but will result in unstable unisons after a short amount of playing. The other trap is to accomplish too much with the hard blow. The temptation, when pitch is high, is to give the note a hard blow to drive the pitch down. Once the desired pitch is achieved, these hard blows are discontinued. We must be sure that if one hard blow put the note where we wanted it, another will not drop it too far. Note that Norman stated a hard blow should be applied both with pressure on the tuning pin to change the pitch, then again with no pressure on the tuning pin to see if the pitch stayed. Bill Garlick advocates another hard blow with the tuning hammer removed from the pin, to exaggerate this point.

In addition, there seems to be something about several notes being played hard at once during performance which is different from each note being played hard individually during the tuning process. If you really want to know if the tuning is going to stay, depress the damper pedal, and play fortissimo octaves with both hands up and down the keyboard, or slap several notes at a time with both hands in like fashion. Chances are that few unisons will slip out of tune. Go back and re-tune them. Better now than later. Finally, Jim Coleman warns of the tendency to pound too hard in anticipation of a concert artist, as this can result in the pitch of the piano creeping sharp after tuning.

In conclusion, it is a combination of good hammer technique and string settling technique which make a stable tuning. Our thanks to Jim Coleman and Bill Garlick for their input on this subject.

Until next month, please enjoy Part One of "The Super-Temperament and Tuning" by Steve Fairchild.

Please send your letters, questions, and comments to:
Rick Baldassin
Tuning Editor
2684 W. 220 North, Provo, UT 84601.

String Repairs In The Field, Part II

Bill Spurlock
Sacramento Valley, CA, Chapter

Last month we looked at efficient methods of repairing and replacing plain wire strings, guided by some basic principles. Those same principles of good tonal matching, tuning stability, neat workmanship, and time efficiency will apply equally to this month's discussion of hitch pin loops and wound string replacement and repair.

Making Hitch Pin Loops

A nice neat hitch pin loop is one of the simplest and most satisfying bits of piano wire art we have occasion to make. A simple tool for making loops can be incorporated into one of your other tool handles as shown in Fig.1. Some prefer to simplify the process even further by winding the coils by hand after making the initial loop with the round nose pliers. To do this, leave a longer tail on the loop to provide more leverage as you hold the loop on one jaw of the pliers and wind the coils with your fingers. With either method, strive to wind the coils together tightly.

If other hitch pin loops are present, I normally wind the same number of coils on the replacement, otherwise I suggest a minimum of four coils for good stability. Note that the finished loop must be installed on the hitch pin in such a way that the tail cannot unwind; that is, the tail should come off the bottom of the core wire rather than the top, where it would tend to unwind and stand straight up. As noted in the drawing, the knot can be tightened around the hitch pin by light tapping to neaten and stabilize.

Wound String Repair

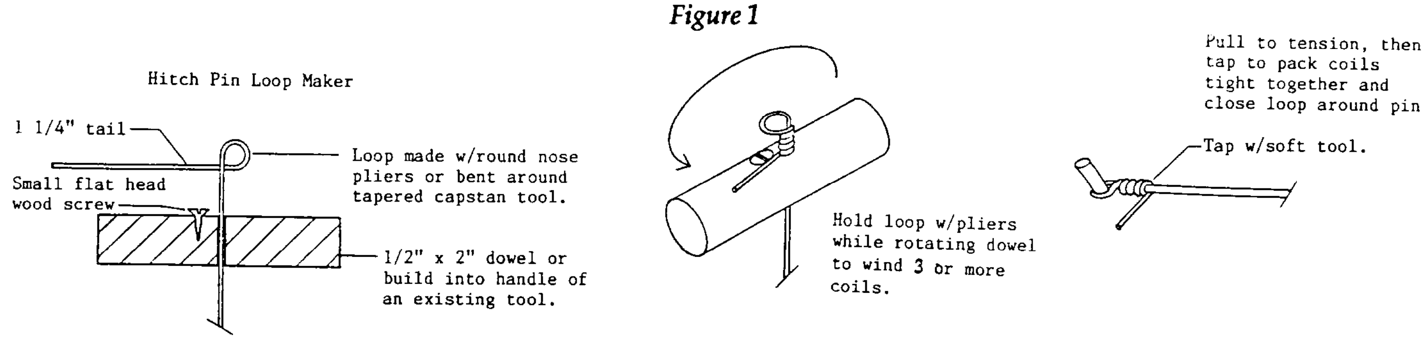
There are several reasons we might have to repair or replace a wound string. Besides breaking, a wound string can "go dead" and develop a tubby sound, it may rattle, or it might not match the other string of a pair. Wire diameter is the main variable affecting tone and inharmonicity of a given plain string. However, the wound string is influenced by the core diameter, the overall wrap diameter, number of wraps and type of wrap material, length of unwound core at the ends, condition of the wrapping, and tightness of the wraps on the core wire.

Let's look first at remedies for a wound string that does not sound right. A common characteristic of older bass strings is a tubby sound, caused by corrosion of the windings muting the string and/or loosening of the windings on the core. In most cases a significant improvement can be made by slacking off the string, removing from the hitch pin, twisting the hitch pin end of the string one turn in the direction of the windings, and reinstalling it. In this case "in the direction of the windings" means that if the end of the last winding were an arrow, it would point in the direction the string should be twisted.

This twisting tightens the wrapping around the core wire; I suspect that the slackening and retightening of the string crushes and loosens some of the corrosion between windings as well. In some cases just slackening the string 1/2 turn and vigorously pounding the key will add noticeable life to a tubby string. When a significant number of strings are tubby the technician must make a judgement call; twisting may not offer enough improvement to justify the time involved. The bass will need retuning a week or so after twisting, and the results do not always last.

Some technicians report success with removing the strings, tying a loose knot in each string and running it end to end in an effort to remove corrosion and liven up the string. My personal feeling

Figure 1



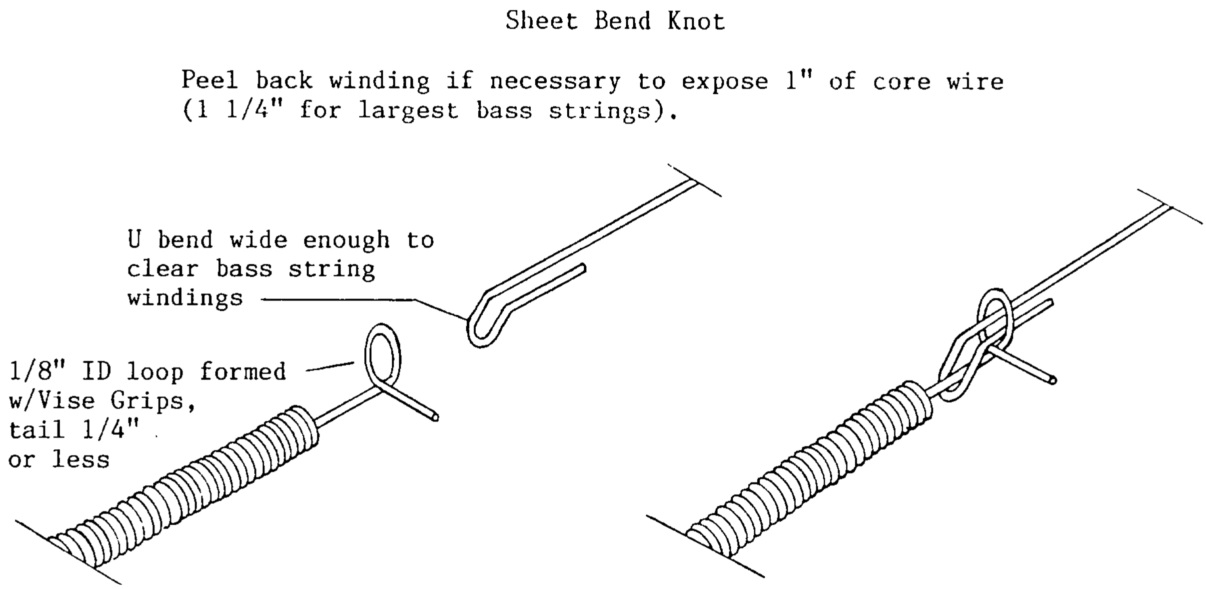


Figure 2

is that if simple twisting does not give adequate improvement, little can be gotten from old strings by other means. If the piano warrants further efforts, then the most improvement for the money will be had from new bass strings.

Another cause of tubby bass strings is contamination of the windings, usually with a liquid. Typical cases are the bar piano doused with a spilled drink or the school cafeteria piano sprayed with milk. I know of no cost effective remedy for this problem short of string replacement (perhaps followed by installation of numerous large wood screws to keep the lid closed).

The rattling bass string can usually be cured by twisting as well, although sometimes replacement is necessary. In some cases minor rattling can be stopped by gripping the core wire next to the wrapping with needle-nosed pliers and tapping the plier jaws with a hammer to pack the windings tighter together, followed by snugging the ends of the wrap down tight using a twisting motion of the pliers. I have had some success with this method but have also had the rattling return in several cases. Also, over-enthusiastic packing of the windings can cause a string to develop a beat.

Another common problem is the wound bichord string that cannot be tuned beatless with its partner. I know of no remedy for this problem other than replacement of both strings.

As with broken plain strings, repair of the broken bass string is usually preferable to replacement because tuning stability of the spliced string will be much better than for an entire new string. In addition, if the strings are even just a few years old the repaired original string will usually match its neighbors better tonally, even if the splice is in the speaking length. If the break is at the tuning pin, I prefer using the compact tuner's knot shown in Fig.8 of last month's article. Very little wire is needed and this knot stabilizes quickly.

If the break is at the agraffe, the splice must be placed in the speaking length. My favorite knot for this purpose is the sheet bend, shown in Fig.2. The advantage of this knot is that less winding has to be removed than for a conventional tuner's knot, and there is less tendency of snagging and separating the end wrappings when pulling the knot together.

Wound String Replacement

If the string has an incurable problem or is too rusty to splice, it must be replaced. If it is one of a bichord pair, both strings should be replaced with two that were manufactured as a matched pair to ensure that they can be tuned in unison.

The quickest way to obtain a replacement string is to phone the string maker with the core diameter, overall wrapped diameter, distance from the hitch pin to the start of the wrapping, the length of the wrapping, wrap material, and type (single or double wrapped). Even if the piano is a common model of recent vintage, this information may be necessary as many models have had scaling changes in mid-production.

Supply houses sell "universal" bass string sets which can be used as either temporary or permanent replacements in the spot repair situation. These sets contain strings in a variety of wrapping and core size combinations; a string is chosen which most closely matches the dimensions of the missing or damaged string (I give priority to the core diameter, taking into account that the universal core is hexagonal and effectively larger than a round string). The excess windings on the hitch pin end are removed until they are about 1/18" closer to the bridge pin than those of neighboring strings. The string is then cut to overall length (approximately four fingers' width beyond the tuning pin) and the excess winding removed from the tuning pin end until about 3/8" farther from the agraffe than neighboring windings. When pulled up to tension, the winding length should then match.

When repair of the original string is not an option, a universal will serve as something for the hammer to hit until an exact replacement can be obtained. In the case of a newer, quality instrument it is normally best to go ahead and order the exact replacement. However, sometimes a universal can be a perfectly acceptable repair. If it matches its neighbors in tone and inharmonicity, and if there would be no devaluation of the instrument from having non-original parts, a universal can be left in place as a permanent repair.

When installing, a twist should be put in a wound string to ensure that the wrapping will be tight on the core wire; recommendations usually range from a half to one full turn. Having had a number of strings develop rattles after installing with only a half turn, I now always use a full turn. The twisting can easily be done at the tuning pin end of the string when the pre-made coils are placed on the pin.

As with plain strings, a new or repaired wound string can be settled to improve tuning stability and tone, using the same procedure as explained last month for plain strings, but with two important exceptions. All rubbing, tapping, etc. should be confined to the core wire only; do not manipulate the wound portion of the string at all! Attempts at stretching the wound area can cause the string to go dead and/or develop a rattle (I speak from personal experience here). In fact, it is good practice to avoid unnecessary handling of copper windings, especially with sweaty hands, as any contamination adds to the inevitable corrosion and deadening of wound strings. Secondly, wound strings should not be pulled too far above pitch at risk of loosening the windings.

Safety

Perhaps the most important principle of all to follow in our work, especially in stringing, is the preservation of our physical health. Putting on eye protection should be an automatic part of our string repair procedures. Of course, pokes in the eye only happen to other people; but since one of my fellow chapter members recently had a close call with serious eye damage from piano wire, I've had a harder time believing it can't happen to me. Besides, I've noticed that a side benefit from donning goggles is that it seems to make small children, who may have been breathing down your neck, clutch their hands together and slowly back away.

