Piano Technicians Journal

January 1990

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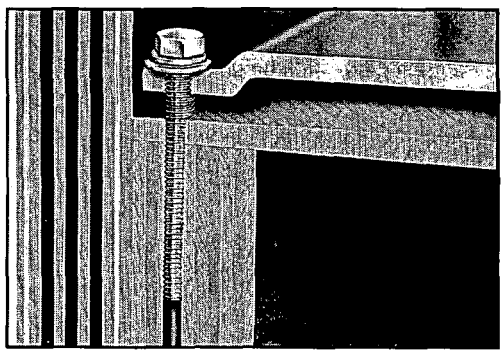
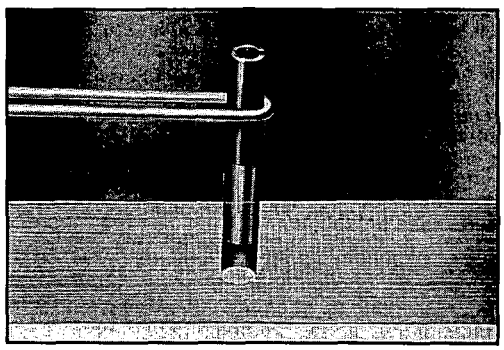
The precise setting of downbearing is extremely important to piano tone. Too much bearing inhibits tone because the soundboard cannot vibrate freely, while too little bearing does not provide good sound transmission. From our research we have developed a unique method of setting downbearing with a degree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

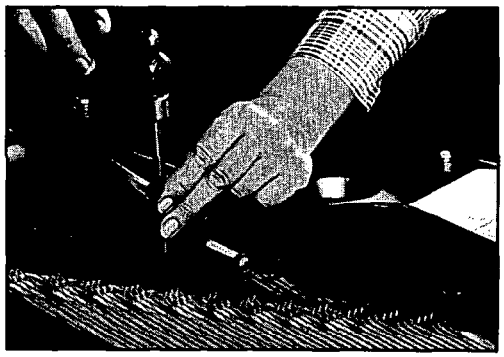
GRAND PLATE MOUNTING SYSTEM: Each mounting hole around the perimeter of the plate is threaded to accept a hardened steel bolt. This allows the plate to be set at the optimum height for bearing on the front side of the bridge (U.S. Pat. No. 3,437,000).



ACU-JUST™ HITCH PIN: Because this pin is installed vertically instead of at an angle, it is possible to raise or lower each string individually for ideal bearing on the back side of the bridge (U.S. Pat No. 3,478,635).



There are important advantages for the technician, too. If major soundboard or bridge work is ever needed, it is possible to remove the plate, pinblock, strings and tuning pins as a unit. Simply lower the tension, remove plate bolts and dampers, and hoist it out. Tiny adjustments in bearing can be made without unstringing the piano or even lowering the tension. Since such adjustments are not normally necessary in the field, they should only be made after consulting Baldwin Technical Service in Cincinnati. When restringing a section or an entire piano, contact Baldwin for the loan of special bearing-setting equipment.

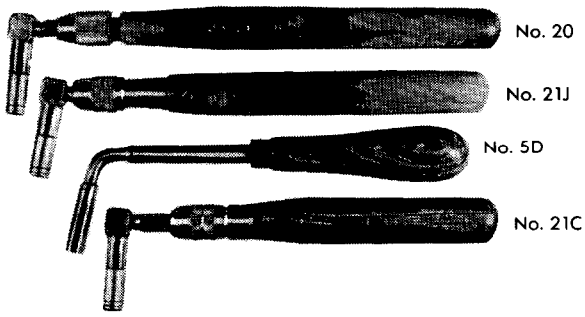


Second in a series of informative ads on piano tone published by Baldwin Piano & Organ Company exclusively for the benefit of piano technicians.

Baldwin. - *Leading the way through research*

For more information contact Kent Webb, Technical Service Manager; for parts contact Linda Gann, Baldwin Piano & Organ Company, Highway 63 South, Trumann, AR 72472 — Phone: (501) 483-6116

SCHAFF'S NEW TOOL EXPLOSION



HARDWOOD EXTENSION TUNING LEVER—Medium priced lever that measures 13" overall, having a 9½" wood handle. Chrome plated hexagon shaft extends to 18" long. Comes with our 1½" long No. 13B Head and No. 14B #2 Star Tip. Lever weighs 14 oz.