Another hazard that may not be so obvious is from the flying bass string. I first experienced this while doing some bass string splicing on a church grand we service, which we fondly refer to as "Our Lady of the Broken Bass String". The bass strings were all getting quite weak, as breakage was getting more and more frequent, and I was carefully pulling a spliced string up to pitch when my coil lifter innocently pressed on a neighboring string, which promptly let go and flew straight out of the back of the piano and twenty feet beyond! My only thought was one of thanks that no one had been standing directly in its path. This lesson was further emphasized as two more strings did exactly the same thing in the course of repairing the first. Never let anyone, especially a small child, stand at the tail of a grand piano when tuning or repairing strings!

For further insights see *Journal* issues of December 1977, February 1978, February 1981, December 1981, and May 1983.

Hopefully these past articles have been useful. Next month we'll continue with an article by Fern on key repairs in the field. ≡

The Super-Temperament And Tuning
T = (M+C)/12

Steve Fairchild
Long Island — Cristofori Chapter

For years, fine aural tuners have tried to perfect a way to overcome the distortion in every piano. With the help of the computer and electronic tuning aids, it is now possible to create a uniform, high quality aural tuning for all pianos.This temperament cannot be called equal in the real sense of the word because inharmonicity will not permit it. The Super-Temperament and Tuning adjusts the piano so that the octaves, double octaves, 17ths, 10ths, 3rds, 5ths, 12ths, and 4ths produce the smoothest changing intervals possible. The mathematics of this temperament and tuning procedure are constant. Only the beat rates and cent values change from piano to piano.

After tuning many pianos using two matched Sanderson Accu-Tuners, and computer studies with "MS/DOS 640K Super Calc 4" using the piano scales on file from my "Super-Scale" piano rescalings, I now believe it is possible to obtain a 100 percent aural tuning. If this new procedure was used to set up the test piano for the tuning exam, it would help to more clearly define what was expected of the person taking the test, and the question, "What are the beats?" could be answered to a more precise degree.

The tuning starts by extracting the inharmonicity constants for 76 notes, from 1:A.0 (key 1, note A, octave 0) to 76:C.7 (key 76, note C, octave 7) mathematically or by electronic means. These constants are placed in the computer, and with the formulas which will be listed later, computes the correct amount of cents change for each of the 88 notes. After getting a print out of the beat rates and cent values, we can then tune the piano either aurally or visually. This theory is the culmination of 16 years of research into finding a way to convert aural tuning into visual terms. My first articles on this subject were printed as early as 1975 and 1976, although they dealt mainly with the temperament.

The overall concept is based on the following principles: First, that all pianos are inharmonic, and that each piano has its own personal way the inharmonicity changes. This I call the "Inharmonicity Curve." Second, that the inharmonicity of each piano may be great or small. This I call the "Inharmonicity Magnitude." How these two factors are handled in the "Super-Temperament and Tuning" is the basis of this advanced procedure.

The formula is T = (M+C)/ 12, where T = Temperament (Stretch, in cents), M = Magnitude (Inharmonicity amount), C = Curve (Inharmonicity change), and 12 represents the number of notes in the octave.The formula tunes each note in the three-octave temperament by measuring the magnitude of the octave below, and the projected curve above.

Before going on, I would like to thank all those who have raised the level of fine tuning to where it is today, and the tireless efforts of such people as Dr. Albert Sanderson and Rick Baldassin. Also, a special thanks to the late Dee Fairchild for her patience, understanding, and programming genius, without which this end result would not have been possible. After years of great personal adversity, I am now able once again to teach at conventions and seminars, and would be happy to explain this tuning procedure in greater detail.

The formula is T = (M+C)/12, where T = Temperament (Stretch, in cents), M = Magnitude (Inharmonicity amount), C = Curve (Inharmonicity change), and 12 represents the number of notes in the octave. The formula tunes each note in the three octave temperament by measuring the magnitude of the octave below, and the projected curve above.

To calculate the Inharmonicity Curve for a given note, four Inharmonicity Constants (Ic) are added together, and the total divided by four. The four inharmonicity constants used to calculate the Inharmonicity Curve for note 37:A.3 would be 37:A.3, 41:C#4, 45:F.4, and 49:A.4. As you can see, these notes make up the three contiguous M3rds between the note you are calculating, and the note an octave above. An example of the formula would be as follows:

(Ic.37+Ic.41+Ic.45+Ic.49)/4 = curve for 37:A.3

To calculate the Magnitude for a given note, take the Inharmonicity Constant (Ic) for the note an octave below, and multiply it by the listed magnitude number in the "Lower" column. Then, take the Ic for the note itself and multiply it by the listed magnitude number in the "Upper" column. From the "Lower" total, subtract the "Upper" total. The difference is the Inharmonicity Magnitude. An example of the formula would be as follows:

"Lower" "Upper"
Example: ((Ic25*20.1)-(Ic37*5.025)) = magnitude for 37:A.3

The magnitude numbers are listed in table 1 below. How these numbers were derived, and their implications will be covered in detail in the future.

The "Lower" magnitude numbers have been rounded off to one decimal place. Divide these numbers by 4 to obtain the "Upper" magnitude numbers, rounded to three decimal places. Magnitude numbers are used for notes 25:A.2 to 60:G#5. Note that there is no magnitude number for 49:A.4, as it is tuned to zero.

As you will see from the formulas listed in table 2, the temperament is constructed by starting at note 49:A.4, tuned to zero. Tuning upward, the cent value for note 50:A#4 is calculated by taking the cent value from the previous note (49.A.4) and adding the Inharmonicity Curve plus the Inharmonicity Magnitude, divided by 12. To tune downward, the cent value for note 48:G#4 is calculated by taking the cent value from the previous note (49:A.4) and subtracting the Inharmonicity Curve plus the Inharmonicity Magnitude, divided by 12. The formula gives the fundamental deviation for the three octaves of the temperament. The actual tuning curve is constructed from this fundamental deviation curve at a later time. In table 2, N = the cent deviation for the note number which follows, and Ic = the inharmonicity constant for the note number which follows.

When the inharmonicity constants are entered, these formulas calculate the cent deviation at the fundamental for each note in the three octave temperament. Next month, we will discuss how to calculate and measure the inharmonicity constants, enter constants for three very different pianos, and create curves for each.

Table 1: Magnitude Numbers

Note	Lower	Upper	Note	Lower	Upper	Note	Lower	Upper
25:A.2	30.8	7.700	37:A.3	23.9	5.975	49:A.4	0.00	0.000
26:A#2	30.3	7.575	38:A#3	23.4	5.850	50:A#4	16.5	4.125
27:B.2	29.7	7.425	39:B.3	22.8	5.700	51:B.4	15.9	3.975
28:C.3	29.1	7.275	40:C.4	22.2	5.550	52:C.5	15.3	3.825
29:C#3	28.5	7.125	41:C#4	21.6	5.400	53:C#5	14.7	3.675
30:D.3	28.0	7.000	42:D.4	21.1	5.275	54:D.5	14.2	3.550
31:D#3	27.4	6.850	43:D#4	20.5	5.125	55:D#5	13.6	3.400
32:E.3	26.8	6.700	44:E.4	19.9	4.975	56:E.5	13.0	3.250
33:F.3	26.2	6.550	45:F.4	19.3	4.825	57:F.5	12.4	3.100
34:F#3	25.7	6.425	46:F#4	18.8	4.700	58:F#5	11.9	2.975
35:G.3	25.1	6.275	47:G.4	18.2	4.550	59:G.5	11.3	2.825
36:G#3	24.5	6.125	48:G#4	17.6	4.400	60:G#5	10.7	2.675

Table 2: Formulas

```
TUNE                INHARMONICITY CURVE          INHARMONICITY MAGNITUDE
60:G#5=  N59+((((Ic60+Ic64+Ic68+Ic72)/4)+((Ic48*10.7)-(Ic60*2.675)))/12)
59:G.5=  N58+((((Ic59+Ic63+Ic67+Ic71)/4)+((Ic47*11.3)-(Ic59*2.825)))/12)
58:F#5=  N57+((((Ic58+Ic62+Ic66+Ic70)/4)+((Ic46*11.9)-(Ic58*2.975)))/12)
57:F.5=  N56+((((Ic57+Ic61+Ic65+Ic69)/4)+((Ic45*12.4)-(Ic57*3.100)))/12)
56:E.5=  N55+((((Ic56+Ic60+Ic64+Ic68)/4)+((Ic44*13.0)-(Ic56*3.250)))/12)
55:D#5=  N54+((((Ic55+Ic59+Ic63+Ic67)/4)+((Ic43*13.6)-(Ic55*3.400)))/12)
54:D.5=  N53+((((Ic54+Ic58+Ic62+Ic66)/4)+((Ic42*14.2)-(Ic54*3.550)))/12)
53:C#5=  N52+((((Ic53+Ic57+Ic61+Ic65)/4)+((Ic41*14.7)-(Ic53*3.675)))/12)
52:C.5=  N51+((((Ic52+Ic56+Ic60+Ic64)/4)+((Ic40*15.3)-(Ic52*3.825)))/12)
51:B.4=  N50+((((Ic51+Ic55+Ic59+Ic63)/4)+((Ic39*15.9)-(Ic51*3.975)))/12)
50:A#4=  N49+((((Ic50+Ic54+Ic58+Ic62)/4)+((Ic38*16.5)-(Ic50*4.125)))/12)
TUNE                INHARMONICITY CURVE          INHARMONICITY MAGNITUDE
START  49:A.4= Zero
TUNE                INHARMONICITY CURVE          INHARMONICITY MAGNITUDE
48:G#4=  N49-((((Ic48+Ic52+Ic56+Ic60)/4)+((Ic36*17.6)-(Ic48*4.400)))/12)
47:G.4=  N48-((((Ic47+Ic51+Ic55+Ic59)/4)+((Ic35*18.2)-(Ic47*4.550)))/12)
46:F#4=  N47-((((Ic46+Ic50+Ic54+Ic58)/4)+((Ic34*18.8)-(Ic46*4.700)))/12)
45:F.4=  N46-((((Ic45+Ic49+Ic53+Ic57)/4)+((Ic33*19.3)-(Ic45*4.825)))/12)
44:E.4=  N45-((((Ic44+Ic48+Ic52+Ic56)/4)+((Ic32*19.9)-(Ic44*4.975)))/12)
43:D#4=  N44-((((Ic43+Ic47+Ic51+Ic55)/4)+((Ic31*20.5)-(Ic43*5.125)))/12)
42:D.4=  N43-((((Ic42+Ic46+Ic50+Ic54)/4)+((Ic30*21.1)-(Ic42*5.275)))/12)
41:C#4=  N42-((((Ic41+Ic45+Ic49+Ic53)/4)+((Ic29*21.6)-(Ic41*5.400)))/12)
40:C.4=  N41-((((Ic40+Ic44+Ic48+Ic52)/4)+((Ic28*22.2)-(Ic40*5.550)))/12)
39:B.3=  N40-((((Ic39+Ic43+Ic47+Ic51)/4)+((Ic27*22.8)-(Ic39*5.700)))/12)
38:A#3=  N39-((((Ic38+Ic42+Ic46+Ic50)/4)+((Ic26*23.4)-(Ic38*5.850)))/12)
37:A.3=  N38-((((Ic37+Ic41+Ic45+Ic49)/4)+((Ic25*23.9)-(Ic37*5.975)))/12)
36:G#3=  N37-((((Ic36+Ic40+Ic44+Ic48)/4)+((Ic24*24.5)-(Ic36*6.125)))/12)
35:G.3=  N36-((((Ic35+Ic39+Ic43+Ic47)/4)+((Ic23*25.1)-(Ic35*6.275)))/12)
34:F#3=  N35-((((Ic34+Ic38+Ic42+Ic46)/4)+((Ic22*25.7)-(Ic34*6.425)))/12)
33:F.3=  N34-((((Ic33+Ic37+Ic41+Ic45)/4)+((Ic21*26.2)-(Ic33*6.550)))/12)
32:E.3=  N33-((((Ic32+Ic36+Ic40+Ic44)/4)+((Ic20*26.8)-(Ic32*6.700)))/12)
31:D#3=  N32-((((Ic31+Ic35+Ic39+Ic43)/4)+((Ic19*27.4)-(Ic31*6.850)))/12)
30:D.3=  N31-((((Ic30+Ic34+Ic38+Ic42)/4)+((Ic18*28.0)-(Ic30*7.000)))/12)
29:C#3=  N30-((((Ic29+Ic33+Ic37+Ic41)/4)+((Ic17*28.5)-(Ic29*7.125)))/12)
28:C.3=  N29-((((Ic28+Ic32+Ic36+Ic40)/4)+((Ic16*29.1)-(Ic28*7.275)))/12)
27:B.2=  N28-((((Ic27+Ic31+Ic35+Ic39)/4)+((Ic15*29.7)-(Ic27*7.425)))/12)
26:A#2=  N27-((((Ic26+Ic30+Ic34+Ic38)/4)+((Ic14*30.3)-(Ic26*7.575)))/12)
25:A.2=  N26-((((Ic25+Ic29+Ic33+Ic37)/4)+((Ic13*30.8)-(Ic25*7.700)))/12)
TUNE                INHARMONICITY CURVE          INHARMONICITY MAGNITUDE
```

Lowering The Plate: Part 1

Nick Gravagne
New Mexico Chapter

The February '89 issue of the *Journal* in this series explained one method of securing a plate to a rim; it didn't explain, however, how the required height of that plate is determined. Since an obvious (and not so obvious) interdependent nature exists among the various components of a piano's tone generation and amplification system—strings, plate, bridges, soundboard, pinblock, plate support dowels, etc.—any discussion of relative plate height can become fuzzy unless a few constant focal points are established. These will be pointed out as we go along.