No. 20—Wood Extension Lever.

STATIONARY ROSEWOOD TUNING LEVER—This lever is modeled after the Yamaha type in design appearance. The overall length is 11½" which includes an 8" rosewood handle. Comes with a stainless steel collar and tuning head (our No. 13B) and No. 14B #2 Star tip. Net weight 1 pound.

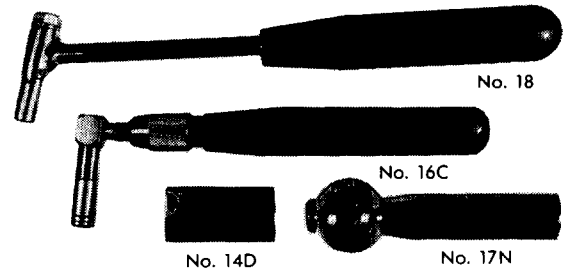
No. 21J—Stationary Rosewood Tuning Lever.

EUROPEAN TUNING LEVER—Imported from England to be used on 1/0 tuning pins that are in European pianos. Lever is all one piece measuring 10½" long with a 5" high gloss finish, hardwood handle. Shaft and head are polished steel. Choose from a star tip or square head. Weighs 9½ oz.

No. 5D—European Lever, Star Head.
No. 5E—European Lever, Square Head.

COMPACT, EXTENDABLE ROSEWOOD LEVER—Just like our famous Schaff No. 21 Lever as shown in the catalog, but it is much shorter, measuring only 10" overall with a 6" rosewood handle. Stainless steel hexagon shaft extends to 14½" long. Comes with No. 13B Head and No. 14B Tip. Weighs 1 Lb.

No. 21C—Compact Rosewood Lever.



PIANO FACTORY STYLE TUNING LEVER—Specifically designed by Schaff. 13" overall with an unbreakable 7" PVC plastic handle. Steel shaft is welded at the head for extra strength. Specially designed tuning tip is locked in position with machine screw and lock washer. Hardened tool steel tip will withstand stress and pounding to set and level tuning pins. Standard with a star tip but square tip available. Approximately 17° angle head. Weighs 14½ oz.

No. 18—Factory Tuning Lever.

COMPACT, EXTENDABLE NYLON TUNING LEVER—Overall length is 10", with the nylon handle being 6½". Hexagon, chrome plated shaft extends to 14". Comes with our No. 13B Head and No. 14B #2 Star Tip. Weighs 14½ oz.

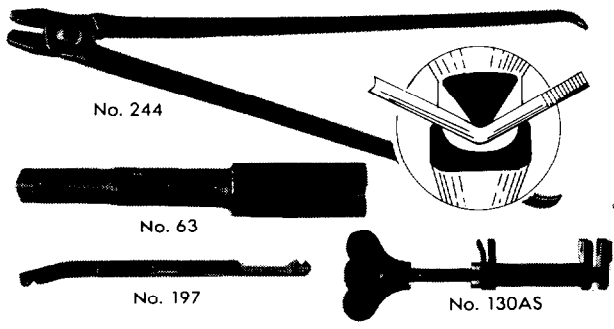
No. 16C—Compact Nylon Lever.

REPLACEMENT TIPS FOR FACTORY STYLE LEVER—These tuning lever tips can only be used with No. 18 Tuning Lever. Available either as a star or square type tip.

No. 14D—Factory Star Tip.
No. 14E—Factory Square Tip.

FENDON NARROW WALL TUNING TIP—A must tool for all piano tuners. Whenever tuning pins are too close together (as in the extreme treble of smaller size pianos) for a conventional sized tuning tip, use this narrow diameter Fendon tip. Comes 2½" long, chrome plated and will fit any Schaff tuning lever. Remember, this tip is not designed to take the stress for high tension notes in the bass and tenor sections of the piano. Use only where you have tuning pin clearance problems.

No. 17N—Fendon Tip.



POWER TUNING PIN SOCKET—Triangle shank on one end, star head on the other. Used for fast removal of tuning pins with a reversing power drill. 3½" long.

No. 63—Power Tuning Pin Socket.

FENDON GRAND AND UPRIGHT BACKCHECK BENDER—Through the help of a local piano technician, Tom Fendon, we have improved our regular grand backcheck wire bender to be dual-purpose. One side to bend the wires forward or backward on grands, the other for uprights. The upright end is notched out for access around the bridle wires. Nickel plated, 6½" long.

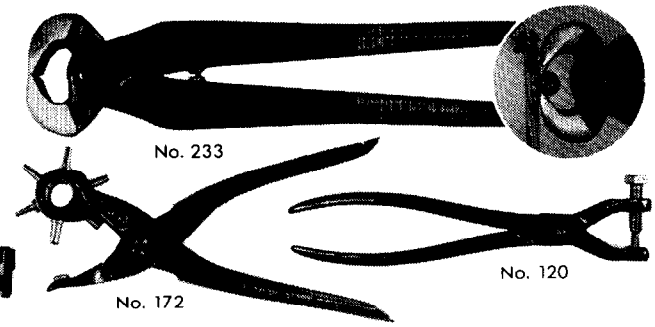
No. 197—Fendon Backcheck Bender.

HAMMER HEAD EXTRACTOR FOR SPINET PIANOS—As a complement to our regular type No. 130A Extractor, this tool is used only on certain spinet pianos where there is a short distance between the hammer butt and hammer head. Use with our No. 130B Clamp for broken hammer shanks.

No. 130AS—Spinet Extractor.

REVOLVING PUNCH PLIERS—Used for punching round holes in leather, plastic, rubber, canvas, cardboard and similar material. Made of steel with 6 tapered, non-clogging hardened steel punches in the following sizes: 5/64, 3/32, 7/64, 1/8, 5/32 and 3/16 inches. Overall tool length is 9" with a weight of 8 oz.

No. 172—Revolving Punch Pliers.



GRAND HAMMER HEAD EXTRACTING PLIERS—By far and away the best tool available for removing grand hammer heads from their shanks. Pliers are made from casted magnesian bronze and are chrome plated. Adjustable screw has a finders point to prevent slippage during hammer head extraction. Overall length is 8", weight 10 oz.

No. 120—Grand Hammer Extracting Pliers.

ORIGINAL FACTORY TYPE WIRE BENDING PLIERS—At long last, after a year in developing, this pre-World War I wire bending plier is now available. By a new method of casting we have had a mold built and can now duplicate the original design that proved so successful in the past. You can be sure that there is nothing on the world market that comes close to duplicating this plier. Made of stainless steel, measuring 9" long, the plier weighs only 9½ oz.

No. 244—Original Wire Bending Pliers.

GRAND KNUCKLE EXTRACTING PLIERS—One of the most ingenious ideas we have seen for solving an age old problem of removing knuckles from grand hammer shanks. As the insert picture shows, simply grab the knuckle and gently squeeze the pliers. This tool is a standard heavy duty cutting nipper made from a drop forged casting, has a polished head and red enameled handles. Overall length 10½", weight 1 Lb. 3 oz.

No. 233—Knuckle Extracting Pliers.

Write or refer to our current list for prices.

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PIANO TECHNICIANS
Journal

JANUARY 1990 — VOLUME 33, NUMBER 1 OFFICIAL PUBLICATION OF THE PIANO TECHNICIANS GUILD, INC.

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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.

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In fact, our course is the only one of its type: With video cassette tuning, repairing and regulating training including instructors like George Defebaugh and Jim Coleman. With more training material than has ever been offered in any home study course before.

One intermediate student says "Thanks for the goods, especially the lessons. You have done a first-class job of preparing this material. It is very professionally done. The best part is that it is extremely clear, quite concise and very understandable. It is definitely worth the money." Clyde Sayler, Associate Member, McMinnville, OR

See us at the California State Convention in Irvine, Feb. 16-18.