Quality piano work demands a healthy mix of theory and practicality, and any working piano technician has learned that a preoccupation with one necessitates an exclusion of the other. So, when it comes to plate setting, let's see what technical ingredients satisfy both the mathematician and the mechanic in us.

First we must understand the conditions which would cause a rebuilder to have to set the plate. Usual reasons for doing so would exist when either lowering the plate in order to obtain more downbearing or installing the plate over a new soundboard. In both cases, all plate support components—inner rim, dowels (if there), nosebolts and pinblock—are called into question. The next two articles are about plate lowering; a future article will be concerned with setting a plate over a new soundboard.

Lowering or Flexing

Plate lowering means different things to different people. As far as this and any future articles are concerned, plate lowering means the entire plate is lowered or otherwise repositioned. In the past, lowering the plate has also been defined as bending the plate down in the hitch area by turning the nosebolts down and securing with the nosebolt nuts. Many prefer to call this technique "flexing the plate." Although this practice is considered officially taboo (call Steinway and ask, for example), and many first-rate rebuilders deplore it, there is no denying that it goes on all the time. In fact, although often abused, the technique does have its place, but more in fine tuning the bearing rather than in establishing it. To reiterate something that has been said repeatedly in this *Journal*, flexing the plate will increase downbearing but will have no effect whatsoever on front string bearing. The only way to increase downbearing in general, and front bearing in specific, is to either lower the entire plate or recap the bridges to a higher setting.

What about the dangers of plate flexing? We all know that cast iron is brittle and, pushed too far, can snap like a candy cane. Still, anyone who has worked with plates knows that they do have some give in the longer and wider spans. In his book, *A Guide to Restringing*, John Travis says of the practice, "I must caution you to use good judgement and to not be too hasty. This is a treacherous operation, but not half so dangerous as some people would have you believe." This will come up again in future discussions.

A Valid Technique—Sometimes

Assuming there is some crown in the soundboard, and that the bridges don't need recapping (seen any lately?), a legitimate technique used to increase downbearing is to lower the entire plate. (Since much has already been said in this series regarding downbearing on fully crowned soundboards and flatter boards, the usual considerations, along with the usual precautions, will not be rehashed here). The typical problem with plate lowering is that, due to soundboard crown inconsistencies, uniform downbearing is virtually impossible to achieve. But, since plate lowering is itself a compromise, it is not surprising that the final bearing condition will likewise be a compromise. The idea is to get the best possible results under the circumstances.

The advantages of plate lowering are lower cost, less relative difficulty than more involved processes, front bearing is automatically increased, and it is a very convenient technique when rebuilding lesser-grade instruments. The big, single disadvantage is that it generally represents less-than-the-best in the overall performance of the piano. Beyond that, like plate flexing, it is an abused technique, often being used in lieu of a more appropriate, skilled job, and on a piano that deserves better. This isn't to say that plates shouldn't be lowered on first-class pianos. It's just that the decision should be made in light of technical criteria—not by default.

The Long And Short of It

Since the net conditions of old soundboard crown and bearing deficiencies are infinite, there is no practical way of getting very specific about plate lowering; still, there is a specific geometrical and trigonometric fact about front and rear string lengths relative to downbearing and plate lowering. It is this: strings which have relatively short rear lengths receive more of a downbearing angle for a given amount of plate lowering than do longer rear lengths. Let's assume, for instance, that a zero bearing condition exists throughout the scale. Further, let's say that a technician lowers the plate everywhere—pinblock, dowels and nosebolts—by 1/16 inch in order to increase downbearing. It will turn out that too much bearing will exist in the higher treble areas while much less will show up in the mid to lower parts of the scale. (See the Computations section of this article for technical details).

So, upon lowering the plate by 1/16 inch all around, a high treble string which has a two-inch front segment and a two- inch rear segment will change from zero bearing to a large 3.60 degree angle, while a string with a 36-inch front segment and a nine-inch rear segment will change from zero bearing to only a 0.50 degree downbearing angle. The rest of the strings in between the two mentioned will have bearing angles proportioned linearly. It is obvious, then, that lowering the plate by the same amount all around can create as many problems as it solves.

It would seem logical, then, that lowering the plate more on its left side (as facing the piano) than on its right side might be a better idea. Let's again take our zero-bearing piano and this time lower the pinblock by 1/8 inch in the bass and 1/32 inch in the treble. Now imagine the entire plate canted to the left as result. (Ignore the dowels and nosebolts for the moment). Our high treble string with a two-inch front and a two-inch rear segment will pick up a downbearing angle of 1.80 degrees (still too much but workable). Those strings ranging in the 24-inch front and six-inch rear lengths will pick up an almost one degree angle. And strings ranging in the 36-inch front and nine-inch rear lengths will net a 0.88 degree angle. Special cases are the lowest tenor strings (in short scales) and the lower bass strings which could have 40-inch fronts with only four-inch rears netting a 1.48 degree bearing angle. The respective hitch areas for such strings will require building up in order to reduce the bearing. This second example of plate lowering, i.e., lowering more in the bass than in the treble, is also a compromise—it's just a better compromise than uniform plate lowering. Of course, there are other possibilities, such as lowering 1/16 inch in the bass with no lowering in the treble.

Table 1

Front Length	Rear Length	Plate Lower: 1/16" All Around	Plate Lower: 1/32" Treble 1/8" Bass
Inches	Inches	Angle	Angle
2	2	3.60°	1.80°
12	3	150°	1.28°
24	6	.075°	.093°
36	9	.050°	.088°
40	4	.099°	1.48°

Plate canting is not unique to piano rebuilding. Measurements made on old pinblocks often reveal that many pianos were initially built with plates canted to the left. Three removed, original Steinway blocks (from an M, an 0 and a B) were better than 1/16 inch thinner in the bass than the treble.

Table 1 shows values for various string lengths and downbearing angles relative to lowering the plate by 1/16 inch all around or by lowering it 1/32 inch in the treble and 1/8 inch in the bass. If nothing else, notice that canting the plate has the effect of evening out the bearing throughout the scale whereas the uniform lowering overloads the bearing in the higher scale while underloading it in the lower parts.

Of course, the whole problem of plate lowering becomes more complicated when uneven bearing conditions exist ranging from, say, good to excellent in the treble to negative in the tenor and high bass. Nevertheless, the simple point here is that downbearing at the shorter rear string lengths is affected to a much greater extent than at the longer rear lengths. So much for the theory.

Plate Canting—It Can Be Done

On the practical side of this, how can an entire plate be canted toward the bass, or left side, of the piano? First of all, look at the plate support dowels, especially at the rear and left side of the rim—is there enough dowel height to play with? This inspection is necessary regardless of the plate suspension system which is going to be used. In some pianos the dowels are barely poking through the soundboard limiting the amount of possible plate lowering. Assuming enough dowel height, it is easy to see that the underside of the pinblock must be planed 1/8 inch thinner in the bass and 1/32 inch thinner in the treble. (Obviously, wood must be removed from the entire underside of the block or the action won't be able to slide in). But what do we do at the plate perimeter and at the nosebolts? The answer depends in part on whether the plate support system is going to be the Baldwin-type (as described in the February '89 *Journal*) or whether the original equipment—dowels, or wood strips, or screws—is being retained. But whatever plate support system is going to be used, one thing is sure: the old system, along with its relative settings, is completely, or partially obsolete. The remainder of this article assumes that the plate is going to be supported per the Baldwin system.

Once the decision is made to lower the pinblock and cant the plate, everything else that supports the plate should be considered as nonexistent. This being true, it is now time to locate and support the plate from scratch.

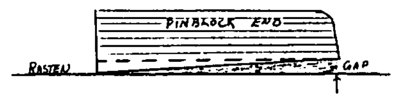
Plate Lowering With Baldwin-Type Suspension

At this point all we have is a plate, a pinblock of non-uniform thickness (but has been fitted to the flange and has had all the plate screw holes drilled and screw-fitted), and an assortment of nosebolts. None of it is installed as yet. The new block, according to the dimensions of our example, will have the effect of canting the entire plate to the left and below its original position. Since the plate lag holes will have been tappped to receive the special inserts, which will in turn receive the Baldwin screws, the original perimeter supports, such as dowels, are no longer necessary. Trim them flush with the top of the soundboard and fill the lag screw holes with dowels or plugs (glued in, of course). Choose one of the nosebolt locations which is more or less centrally located and towards the rear of the piano. The idea is to spot three points on which the plate/pinblock can rest without tipping or rocking—the left pinblock shelf, the right pinblock shelf and the rear nosebolt. For convenience, this nosebolt should be the type which can be adjusted up or down by turning it from above the plate. The Steinway-type, for example, which can be turned with a tuning hammer is ideal. If the plate doesn't have a rear, centrally located nosebolt, insert one of the special Baldwin plate perimeter screws in a rear hole insert. Make sure to put a locking nut on the screw first so that the screw can be temporarily locked to the plate later on. Incidentally, piano plates, even long ones, will not sag or appreciably bend when supported at only three points.

Two things, now, have to be accomplished simultaneously: the plate position for downbearing needs to be determined while making sure that no future bending force is going to be exerted on the plate in the vicinity near the block. In order to achieve this the pinblock should not yet be attached to the rim. The new position of the plate is going to determine the final relationship of the pinblock to the rasten. To secure the block now is both premature and dangerous. Still, if the block and plate are simply lowered and/or canted from their original positions, the block should make full front-to-back contact on the shelves (that is, not tipped) even after the new bearing settings are established.

Place the block in the case more or less where it belongs. Put in the rear nosebolt and turn it down to its original

Figure 1



Remove wood below dashed line to allow for a uniform thick shim.

position, plus a turn or so. Now lower the plate in place so it is resting on the block and nosebolt. Install several plate screws so that the pinblock is pulled up to the plate, especially at the bass and treble ends. (Some technicians lower the plate with the block already screwed on, i.e., the plate and block as one unit. This doesn't work for me since I like very snug fitting blocks at the ends and at the front stretcher, especially in Steinways). At this point it doesn't really matter if the left & right and fore & aft plate location is exact. Look in the action cavity for an initial inspection on how the block is sitting on the shelf at both the bass and treble ends. Is it tipped forward or backward or is it squarely on? Make a mental note of it but don't deal with it yet.

It is time to set the bearing. Turn the nosebolt up until it is contacting the underside of the plate (if it wasn't already). Check for downbearing at various sections of both bridges. Adjustments are made by raising or lowering the rear of the plate with the nosebolt or rear perimeter plate screw. Remember, you will find less gain where the rear string lengths are long. Be prepared to compromise until the best bearing can be had for that piano. Remember, also, that if too much bearing must be introduced in one section in order that another section can be made adequate, the condition can be remedied before stringing by building up the rear string rest where necessary, (and where possible). When convinced that a happy compromise has been struck, leave the nosebolt alone, or lock the perimeter screw to the plate.

Check, again, how the pinblock is seating on the rasten; it should be making full, front-to-back contact. Thin, feeler-gauge differences don't matter, but a visible, triangular gap, such as might exist if the block is touching the rasten at the front but not at the rear, is bad. It is often helpful to apply some pressure from above and force the block down to the shelf to see how it is seating. Use a bar or pipe clamp with a block of wood. Place the wooden block on top of the plate and above the pinblock ends to engage one of the clamp jaws; the other clamp jaw engages the underside of the keybed. Don't overtighten. If a non-uniform gap still exists, and you're sure that you are satisified with the bearing setting, the pinblock will have to be shimmed to fill in the gap (difficult to do with triangular gaps), or the gap will have to be made rectangular by planing, in which case a simple rectangular shim can be inserted. The latter method is accomplished by measuring the gap opening at one edge and making a note to remove the same amount at the opposite edge. A simple uniform shim can then be set under the block. Done correctly, the chosen height setting of the block will not be changed. See Figure 1.

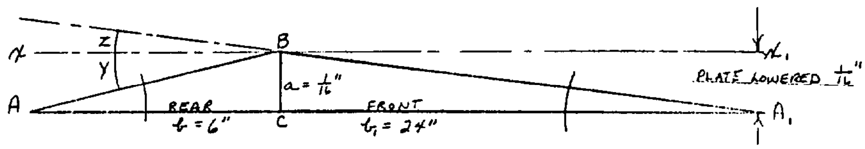
Remove the pinblock screws and pull the plate. Don't upset the one installed nosebolt, or the locked perimeter screw. If the block needed further work, such as evening out the aforementioned triangular gap, now is the time to do it. Secure the pinblock to the rasten per the dictates of the job. Install the rest of the nosebolts and turn them down farther than their original settings. When the plate is finally installed, it will sit on the pinblock and the critically adjusted nosebolt or rear screw. Install the pinblock screws and secure the plate at the nosebolt with the nosebolt nut. Turn the remainder of the nosebolts up until they just make contact with the underside of the plate and secure from above. All that is left now is to install the special Baldwin perimeter screws as outlined in the February '89 issue of the *Journal*.

Undercentering Hammers

Lowering a plate will have an impact on all action regulations. But the most significant aspect of affected action functioning is that the original hammers (or new hammers if bored to the original length, i.e., center of hole to tip of hammer) will undercenter when they strike the string. That is, they will be striking the strings at less than a 90-degree angle, (or, at any rate, less than the intended angle). A thorough job would call for an adjustment in the distance boring. The idea is that, as the plate is lowered, the hammers should likewise be lowered on their shanks, i.e., the hole will be closer to the top of the hammer. Check with your hammer supplier. In the case of our example, the boring distance on hammer number one will be reduced by 1/8 inch, and on hammer number 88 by 1/32 inch. A straight line drawn on all the intermediate hammers between these two reference points will locate the length of bore for each hammer.

Next month we'll discuss what to do with the dowels if they are going to be retained for plate lowering. ≡

Computations



By geometric logic, we know that if line XX_1 is parallel to line AA_1, then Angle A_1 = Angle Z and Angle A = Angle Y.
The downbearing angle is Angle Z + Angle Y.

Angle Y = Tan $A = a/b$ = 0.063/6 = 0.60°
Angle Z = Tan $A_1 = a/b_1$ = 0.063/24 = 0.15°
Hence, Bearing Angle = 0.60° + 0.15° = 0.75°

Now, with a shorter rear length of 4"
Angle Y = Tan A = 0.063/4 = 0.90°
Angle Z = 0.15°
Hence, Bearing Angle = 0.90° + 0.15° = 1.05°

Correction: A formula was incorrectly published in the August "Good Vibrations" article. In the "Computations" section on page 43, the formula should read:
$T = .0002454\ (f^2L^2)(8.39D^2+d^2)$

In addition, the last paragraph of that section should read: "Remember that you must multiply 8.39 by D and then add this to d. This now becomes one factor which is multiplied with the other factors."

The History Of Musical Pitch In Tuning The Pianoforte

Edward E. Swenson
Ithaca College School of Music

On July 27, 1987, at its meeting in Toronto, the International Society of Piano Builders and Technicians unanimously renewed their support for A=440 as the international pitch standard for piano manufacturers and for modern piano and orchestral tuning. The advantages for the acceptance of A=440 by all makers of modern musical instruments for use in concert halls and recording studios seems obvious. Unfortunately, the question of musical pitch is even more complicated today than it was 50 years ago when an International Conference in London also recommended the international use of A=440. The history of musical pitch as it relates to piano tuning has important consequences. Stringed-keyboard music written in the Baroque and Classic periods (including the music of J.S. Bach, Handel, Joseph Haydn, W.A. Mozart, C.P.E. Bach and Beethoven) was originally intended to be played at a low pitch which ranged from A=420 to A=430, nearly a semitone lower than A=440. Obviously, the musical result of playing harpsichord and early piano music at A=440 is considerably different from the less brilliant low pitch the composers originally intended. In the Romantic Period pitch skyrocketed upward well past A=440 and it fluctuated wildly according to location and performing arena. For example, in 1879, Steinway in New York used a tuning fork which produced A=457.2. During the same period, Chickering in Boston preferred A=435, the international pitch standard established by a French commission in 1859. Still, it is likely that most of the late 19th-century pianos (grands, squares and uprights) built in the United States after the Civil War (1865) were tuned at a pitch higher than A=440.

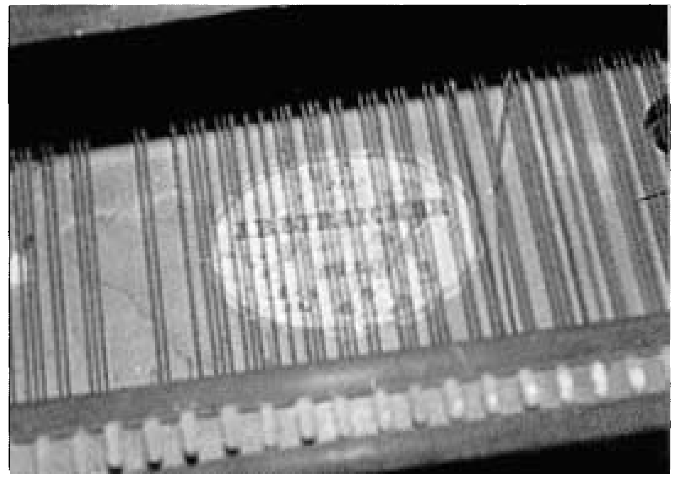
There is a rapidly growing trend to play Baroque- and Classic-period music on original instruments at authentic pitch. Major cities such as London, New York, Amsterdam, Vienna and Toronto now have orchestras which are solely devoted to performing early music on original instruments and at original pitch. Recently, all of Mozart's symphonies and piano concertos and the piano concertos of Beethoven have been recorded using period instruments and low pitch.[1] Performers in early music ensembles will never consider using A=440 as a pitch standard because music written before 1830 sounds more authentic and closer to the composers' original intentions when performed at low pitch. [2] At present there is still no discernable trend to play music of the late Romantic period at high pitch.

My interest in the history of musical pitch was stimulated during a meeting of the Arbeitsgemeinschaft der Restauratoren (A German society of conservators and restorers) in Salzburg, Austria, in 1986. During this meeting, which was held at the musical instrument collection of the Carolino Augusteum Museum, I had the opportunity to examine a piano built by the prestigious firm J.B. Streicher in Vienna. Glued on the soundboard was a printed label which gave the instrument's serial number, the maker's name and location and finally the indication *"440."* (Illus. 1) *Was it possible that Streicher intended his pianos to be tuned at A=440 in 1839? Was it possible, as early as 1839, to measure musical pitch in cycles per second?* My European colleagues unanimously rejected the idea that Streicher could have intended "440" as a pitch indication. Instead it was suggested that this number was a production number or part of a date. Subsequently, I found and studied in Mantua, Italy, still another Streicher piano which had a similar label with the same "440" indication. (illus. 2)

When I returned home I began to study the available sources on the history of musical pitch. I was able to confirm that Streicher was indeed recommending A=440 as the ideal pitch standard for his pianos as early as 1836.

In 1880, Alexander Ellis wrote an important essay on the history of musical pitch for the Society of Arts in London.[3] Apparently, Ellis was unaware that Streicher in Vienna had advocated the use of A=440, but from his research I found the missing link between Streicher and a German physicist named Johann Heinrich Scheibler (1777-1837). Scheibler invented one of the first accurate methods for measuring musical pitch. He called the device a "tuning fork tonometer." It consisted of 52 forks tuned from A 219 2/3 to A 439 1/2 at 69 degrees Fahrenheit. The device and his amazingly accurate method of measuring beats were described in Scheibler's book *The Physical and Musical Tonometer*[4] Ellis' research confirms that there was a connection between Scheibler in Stuttgart and Streicher in Vienna. A tuning fork with the name "Streicher" written in ink on one of the prongs and measuring A=443.2 was found in Scheibler's collection of forks after his death.[5] Scheibler's recommendation for A=440 as an international pitch standard had been adopted by a Congress of Physicists (Deutsche Naturforscherver-

1



2

sammlung) in Stuttgart in 1834. It is very likely that the Streicher piano company adopted Scheibler's recommendation for A=440 shortly after the Stuttgart Congress. The label advocating A=440 in the Streicher piano built in 1839 indicates that Streicher supported the establishment of a pitch standard and that he was up to date with the latest developments in musical acoustics.

Scheibler measured the pitch of many early tuning forks with his tonometer. Many of the forks still existed when Ellis measured them again with more sophisticated technology. Ellis points out with admiration and amazement in his essay, that Scheibler's pitch measurements were extremely accurate.

The Tuning Fork

At about the same time Cristofori invented the first piano in Italy, the tuning fork was invented in England by Royal trumpeter John Shore in 1711.[6] Ellis provides very detailed information on the history and care of tuning forks. I have attempted to extract the most useful information from his research.[7]

Tuning forks vary slightly with changes in temperature. Contrary to the effects of heat on organ pipes, tuning forks are flattened by heat and sharpened by cold. When Ellis made his experiments on tuning forks, he took the following precautions in handling them:

1. Tuning forks should not be touched by the bare hand or carried in the pocket.
2. When a tuning fork is sharply struck, the blow causes heat and, therefore, slightly flattens the fork.
3. Tuning forks are tuned by filing which causes heat and unsettles the molecular structure of the metal. After filing a fork, it should rest for about a week and then be rechecked. It will often rise by several beats in 10 seconds in the course of cooling and settling.
4. Tuning forks are damaged by wrenching and twisting the prongs which is usually caused by dropping the fork.
5. Rust will slightly flatten a tuning fork and is generally more serious at the bend than on the prongs. Modern forks are plated or blued to protect them from rust.

Before turning to specific evidence about pitch level measurements for tuning pianos, here is a quick overview. It is very important to note, that, although pitch was generally much lower from 1600 to 1825, pitch began to rise in the early 19th century. A=440 was already recommended as a pitch standard in Germany in 1834. It appears that very few musicians found the standard pitch desirable. By 1879 Steinway in New York used a tuning fork which measured A=457.2 and in London, Steinways were tuned to A=454.7! Tuners don't need to worry about tuning Steinways from the late 19th century at A=440.

In England I saw three tuning forks, enclosed in a special box, which were used by a Broadwood Piano Co. tuner around 1850. The forks were used for piano tuning in different settings. Broadwood's low pitch equalled A=433 and was close to the A=435 pitch recommended by a French commission in 1859. Broadwood's medium pitch was 445 and the highest fork was tuned to A=454. Generally, singers preferred low pitch, the medium pitch was probably used for home tuning and high pitch was used in tuning pianos to the orchestra and in concert settings.In the midst of this chaos, it is little wonder that the establishment of a standard, international compromise pitch soon became desirable.

Chronologically Arranged Tuning Levels For Early Pianos Extracted From The Research of Alexander J. Ellis

By comparing the date and place of a piano's manufacture to the information given below, at least a general indication of the correct tuning level can be determined. It is clear that much research still needs to be done on the history of musical pitch in the United States.

Year Pitch Place and Source

c. 1715 A=419.9, England. Crude tenor fork, possibly made by John Shore, the inventor of the tuning fork.

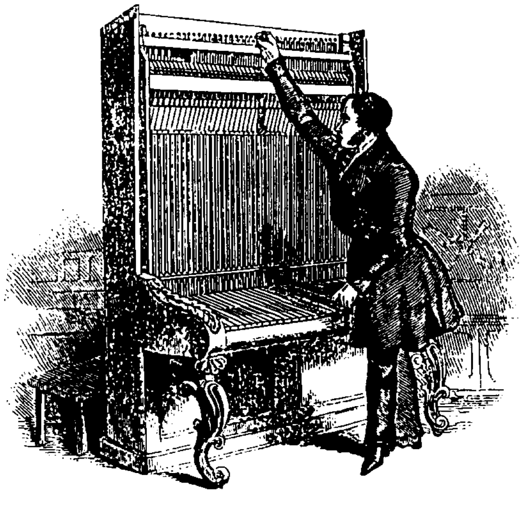
c.1740-1812 A=424.1, Eutin, Germany. Tuning fork owned by Franz Anton von Weber, father of Carl Maria von Weber.

c. 1750 A=424.3, London. "Common music shop fork."

1751 A=422.5, London. Handel's tuning fork. The box which contains the fork bears the inscription: *This pitchfork was the property of the Immortal Handel and left by him at the Foundling Hospital, when the Messiah was performed in 1751.*

c.1754 A=422.6, Lille, France. Tuning

fork found in the workshop of M. Francois, musical instrument maker.
1754 A=415, Dresden. Fork used to tune the Catholic Church organ built by G. Silbermann.
1776 A=414.4, Breslau. Marpurg's pitch for clavichord tuning.
1780 A=421.3, Vienna. Tuning fork of the Saxon organ builder Schulz who lived in Vienna during Mozart's lifetime.
1780 A=421.6 Vienna. Tuning fork used by the piano builder Stein. The fork was inherited by his son-in-law Streicher who Ellis calls "the present great pianoforte maker." *A=421.6 is probably the pitch which Mozart used to tune his fortepianos and clavichords.*
1780 A=422.3, Dresden. Tuning fork in the possession of Dresden court organist Kirsten.
1783 A=409, Paris. Fork of Pascal Taskin, Paris Court tuner.
1796 A=436, St. Petersburg (now Leningrad). Giuseppe Sarti's measurement of the pitch of the St. Petersburg opera. Chladni in his book on acoustics mentions that this pitch was "very high."
c. 1800 A=422.7, London. From an old tuning fork belonging to the Broadwood piano makers.
c.1810 A=430.0, Paris. Tuning fork belonging to M. Lemoine, a "celebrated amateur."
c.1820 A=433, London. "Pitch approved by Sir George Smart, conductor of the Philharmonic.
1823 A=424.2, Paris. Spontini's tuning fork for the Paris Italian Opera.
c.1825-1830, A=435. Dresden. Tuning fork owned by Kapellmeister Reissiger.
c.1826 A=427.2, London. Old fork belonging to the Broadwood piano makers.
c.1826 A=427.6, London. An old fork belonging to the Broadwood Co.
1826. A=428.4, London. An old fork belonging to the Broadwood Co.
1829 A=425.5, Paris. Pitch of the piano at the opera.
1829 A=434, Paris. Tuning fork used by the piano maker M. Montal.
1834 A=441.8, Berlin. Orchestra and opera.
1834 A= 436.5, Vienna. Pitch given by Scheibler as one of the tuning standards for the Vienna Opera.
c. 1834 A=445.1, Vienna. The highest fork which Scheibler measured in Vienna and to which he attributed the "monstrous growth in the upswing in musical pitch.



Tuning a cabinet piano in England — from the Penny Magazine, *April 1842. Was the pitch as high as the arm position?*

c. 1834 A=434, Paris. Pitch of the Paris opera.
c.1834 A=433.9, Vienna. Orchestra fork measured by Scheibler and referred to as "Vienna minimum."
1834 A=440.2, Stuttgart. Congress of Physicists, based on Scheibler's proposal of "the mean of the variation of Viennese grand pianos by temperature." *Scheibler was the first person to recommend the adoption of A=440 as a standard pitch for piano tuning. The piano builder J.B. Streicher in Vienna began to include the indication "440" on his soundboard labels shortly after 1834.*
c. 1834 A=443.2, Vienna. Streicher's fork as measured by Scheibler.
1836 A=443.3, Paris. Tuning fork for pianos built by Woelfel in Paris.
1836-39: A=441, Paris. Opera pianos. Tuning fork owned by M. Leibner who tuned the pianos of the opera at the pitch of the orchestra. In 1849 it agreed precisely with the oboe of M. Vorroust.
1839 A=425.8, Bologna, Italy. Tuning fork used by Tadolini, the best piano tuner in Bologna, Italy.
1839 A=448, Hamburg. Opera pitch.
Date unknown. A=440.5, Paris. Opera. Fork said to have been adjusted by Pleyel.
1845 A=439.9, Turin Italy. Tuning fork.
1845 A=446.6, Milan, Italy. Tuning fork.
1845 A=445.4, Vienna. Fork used at the Vienna Conservatory.
1849-54 A=445.9, London. Broadwood piano company's original medium pitch tuning fork belonging to tuner Alexander Finlayson, who died in 1854.
1852-1874 A=452.5, London. Average pitch of the Philharmonic Orchestra under the direction of Sir Michael Costa (1846-54). Broadwood's tuner Mr. J. Black tuned to this pitch. Broadwood retained this pitch for concerts until 1874 when it was raised to A=454.7.
1854 A=446, Paris. Fork used to tune Pleyel pianos.
1854 A=450.5, Lille, France. Opera orchestra.
1856 A=446.2, Paris. Opera pitch. From a tuning fork sent to the French Society of Pianoforte-makers.
1856 A=446.2, The Hague, Holland. Conservatory of music pitch. Fork sent to the French commission.
1857 A=448.4, Berlin. Opera. Tuning fork sent by the conductor Taubert to the French Society of Pianoforte-makers.
1857 A=444.9, Naples. San Carlo opera theatre tuning fork sent to the French Society of pianoforte makers by E. Guillaume, conductor of the opera orchestra.
1859 A=443.5, Braunschweig, Germany. opera orchestra pitch. Fork sent to the French Commission by Kapellmeister Franz Abt.
1859 A=444.8, Turin, Italy. Opera orchestra. Tuning fork sent to the French Commission by director M. Coccia.
1859 A=444.8, Weimar. Orchestra fork sent to the French Commission.
1859 A=444.8, Wuerttemburg, Germany. Fork of the concert orchestra.
1859 A=435, Karlsruhe, Germany. Pitch at the German opera. Kapellmeister Jos. Strauss felt that this pitch fatigued his singers the least and was the best pitch for the performance of operas from all periods. Strauss' fork became the pitch standard for the French Commission's Diapason Normal.
1859 A=435.3, Paris. Fork representing the French Commission's Diapason Normal Pitch. Presented by the Commission to John Broadwood & Sons Piano Co. in London.
1859 A=435.4, Paris. The French Commission Diapason Normal as actually constructed by Secretan and preserved

at the Paris conservatory.

In the United States this pitch was sometimes called "International pitch." *It was recommended by Chickering in Boston as the ideal pitch for tuning Chickering pianos.*

1859 A=435.34 Paris. Secretan made a dozen tuning fork copies of the French Diapason Normal. Excluding one of these forks which is clearly too flat, A=435.34 is the general average pitch of the other eleven forks.

1859 A=441, Dresden. Opera. Tuning fork sent to the French Commission by Kapellmeister Reissiger, who wrote: *The great clevation of the diapason destroys and effaces the effect and character of ancient music—of the masterpieces of Mozart, Gluck and Beethoven.*

1859 A=446, Budapest. Opera.

1859 A=448, Liege, Belgium. Conservatory of music tuning fork.

1859 A=448, Lyons, France. Opera orchestra tuning fork.

1859 A=448.1, Munich, Germany. Opera tuning fork.

1859 A=448.8, Leipzig, Germany. Conservatory of music fork.

1859 A=449.8, Prague. Pitch of the opera orchestra.

1859 A=456.1, Vienna. Sharp Vienna pitch from a fork in the possession of the Streicher Piano Co. The Viennese orchestral pitch as used before the introduction of the French Diapason Normal.

1860 A=445.5, London. Copy of Broadwood's medium pitch fork made for the society of the arts.

1860 A=448.4, London. Society of the Arts tuning fork.

1862 A=437.8, Dresden. Court theatre.

1862 A=445, Vienna. Piano pitch based on the tuning fork of Kapellmeister Proch. The opera tuned during this period at A=466.

1862 A=454, Vienna. Piano pitch based on tuning fork owned by Kapellmeister Esser. (Compare this pitch with the one above from the same period.)

1869 A=443.1, Bologna, Italy. Liceo Musicale.

1869 A=448.2, Leipzig, Germany. Tuning fork used by the Gewandhaus orchestra.

1874 A=454.7, London. Fork representing the highest pitch used in Philharmonic concerts. Used as the highest pitch used by the Broadwood Piano Co.

1876 A=446.7, London. Concert pitch.

1877 A=449.9, London. Standard fork used by Collard piano Co.

1877 A=454.1, London. From a tuning fork used by Hipkins to tune for the Crystal Palace concerts.

1878 A=446.8, Vienna. Opera pitch.

1878 A=448.1, London. Tuning fork made by Walker.

1878 A=436, London. Standard pitch of church organs taken from Metzler's tuning fork.

1878 A=445.1, London. Society of Arts pitch.

1878 A=449.9, London. Covent Garden opera orchestra during performance as measured by Hipkins.

1878 A=451.9, London. British army regulations. Pitch for wind instruments.

1879 A=445.5, London. Her Majesty's opera orchestra during performance from a fork made by Hipkins.

1879 A=449.7, London. Pitch of the opera orchestra at Covent Garden during performance.

1879 A=454.7, London. Tuning fork used by Steinway & Sons to tune pianos in London.

1879 A=455.3, London. From a tuning fork representing the concert pitch used by the Erard Piano Company.

1879, A=457.2, New York. *From a tuning fork used by Steinway & Sons!*

1880 A=444.9, London. Her majesty's opera. From a tuning fork of the theatre as measured by Hipkins.

1880 A=446.2, London. Tuning fork used by John Broadwood and Co. for in-house tunings but not for public concerts. ≡

End Notes

[1]. See, for example, the complete set of Mozart Piano Concertos, recorded at low pitch by Malcolm Bilson, fortepiano with the English Baroque Soloists conducted by John Elliot Gardner, Archiv Produktion recordings.

[2]. Experiments have shown that a low-pitch A tuning fork held between the F-holes of a Stradivarius violin (originally constructed to play at low pitch) produces a richer and stronger resonance than a high A=440 fork.

[3]. Long out of print, Ellis' studies have been reprinted by Frits Knuf publishers in Amsterdam in 1968. This book can be found in any good music library.

[4]. Johann H. Scheibler. *Der physiikalische und musikalische Tonmesser* Essen: Baedeker, 1834. Scheibler also wrote a treatise on organ tuning: *A method for correctly tuning the organ in equal temperament by means of beats and the metronome.* Krefeld: Schueller, 1834.

[5]. Alexander J. Ellis. *On the History of Musical Pitch,* Journal of the Society of Arts, (March 5, 1880). Reprinted in Studies in the History of Music Pitch, Amsterdam: Frits Knuf, 1968, p. 44. Ellis measured the pitch of the Streicher fork at A=442.78

[6]. Ellis, *op.cit.*, p. 15

[7]. *Ibid.*

[8]. *Ibid.*

Your Labor—A Business Expense

Carl D. Root
Chairman, Economic Affairs Committee

In last month's article entitled "What Kind of Work Do You Do?" we looked at net income from both business and non-business sources. In this article, we will take a closer look at net business income and include the largest expense of all—labor. Consider what your annual gross and net would be if you paid yourself a salary and treated that salary as if it were a business expense. You will soon realize that both your personal income and business income need to exceed expenses. If there is no money left over after personal expenses, your standard of living will remain unimproved and you may have trouble paying bills if you encounter unbudgeted expenses. If there is no money left over after business expenses (including your "salary"), growth of your business will be slowed substantially. Ideally, the items that are often paid for out of profit should be part of your personal and business budgets, but they are often overlooked. Items such as an annual amount set aside for retirement, various kinds of insurance, new shop equipment, or promotion of a new area of expansion often fit into this category.

Since labor is not an out-of-pocket expense for most of us, reducing time spent will not increase gross receipts or profit. However, time reduced in one operation, while still maintaining the same income, is time that can now be spent on new income-generating work. Technicians that have exhausted all their options for new work should consider expanding their sources of income and that usually takes money—enough to cover every phase of the new venture. It is well known that one of the main reasons businesses fail is due to undercapitalization. Set aside money for future expansion even if you have no idea what form it will take. This may seem like a catch-22 since the reason for expanding in this case is to bring in more needed income, but if you invest your time and money wisely and lower your standard of living in the short term, your long-term prospects will be much improved.

If you are having difficulty making a profit in your business, you need to increase the gross receipts of your business or reduce costs. Hard cost reduction is a challenge. Advertising costs could be analyzed to determine how much income is being generated. Examine your scheduling methods to see if you can cut down on your driving expenses. As you look at other items, be sure to separate expenses from investment. Gasoline is not an investment, a computer is. One is consumed, the other is an asset that will generate new income or increase productivity.

One way to simplify daily business decisions is to make every hour worth the same. If you think of yourself as an employee of the business that you own, you would expect to be paid for your time regardless of whether or not it was spent generating income or doing routine business maintainance. Remember that we are looking at net figures, not what you charge. To determine your net profit on each type of work, you must keep track of both the income and non-income producing hours spent and then factor in hard costs. If you want every hour spent on your business to produce the same net income, it will soon become apparent that you must charge different hourly rates for each operation. This is because some operations require more non-income producing time; others require more out of pocket expenses.

You may object to the idea of paying yourself the same net hourly rate for each operation. Some technicians find it hard to net the same amount from a day's worth of shopwork compared to a day's worth of field service. In this case, a breakdown of your business according to the type of work becomes even more useful if you hope to predict your income for the coming year. How much shopwork can you afford to do and still pay all your business and personal expenses?

Keeping track of the hours put into your business—in the customer's home, in the shop, making calls, writing estimates, ordering parts, running errands, driving to appointments—is necessary not just as a means of determining rates, but also as a way to examine and minimize non-income producing time. Perhaps the most obvious time savings can be found in scheduling appointments. Drive to a neighborhood, tune four pianos, then drive home. If you spend as much time driving as you do tuning, your gross annual income could be reduced by the equivalent of one tuning fee per day! The time and costs of the different ways of contacting customers represent a range of investment in time and money and should be compared to the number of appointments they produce.

Let's look at the time and expenses of a typical service call. Time spent on the telephone making appointments is "billable" to your service business, not your restoration work. When you look at the time spent behind the wheel of your car, it may seem extreme to charge less to a customer who lives 10 minutes away than one who lives 30 minutes away, but tuners who travel greater distances find that they must think in these terms. You could give discounts when there is more than one piano in the same location because each additional piano has no traveling or scheduling expenses associated with it. You can charge extra when someone insists that you leave a bill rather than pay at the time the service is rendered. Charges for late payment, failed appointments, and written estimates and appraisals could also be set to reflect all the time spent servicing each of those accounts.

Let's pick $60 for a tuning fee. (That's not what I charge, nor am I suggesting that it should be what you charge; it's just a round number.)Let's say it takes an hour to tune a piano and there are four calls on today's schedule. An hour and twenty minutes of driving are required so that's twenty minutes per tuning. You called customers to schedule the appointments and it takes twenty minutes to schedule four calls. Add ten minutes at the end of the day to update customer records, order parts, etc. That's almost two hours of non-income producing time divided by four tunings that must be reflected in your tuning fees. (Time spent socializing with the more congenial customers in my clientele is not billable to them or to my business.)

Now, if you work on a piano in the home for an additional hour, how much should you charge if you want to put the same value on your time? The sixty-dollar tuning that took you an hour actually took you about an hour and a half of total business time so an hour is worth $40 in this model. If you're going to spend all day on one piano, use the same approach, adding parts and supplies where appropriate. I need to make a profit for parts that I stock because that money could have been invested elsewhere. When a part is special ordered, I charge for the time spent ordering the part in addition to a smaller profit.

In my business, a day's net income is about the same—whether I'm driving, tuning, regulating, rebuilding, or doing office work. If piano work of any description really is hard to come by in your area, then I suppose you can charge whatever seems fair even if some days produce more net income than others. You could put a lower value on an hours' worth of driving compared to an hour's worth of tuning because it requires less effort. I've rejected that notion in my area because perpetual rush hour conditions and road construction make for more stressful, not less stressful time. I've also thought that I could charge more when I have become especially efficient at a given operation. Why would the customer be charged less because I'm able to do something in twenty minutes that my competitor takes an hour to do? I must also admit, however, that I'm a bit slow at some things as well, so my overall level of efficiency and productivity is reflected in my net hourly rate.

Regardless of your work preferences or local market conditions, you will be able to make decisions consciously rather than by default if you know how much time and money must be spent on all phases of your work. Perhaps the best reason to make all operations of your business equally profitable is that the customer will end up with the service that you have recommended to them based on their needs, not your profitability.

Think "net."

Calendar Of Coming Events

Date	*Event*
March 30-April 2, 1989	**Pennyslvania State Convention** Brunswick Hotel, Lancaster, PA Dick Bittinger; 107 W. Main St., P.O.Box #51; Brownstown, PA 17508 (717)859-3111
April 7-9, 1989	**Central West Regional Seminar** University of Nebraska-Lincoln Richard West; 1201 Rose, Lincoln, NE 68502 (402)472-2568
April 21-23, 1989	**Central East Spring Seminar** Holiday Inn North, Indianapolis Robert Bussell; 224 W. Banta Road, Indianapolis, IN 46217 (317)782-4320
May 4-7, 1989	**New England Regional Seminar** Treadway Inn at Cromwell Jim Birch; 56 Nashville Road, Bethel, CT 06801 (203)744-4842
May 5-6, 1989	**Richmond Regional Seminar** Richmond, VA Jesse Williams; 7500 Robinwood Court, Chesterfield, VA 23832 (804)743-7062
May 13, 1989	**Lake Charles One-Day Seminar** University United Methodist Church Larry Eddy; 2426 Weil Drive; Sulphur, LA 70663; (318) 625-7027
May 19-20, 1989	**Utah Intermountain Seminar** Holiday Inn-Airport Gary Dunn; 6287 W. 3705 S., West Valley, UT 84120 (801)967-5215
May 25-June 4, 1989	**PTG Orient Tour** Charlie Huether; 34 Jacklin Court, Clifton, NJ 07012-1018 (201)473-1341
May 26-28, 1989	**Mexico City (sponsored by Region 3)** Mexico City Danny Boone, 9707 Timberview, Waco, TX 76710 (817)772-0546
June 10-13, 1989	**IAPBT Conference** Kyoto, Japan Charlie Huether, 34 Jacklin Court, Clifton, NJ 07012-1018 (201)473-1341
July 10-14, 1989	**32nd Anual Piano Technicians Guild Convention & Institute** Red Lion Lloyd Center, Portland, OR Home Office; 4510 Belleview, Suite 100, Kansas City, MO 64111 (816)753-7747
Sept. 23-24, 1989	**Milwaukee Chapter Days** Howard Johnson, 611 W. Wisc. Ave. Rudolph Moroder, 3916 N. Frederick Ave., Shorewood, WI 53211 (414)332-8474

New Members In February 1989

REGION 1

TORONTO, ON — 062

EDWARD G. SAMBELL
19 CASTLE FRANK CRES.
TORONTO, ON M4W 3A2
CANADA

CONNECTICUT, CT — 064

KAREN ROBINSON
190 LONG HILL ROAD
SO. WINDSOR, CT 06074

SOUTH JERSEY, NJ — 080

RICHARD P. CARROLL
203 ALMONESSON ROAD
BLENHEIM, NJ 08012

NEW YORK CITY, NY — 101

LINNEA C. JOHNSON
218 THOMPSON ST., #12
NEW YORK, NY 10012

KRISTIN L. PETERSON
5540 TIMBERLANE, #A1
EAST LANSING, MI 48823

SYRACUSE, NY — 131

TOM J. MOONAN
811 AMHERST DRIVE
ROME, NY 13440

ROCHESTER, NY — 144

JAMES O. FORD
3712 SADDLEBACK ROAD
CANANDAIGUA, NY
14424

REGION 2

ATLANTA, GA — 301

JENNIFER W. COOPER
266 11TH STREET, #9
ATLANTA GA 30309

MICHAEL D HEDDEN JR
5541 RAINTREE TRACE
OAKWOOD, GA 30566

MEMPHIS, TN — 381

JOE E. DUNCAN
1036 CHATWOOD
MEMPHIS, TN 38122

A. ROY JOHNSON
4671 MONTGOMERY
MILLINGTON, TN 38053

REGION 3

NORTHWEST ARKANSAS, AR — 727

CLARK A. JENKINS
201 JAY
HARRISON, AR 72601

REGION 4

CINCINNATI, OH — 452

JAMES S. NASH
2561 CELIA DRIVE
XENIA, OH 45385

MILWAUKEE, WI — 532

PHILIP L. FROHNA
3415 N. 95TH STREET
MILWAUKEE, WI 53222

WAUKEGAN, IL — 600

DANIEL J. CHRISTENSEN
1124 N. TAYLOR
OAK PARK, IL 60302

REGION 5

ST. LOUIS, MO — 631

MIGUEL A. ZARATE
P. O. BOX 446
GRANITE CITY, IL 62040

DENVER, CO — 801

REID W. SCHAEFER
2128 LAFAYETTE
DENVER, CO 80205

ROY E. SINCLAIR III
P. O. BOX 11042
2719 HAZEL COURT
DENVER, CO 80211

REGION 6

LOS ANGELES, CA — 901

THOMAS R. SCHULTZ
439 S. GRAND
PASADENA, CA 91105

SAN DIEGO, CA — 921

JON T. JOYCE
5845 VALE WAY
SAN DIEGO, CA 92115

SAN FRANCISCO, CA — 941

BRIAN M. PARKER
957 MOUNTAIN BLVD.
OAKLAND, CA 94611

REDWOOD, CA — 955

RONALD R. STANLEY
P. O. BOX 724
GARBERVILLE, CA 95440

CENTRAL WASHINGTON, WA — 993

ADELE E. BAINTER
8202 SCENIC DRIVE
YAKIMA, WA 98908

Reclassifications During February 1989

REGION 1

TORONTO, ON — 062

EDWARD G. SAMBELL
19 CASTLE FRANK CRES.
TORONTO, ON M4W 3A2
CANADA

REGION 4

CLEVELAND, OH — 441

DONALD P. ECKERT
1125 LEONARD BLVD
KENT, OH 44240

APPLETON, WI — 549

KENNETH W. MERRELL
1004 SPENCE STREET
GREEN BAY, WI 54304

CHICAGO, IL — 601

ALLAN H. DAY
425 HOME AVENUE
OAK PARK, IL 60302

Membership Status

	1989	*1988*
Northeast Members	796	800
Northeast RTTs	540	552
Southeast Members	576	565
Southeast RTTs	391	382
South Central Members	311	313
South Central RTTs	213	229
Central East Members	610	614
Central East RTTs	405	414
Central West Members	393	415
Central West RTTs	280	312
Western Members	884	868
Western RTTs	616	631
Total Members	3570	3625
Total RTTs	2445	2520

The Auxiliary Exchange

The Magic Glass

At the famed Waterford factory in Ireland the artisans say, "A machine can churn one out in only 45 seconds, we take over 14 hours to mouth-blow and hand-cut a single glass. But then, our goal is not efficiency, but beauty."

Glass as defined in the chemistry text is a complex silicate of some alkali (such as soda, potash) and an alkaline earth, such as lime, barium and other metallic salts. Glass is generally transparent, although not essentially so, since it may be almost opaque. When softened by heat it is highly tenacious; at a lower heat it is plastic and may be cut with scissors; when cooled it is quite brittle.

Authorities date the invention of glass from antiquity. The oldest known specimens are Egyptian. From Alexandria and Sidon glassmaking spread across the Mediterranean to Constantinople and Venice where it reached a peak in the medieval period and later eras until more recent times. Only the very wealthy merchants and lords knew of glass. The narrow windows and arrow slots of massive castles and keeps had wooden slatted shutters at their windows. Glass was too precious. The peasant and middle class covered the windows of their hovels or homes with battened sheep skins which were opaque but they allowed some light and kept out the cold drafts and insects.

Today glass has a myriad of uses. Once the reserve of kings and nobility who drank from glass goblets in mirrored walled palaces, glass now insulates our homes, shields delicate instruments, corrects our myopia, helps us to visually explore the heavens and insulates our cars. With this prelude, and without taking any edge off the lecture you will hear next July from our own **Nita Kadwell** who will tell us about antique and art glass, the following is an account of the glass flowers at Harvard University's Agassiz Hall.

George Lincoln Goodale, Harvard's first director of their Botanical Museum, sought a better way to display plant development. Most dried specimens crumbled after a short while, and papier-mache and wax models were crude and worthless. This was back in the late 1800's before plastic had been developed. But when he observed glass replicas of marine invertebrates in the neighboring Museum of Comparative Zoology, he felt certain that glass would be the fitting medium for his display.

George Goodale then visited the makers of the marine models, a father and son, Leopold and Rudolph Blaschka whose third and fourth generation ancestors were glass modelers of profound skill. Goodale traveled to their studio in Hosterwitz, near Dresden, Germany, in 1886 and ultimately succeeded in persuading Leopold Blaschka to create plant models for him and Harvard University's Botany Museum. There were problems to surmount, of course. Some models were damaged in transit. Backers were needed to pay the Blaschkas to make glass flowers for Harvard on a half-time basis. By 1890 a benefactor, Elizabeth Ware, made a donation in memory of her husband Charles Eliot Ware, class of 1834. Leopold Blaschka died in 1895 but his son Rudolph continued their work alone, until a few years be-

President's Message

With the arrival of April, we herald a new season that marks the second quarter of our year. Your plans for July 1989 must be well underway and we hope they include the convention of PTG at the Red Lion Inn in Portland. If you have read the previous articles about this city you know there is much to see and enjoy. A deluxe city tour (optional) is planned to include several of Portland's famous attractions.

Among them is the renowned World Forestry Center, a unique facility which describes and illustrates through well-planned exhibits the riches Oregon claims from its forests of redwood, cedar, myrtlewood and black walnut. In the Center's large exhibit hall stands a giant "talking tree" to serve as "spokesman" for all the trees of the forest and to recount the state's efforts to insure a healthy and renewable timber source.

The Pittock Mansion built in 1914 by Henry L. Pittock, founder of Portland's *Oregonian*, has landmark status and its restoration is one of Portland's proud achievements. This twenty-two room residence is furnished with fine antique chairs, tables and other furniture of French, English and American design in settings of fine plasterwork, cut and polished marbles and superbly crafted hardwoods and paneling. Situated 1000 feet high above the city and the Willamette River, the mansion commands sweeping views of the city, four snow-capped mountains and two states!

A third great attraction on our tour is the Japanese Garden in Portland's Washington Park. Acclaimed as one of the most authentic gardens outside of Japan, its magnificent Pavilion, in simplicity and setting, combines to recapture the mood of ancient Japan.

Viewers of the PBS program *Nature* know that Washington Park also boasts the Portland Zoo, famous for its reproductive elephant herd, and for one of the largest chimpanzee colonies in America. There is *much* to miss if we do not see you in July!

Agnes Huether

fore his death in 1939.

Today in Cambridge, Massachusetts there are 847 flowers that never wither, die or tremble in a breeze, ears of corn that look luscious enough to eat, strawberries that can make one's salivary glands function. It is hard to believe they are glass. They have their own magic.

The Harvard exhibit has drawn admirers from all over the world and it is the largest single public attraction at the University. The flowers and plants have traveled by special arrangement to other countries and universities. They have two special guardians who travel with them first class. Secure in styrofoam, the boxed flowers go into large wooden crates. Their caretakers have discovered that the trip from an airport to a museum is best negotiated in a hearse rather than an ambulance or stretch limo! Until another skilled artisan comes along like *pere et fils*, the world will have to be satisfied with the tale of the Blaschkas and the glass flowers of Harvard.

Agnes Huether, Editor

TO OUR TAURUS BIRTHDAY CELEBRANTS—APRIL 20 -MAY 20

Let a Taurus have his way!
For no matter what you say,
He will do just as he chooses.
Scorning all his P's and Q's!

Happy Birthday to Zubin Meta, Eleanor Ford, and Pope John Paul, and also to Christine Monroe, April 20; Beva Jean Wisenbaker, April 23; Nancy Lamoreaux, April 24; Leigh Ann Hale, April 25; Helen Love, April 27; Mabel Olney, April 27; Agnes Huether, April 29; Dorothy Trader, May 3; Dorothy Brown, May 7; Maryann Ryder, May 10; Mary Thomason, May 12; and Celia Bittinger, May 18.

Have you heard this?

—A wag once said: "The age of some women is like the speedometer on a used car—you know it's set back but you don't know how far."

Only the good die young; here's hoping that you live to a ripe old age.

—Here's to woman—who came after man—and who has been after him ever since!

—Here's to woman—who generally speaking is generally speaking.

—Here's to woman—indestructible, delectable—and so deductable!

Brenda Starr

From the Editor's Desk

To all of you who recall the NRA (National Recovery Act)—not the NRA (National Rifle Association) there is a new book out of Hollywood by one of its famous movie stars which might capture your interest: *Child Star* (McGraw-Hill). Unlike other bios and autobiographies of recent years, this one provides a matter-of-fact account of the vicissitudes, the arduous hours, stern discipline and unrelenting demands made upon an actress who managed to remain relentlessly cheerful, bright-eyed and dependable. Her family, fellow actors, directors and all other adults involved with her in the cinema business were hard pressed to match her stamina and good humor. Even FDR (Franklin Delano Roosevelt) said, "It is a splendid thing that for just fifteen cents, (!) an American can go to a movie and look at the smiling face of a baby and forget his troubles." Of course, we are referring to that charming, dimpled, curly-top—Shirley Temple.

During the late depression years—1931 to 1939—she brought tears, laughter and a special magic to the millions who went to see her in the movies. For a couple of hours they were absorbed in her cares, delights and dances, thereby forgetting their own poverty or plight.

Shirley Temple, who was later to become Mrs. Charles Black, mother of three children, ambassador to Ghana, representative to the United Nations and chief of protocol, dismissed the advice of friends who urged her to sue her family and relatives for having squandered all but $44,000 of the $3,207,666 finances she had earned in eighteen years of film making. Instead, she chose to get on with her life, avoid piggish action and make the best of an ill-deserved situation. According to a review by Geoffrey Ward, Shirley Black seems to have no regrets or hold no grudges even against her late parents. She nursed her father through his last illness and the last words of her book simply stated are, "Thanks, Mom." It does sound like an autobiography we might all enjoy and benefit from reading.

We are pleased to report that **Ailsa Thompson** has agreed once again to serve as our parliamentarian at our Auxiliary Council meeting next July 11 in Portland, Oregon.

Deanna Zeringue of Thibodaux, Louisiana will be happy to conduct the installation of new officers to the Auxiliary Board and **Phyllis Tremper** of Morehead, Kentucky will convey our Memorial Tribute.

Agnes Huether, Editor

P.T.G. Auxiliary Executive Board

President/Exchange Editor
Agnes Huether (Charles)
34 Jacklin Court
Clifton, NJ 07012
(201) 473-1341

Vice President
Arlene Paetow (William)
Rt. 1, Box 473
High Falls, NY 12440
(914) 687-0364

Recording Secretary
Bert Sierota (Walter, deceased)
3803 Arendell Avenue
Philadelphia, PA 19114
(215) 333-3408

Corresponding Secretary
Judy White (Charles)
Rt. 1, Box 134
Alma Center, WI 54611
(715) 964-8566

Treasurer
Barbara Fandrich (Delwin)
1809 Covey Road
Jonesboro, AR 72401
(501) 933-8543

Immediate Past President
Ginger Bryant (James)
1012 Dunbarton Circle
Sacramento, CA 95825
(916) 929-5706

Classified Advertising

Classified advertising rates are 35 cents per word with a $7.50 minimum. Full payment must accompany each insertion request. Closing date for 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, 4510 Belleview, Suite 100, Kansas City, MO 64111.

For Sale

1964 6' Bechstein. Mint Cond. H. Pol. Ebony. $16,000. **Box 64, Matteson, IL 60443. (312)720-9058. AM and Eves.**

FOR SALE-**Allison & Allison (London)** small upright. Burled Walnut. **Olen W. Allen, RTT. 11-Edgemoore Hutchinson KS 67502, (316)665-5166.**

FOR SALE: **Sight-O-Tuner #4436** (good number), with case, not used much. $150.00. **Call Allen Wright (904)787-8951.**

SANDERSON ACCU-TUNER, twenty page memory filled, foot and thumb switches, less than two years old. $650 or best offer. **(618)544-8780.**

USED ACCU-TUNER FOR SALE: Save $. Authorized Distributor for Sanderson Accu-Tuner. Call for details. **Bob Conrad (816)444-4344.CALL COLLECT.**

CUSTOM PIANO COVERS MADE TO YOUR SPECIFICATIONS. Perfect for any storage or moving situation. All work guaranteed. Also available many gift items. Send for brochure and samples. **JM FABRICations, 902 185th St. Ct. East, Spanaway,WA 98387. (206)847-6009.**

SANDERSON ACCU-TUNERS FROM AUTHORIZED DISTRIBUTOR. Send for free catalogue. Call for details. All MIDI, battery, note-switch, memory, software, repairs/rental, and tool case options available at current prices. Used Accu-Tuner. **Bob Conrad (816)444-4344, Kansas City, MO. CALL COLLECT.**

For Sale: 9 FT. BECHSTEIN CONCERT FLUGEL Model EN, 5 years old, high polish ebony, private ownership (used less than 50 hours). $40,000. **Jay Mangano (615)226-0013.**

AUBREY WILLIS SCHOOL-Our home study course in piano, tuning, repair and regulating has been used by hundreds to learn the basics. Accredited member National Home Study Council. No cost information. **Aubrey Willis School, 1212 W. Camelback Rd., Phoenix,AZ 85013.**

SANDERSON ACCU-TUNERS-from Authorized Distributor. The most accurate and advanced tuning aid available. Tuning lever note switch for Accu-Tuner $25. Consignment sale of used Accu-Tuners and Sight-O-Tuners or new Accu-Tuner customers. Call for details. **Rick Baldassin, 2684 W. 220 North, Provo,UT 84601, (801)374-2887.**

"COMPONENT BEARING GAUGES give readings in degrees (string angle) and thousandths of an inch (dimension). Available at supply houses. **Box 3247, Ashland,OR 97520."**

GRAM WEIGHT SETS-individual brass weights, lathe turned & calibrated to +/- .10 gm, in fitted wooden case. Use only one or two in combination to cover 16-75gm range, much faster than 7pc. supply house sets. $120.00 ppd., CA res. add sales tax. **Bill Spurlock, 3574 Cantelow Rd., Vacaville, CA 95688. (707)448-4792.**

52 PIANO KEYS RECOVERED-.50-$50.00; .060-$60.00; .075 with fronts-$75.00. New sharps-$32.00; sharps refinished-$17.50. Keys rebushed, felt-$60.00. Return freight paid with prepaid order. Charles **Wilson, 1841 Kit Carson, Dyersburg,Tenn.38024,(901)285-2516.**

STEINWAY "M" 1963, **Louis XV**, Walnut, Mint Condition, $14,500.00. **(206)252-5000, Roger Gable, 2914 Hewitt Ave., Everett, WA 98201.**

AVAILABLE-Past issues of the *Piano Technicians Journal.* Issues of 1959, the 1960's, 1970's and 1980's. Please write to **Harry Foster, 6555 East 211th St., Noblesville, IN 46060 or call (317)877-5278.**

FLORIDA BUSINESS AVAILABLE by middle of 1989. Please contact **Jeanne LeFeber, (813)665-3104. 2315 Broadway, Lakeland,FL 33801.**

THE PIANOFORTE AND ITS ACOUSTIC PROPERTIES by Siegfried Hansing. An essential work on design and construction. 234 pages, English translation. A quality bound reproduction. $22.00 includes shipping. **C. Miller, P.O. Box 1042, Marietta,GA 30061.**

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

WOULD LIKE TO TRADE new studio pianos for older grands needing restorations such as Steinways, Baldwins or Mason & Hamlins. Call **Jim Brady collect at (317)259-4307 daytime or (317)849-1469 evenings or write 2725 E. 56th St., Indpls., IN 46220.**

MAPLE KEY BUSHING CAULS for two-caul method featured in August '88 *Journal.* Precision made, color coded & waxed, in quantities of 45, 90, or 180, 25 cents ea. Available for key pin sizes .087", .125", .131", .133", .137", .146", & .163". Join your colleagues who have found the way to painless and profitable key rebushing. Call or write **Bill Spurlock, 3574 Cantelow Rd., Vacaville,CA 95688.(707)448-4792.**

RESTORATION OF CARVED WORK, turnings, inlays, and marquetry, including repair of existing work and reproduction of missing pieces. **Edwin Teale, 19125 S.W. Kinnaman Rd., Aloha, OR 97007, (503)642-4287.**

PIANOS!-PIANO!-PIANOS! Buying and selling all types of usable pianos. We give genuine wholesale discount on volume. Immediate removal. Cash paid. Also selling all kinds of vintage grands—Steinway specialty. **Jaymart Wholesale, "THE PIANO STORE FOR PIANO STORES," P.O. Box 21148, Cleveland,OH 44121. (216)382-7600.**

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.**

THE GUIDE **$10.** The Piano Technicians Guide. A job time study and work guide. Revised and printed to fit a pocket. **Newton J. Hunt, Dept. of Music MGSA-Douglas, Old Music Bldg. New Brunswick,NJ 08903.**

LEARN PIANO TUNING—Small classes; Personal attention; Calif. State approval; Veterans approved; Not a mail order course. Call for free brochure. **S.F. School of Piano Tuning. 2652 Harrison St., San Francisco,CA 94110, (415)824-TUNE.** "Our 8th Year."

POLYESTER PIANO FINISH. A complete line of professional products for producing the ultimate polished polyester piano finish. Black, White, Clear, Custom Colors. Catalog $2.00. **Donald M. Steinert. Dept. PTJ. 800 Messinger Road, Grants Pass, OR 97527.**

SO YOU WANT TO BE A CONCERT TECHNICIAN, by Norman Neblett. This informative lecture, professionally recorded and edited in May 1988, is now available on cassette. $10 post paid. **Rick Baldassin 2684 W. 220 North, Provo,UT 84601.**

THE RANDY POTTER SCHOOL OF PIANO TECHNOLOGY—Home Study programs for beginning students, associate members studying to upgrade to Registered Tuner-Technician, and RTT'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, RTT; 61592 ORION DRIVE; BEND,OR 97702; (503)382-5411.** See our ad on page 3.

SANDERSON ACCU-TUNER TOOL CASES. Carry your Accu-Tuner and Other Tools in the Same Case. 4 Sizes. 3 Prices. $90-$160. **Bob Conrad (816)444-4344.** CALL COLLECT.

NILES BRYANT OFFERS TWO HOME STUDY COURSES: Electronic Organ Servicing: Newly revised. Covers all makes and models-digital, analog, LCI's synthesizers, etc. Piano Technology: Tuning, regulating, repairing. Our 87th year! Free booklet: Write or call NILES **BRYANT SCHOOL, Dept. G, Box 20153, Sacramento,CA 95820—(916)454-4748 (24 hrs.).**

DON'T LEAVE HOME without your bottle of Pearson's Super Glue ($3.25) or your tungsten carbide sanding file ($7.00). Rapidly becoming an essential part of every technician's bag-of-tricks (Postage extra). **Steve Pearson Piano Service, 831 Bennett Ave., Long Beach,CA 90804. (213)433-7873.**

WENOL—W. German metal polish contains jeweler's rouge, no ammonia, cleans, polishes, protects. Mentioned at PTG convention. Great for capstans, balance rail pins, bottom of studs. Price break in case lots. Case equals twenty 3.9 oz. tubes. Also in 39.0 oz. cans. Write for prices and order from VANCE PIANO **SERVICE, 1881 W. Marion Ave., Punta Gorda, FL 33950.**

HARPSICHORD AND FORTE-PIANO PARTS and kits, original factory materials from the finest early keyboard suppliers in the world. Also Troubleshooting and assistance to fellow RTT's on harpsichord problems. Authorized Zuckermann Agent. Lowest Factory Direct Prices-buy from the source. Catalogs, price lists free. **Yves A. Feder RTT, Harpsichord Workshops, 2 North Chestnut Hill, Killingworth CT 06417 (203)663-1811.**

VICTOR A. BENVENUTO VIDEO TAPES, PIANO TUNING AURAL/ ELECTRONIC,—**$175.**The most accurate approach in fine tuning. KEY MAKING, $124.75. GRAND REBUILDING(2 tapes), $225.75. Preparation, pinblock replacement, damper installation, restringing. GRAND REGULATING, $175.75. SOUNDBOARD REPLACEMENT, $94.75. Ship old board—new board comes to you ready for installation. Please specify VHS or Beta. All prices include shipping. **THE PIANO SHOPPE, INC. 6825 GERMANTOWN AVE., PHILADELPHIA, PA 19119. (215)438-7038.**

RESCALING SERVICE: Customized tunings for Sanderson Accu-Tuner; custom rebuilding and remanufacturing. Soundboards, pinblocks, etc. **Lawrence Buck, 171 Lincoln Street, Lowell,MA 01852, (508)458-8688.**

JOHN TRAVIS PUBLICATIONS going out of business. *A Guide to Restringing* for sale by the book or by the dozen. Paperback each $16.50 postpaid, hardback each $21.50 post paid. Order now. No COD. Make check or money order payable to : JOHN W. TRAVIS, 8012 Carroll Ave., Takoma Park, MD 20912.

WANTED!! DEAD OR ALIVE "Steinway Uprights." Call collect, **Ben Knauer (818)343-7744.**

PLATING-PIANO HARDWARE. Stripping, buffing, and NICKEL plating, with hinges up to 60" lengths $125-$225/ set, depending on quantity of parts included. Enclose packing list indicating number of screws with description and quantity of items. REFERENCES AVAILABLE COD delivery in 2-3 weeks. A.R.O.M. throughout the U.S.A.! We will serve you with quality & reliability. **CRAFTECH ELECTROPLATING, #46R Endicott St., Norwood, MA 02062, (617)769-0071 days, (617)469-9143 eves.**

HAMMER BORING JIG: Fast, Accurate, easy to use, more than 600 in use. Requires drill press and drill press vise. Complete with instructions $69.00. PIANO HAMMERS by Nu-Tone (Knight), A. ISAAC, IMADEGAWA. Action parts by Tokiwa with cloth bushings, genuine buckskin and maple shanks. Try the NEW NU-TONE HAMMERS on mahogany moldings; excellent! **Wally Brooks—BROOKS, LTD., 376 Shore Road, Old Lyme,CT 06371, (203)434-0287.**

"LET'S TUNE UP" $20.00 per copy. Last few hardbacks will soon be gone. No immediate plans for another printing. Paperbacks still available at $17.50. Make checks payable to **John W. Travis, 8012 Carroll Avenue, Takoma,MD 20912.**

NEW SOUNDBOARDS MADE FOR YOU. Ship old board. New board comes to you ready for installation. Send for instruction on: **Victor A. Benvenuto, 6825 Germantown Avenue, Philadelphia,PA 19119. (215)438-7038.**

Wanted

WANTED!!! PIANO TUNER/TECHNICIAN for New York market. In need of experienced and well qualified piano technician. Hamburg Steinway factory training a real blessing!!! Well attired, good personality. Willing to work and work and work and work. **Pro Piano,(212)206-8794/(800)367-0777**

WANTED: Mason & Hamlin BB, Steinway B, or Baldwin F in restorable condition. Finder's fee. Call or write: **Dave Kook, 18033 Reed Knoll Rd., Los Gatos, CA 95030. (408)866-8600 days, (408)354-0982 eves.**

WANTED-Bass string winding machine. David Briars, Craftsbury, VT 05826.

WANTED: STEINWAY AND MASON HAMLIN GRAND PIANOS, prefer original condition but will consider others. Call **(415)676-3355** or write: **Piano Finders, P.O. Box 23951, Pleasant Hill,CA 94523.**

WANTED: Still looking for Steinway player grand in fancy case (prefer unrestored). Will also consider Mason & Hamlin, Knabe or Chickering. Reward for successful leads. **Kavouras, 2740 Lighthouse Ct., Lynwood,IL 60411 (312)474-8787.**

LEARN PIANO TUNING AND REPAIR in one of the Southeast's leading cities: Charlotte, North Carolina. Central Piedmont Community College is now in its tenth year of offering a full one year diploma course covering aural tuning, regulating, repairing, and rebuilding of grand and upright pianos. Well-equipped facilities and an instructor with twenty-five years experience makes it possible for students to prepare for a truly rewarding career. Next class begins September 5, 1989. For further information contact **Arthur M. Williams, Program Director, Piano Tuning and Repair, Central Piedmont Community College, P.O. Box 35009, Charlotte, N.C. 28235. (704)342-6618**

REWARD. $1000.00 Reward offered for information leading to the recovery of one Yamaha U1A upright piano, ebony polish, serial #4041146. Confidentiality assured. **Please phone (212)206-8794**

TUNER/TECHNICIAN. Full time or part time. The Piano Shop. 3 locations, VA, DC, MD. **Contact Phyllis, (301)738-1145.**

TUNER NEEDED: Prominent Southern California piano servicing company is looking for an excellent tuner who wants to be part of a high profile company. Please call for details. **(818)789-1212.**

UP TO $1000.00 Finder's Fee will be paid for successful purchase of a Mason and Hamlin Ex-Player. I have mechanism to install. Pls. call collect **(317)259-4307 or evenings (317)849-1469. Jim Brady, 4609 Cranbrook Dr., Indpls.,IN 46250.**

PIANO ROLLS, Artrio-Angelus, Angelus (reproducing). Top prices paid, 1 or 100. **Kirk Russell, 37 Liberty St., Wakefield,RI 02879. (401)783-1966, 421-6000.**

WANTED: PIANO TUNER/TECHNICIAN, full or part time work in quality rebuilding shop. Superb work and experience a must! Call: **Piano Finders, (415)676-3355, P.O. Box 23951, Pleasant Hill,CA 94523.**

GREAT OPPORTUNITY FOR SELF-MOTIVATED PERSON TO LEARN PROFESSIONAL REMANUFACTURING OF PIANOS. Having expanded and moved into our new factory and distribution center, we now need to train more people to become craftsmen capable of meeting our high standards of workmanship. Send resume to **Webb Phillips,** 1836 **Stout Drive, #16, Ivyland,PA 18974.**

PIANOS! — PIANOS! PIANOS!

Buying and selling all types of usable pianos. We give genuine wholesale discounts on volume. Immediate removal. Cash paid. Also selling all kinds of vintage grands — Steinway specialty.

Jay-Mart Wholesale — "The Piano Store For Piano Stores"

Box 21148, Cleveland, OH 44121
(216) 382-7600

COLEMAN -DEFEBAUGH
Video Cassettes

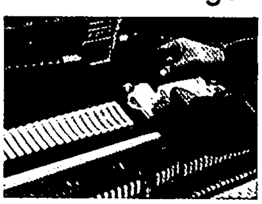
- Aural & Visual Tuning $79.50
  Pitch raising, temperament setting, beat counting, Sanderson Accu-Tuner, etc.
- Grand Action Rebuilding $79.50
  Hammers, shanks & flanges, wippens, key bushing, backchecks, etc.
- Upright Regulation $65.00
  Troubleshooting, refelting, etc.
- Beginning Piano Tuning $55.00
- Grand Action Regulation $79.50
- Voicing $79.50
- Exploring the Accu-Tuner $55.00

VHS or Beta (213) 735-4595
Superior Instruction Tapes
2152 W. Washington Ave.
Los Angeles, CA 90018

FAZER PIANO

European Tradition, Quality And Styling ...At Asian Prices!

Fazer* is the only piano on the market today that offers the best in price, quality and performance. Consider: Langer 80 Action in some models ...replaceable cabinets — yes, even the sides — Roslau strings, solid copper wound by Fazer, and polyester finishes from Italy. If you sell pianos, write or call today for literature and information.


Langer 80 Action

Coast Wholesale Music — Div. of Kaman Corp.
1215 W. Walnut St., Compton, CA 90224
In U.S. 800-262-7873 — In CA 800-262-7826
Contact Mr. Bill Lanzendorf

Since 1897 *Pronounced "Faht-zer"

Index of Display Advertisers

OUR QUEST FOR EXCELLENCE SHALL NEVER CEASE.

Kawai KG-2 Grand Piano

For over sixty years, Kawai has maintained an uncompromising commitment to excellence.

Superior hand-craftsmanship and the most advanced piano technology are blended to create the number one selling grand piano in the world.

More symphonies, opera companies, universities and music educators proudly choose Kawai grand pianos. Discover for yourself why Kawai is the choice of those who know.

KAWAI
The Master Builder

Kawai America Corporation, 2055 E. University Dr., P.O. Box 9045, Compton, CA 90224-9045, (213) 631-1771

Tech Gazette

Yamaha Piano Service April, 1989

The Yamaha Piano Servicebond

In about 1962, Yamaha began the research necessary to create a piano service program unlike any other. The purpose was to devise a plan that would truly fit the technical needs of a new piano during the first year of use and the initial "settling in" process. The task of designing the contents was given to two US Technical Piano Consultants employed by Yamaha with the orders to simply: "Do it right!". With the exceptions of a few modifications, this program remains unchanged over the last 26 years.

Briefly, Yamaha recommends the following procedure:

First, each Yamaha piano is uncrated and "dealer prepped" to make sure it is in optimum condition. A "Servicebond Hang Tag" is attached to the piano to certify that the service was performed.

When the piano is sold, the warranty registration information is sent to Yamaha. Yamaha, in turn, sends each customer a "Thank You" letter with a request for comments on their new piano. Shortly after delivery, the piano is serviced in the customer's home.

After approximately 6 months, the piano is serviced a second time. At this time, the piano receives another tuning—plus a prescribed technical inspection and adjustment program.

What are the benefits of this unique program?

THE PIANO receives essential care and attention at the beginning of its life, and a **thorough** "CHECK-UP" after 6 months of use and "settling in".

THE CUSTOMER receives a piano in top condition, and has additional service performed at no extra cost.

THE DEALER AND SALES STAFF receive the assurance of customer satisfaction — the greatest source of referral sales.

YAMAHA receives valuable input in the form of feedback from the customer, dealer, and technician involved with every new Yamaha piano sold. This information is a major source of ongoing piano research and development, and a vital factor in improving Yamaha products to fulfill customer needs.

THE TECHNICIAN becomes associated with a manufacturer that truly believes in the need to properly care for a new piano, and even goes the "extra mile" to assist Yamaha Piano dealers in proving this service during the piano's first important year. It is an "Everybody Wins" program!

The YAMAHA PIANO SERVICEBOND PROGRAM is offered exclusively through authorized YAMAHA piano dealers.

Personnel Profiles

DEAN GARTEN

Dean was raised in Liberty, Missouri. Upon graduating from high school, he studied music at the University of Missouri, Kansas City and became involved in a career in piano technology. After 10 years of operating his own piano service business in the Kansas City area, he joined Yamaha in 1987 as a Technical Service Representative in the Piano Service Department.

Yamaha will participate in:

April 7-9:	Central West Regional Seminar Lincoln, NE
April 21-23:	Central East Spring Seminar Indianapolis, IN
May 4-7:	New England Regional Seminar Cromwell, CT
June 17-20:	Summer NAMM Chicago, IL
July 10-14:	32nd Annual PTG Convention Portland, OR

YAMAHA®