Call or write for additional information:
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President's Message

Realizing The Value Of Our Volunteers

Ronald L. Berry, RTT
President

My wife, Julie recently ran a seminar for another organization we are involved in. This seminar had about 500 people attend for a day with 28 different classes, so the work involved in arranging it was extensive. This seminar had been run by someone else for several years past, and she had done it as a volunteer. This year they moved the seminar to Indianapolis and decided to pay the coordinator for the work. Julie would have done it as a volunteer, but they had decided to pay her for the work. They had reached the point where there were not enough volunteers to do the seminar without sweetening the deal with money. Why do I bring this up? To help us realize the value of our volunteers. As people are getting busier with their personal lives, many organizations are finding it necessary to pay people to do what has been done by volunteers. However, most organizations are not like PTG. PTG has a firm base of people who are long-time members and give on a long-term basis. Since they received much from PTG, they are happy to give back to the organization. I can only think of one or two people I know who were committed piano technicians, who have quit the Guild and gone into some other type of work. With this other organization, most people are members for only a few years then move on. With PTG there are those who are in it to learn the craft and get what they can, and there are the old-timers who stay around to teach. This other organization has few old timers and the new people have an attitude of "I'm willing to pay for information, but don't ask me to get involved."

Most PTG members are do-it-yourself types who would rather do things their own way and know it is done right. Our Council session is proof that members want to be involved and most are prepared to fight to have it their own way. Our convention is another example. There is always a backlog of people wanting to teach even though there is no pay involved. The fact that the convention is so much a volunteer effort made it possible for us to have a successful convention after our change to captive staff including two people who had never been to a convention. Seminars and chapter activities require a great deal of volunteer effort and we seem to have little trouble finding people who are willing to take on the jobs.

The dedication of our volunteers is something very valuable to us. I hope we never get to the point, like so many associations, that we let a paid staff do all the work and sit back waiting for them to suggest things to do. An organization will always meet its members' needs better when the members are involved in running the organization.

The luxurious Irvine Hilton Hotel and Towers, is the site of the California State Piano Technicians Convention and Institute. The date to mark on your calendar is Friday through Sunday, February 16-18, 1990!

For those registered at the hotel, there will be special "hands-on" *bonus* classes Friday afternoon, beginning at 1 p.m. Other highlights will include 18 instructors presenting seminar classes Saturday and Sunday, seven of which are brand new. The exhibit hall will be well represented, with more than 20 companies displaying their products. A sumptuous banquet, auxiliary tours, reasonable room rates, and a pool, gym and jacuzzi will make your stay most enjoyable. See you *there*.

To register, contact: Paul Monroe, 5200 Irvine Blvd., Sp. 310, Irvine, CA 92720.

Young Chang has given service a good name: Alan Vincent.

If you have any questions about Young Chang pianos, feel free to call Alan Vincent, our Director of Technical Services. He's been around the industry for years working in the technical service departments of other major manufacturers before joining our family. And, because he personally oversees the servicing of all Young Chang artist instruments, he knows what you face in your daily rounds.

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To get your free copy of Young Chang's full service guide, write to Alan at Young Chang America, 13336 Alondra Blvd., Cerritos, CA 90701. Or call him at (213) 926-3200. And find out for yourself why we're so pleased to have Alan represent us.

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FROM THE HOME OFFICE

Welcome To The '90s

Larry Goldsmith
Executive Director

As we move into the final decade of this century, it behooves us to keep a weather eye on the next one. What will the '90s and the new century bring us? It's anybody's guess, of course, but if the daily newspaper is a continuing source of amazement (Okay, nobody reads anymore. Make that "If the evening news is..."), my prediction is that you haven't seen anything yet.

Take fax machines and electronic mail, for example. They're changing the face of modern business. You scorn them. You say that more than 99 percent of business fax transmissions are unnecessary. You say that they're mostly used to fax carryout lunch orders to local restaurants, or to make senders (and recipients) feel important. You're right, of course. But you'll still get a fax at some point. You probably won't have a choice. It probably will be part of your new pocket telephone/computer/television/microwave.

You say you'll never get a computer because you're happy with your typewriter, adding machine and card files, and besides, you'll never understand them anyway? You'll get one. You may not recognize it as the box you've seen sitting on other people's desks. You may not have to spend a lot of time shopping for software or learning to use it like those people did, but you'll get one.

What about your business? Several trends seem to be converging here. As the international flow of information speeds up, as our values change, the business environment is becoming more competitive. In the 21st century, there will continue to be huge companies, according to a report by the World Future Society of Bethesda, MD, but their structure will be quite different.

As major firms trim the fat from their operations, the management pyramid will be flattened. Instead of half a dozen layers of middle management, they'll have one or two. Therefore, opportunities for advancement there will be fewer and more mid-level professionals, feeling the squeeze, will become entrepreneurs. Another point of view says that the mega-companies will have to become more entrepreuneurial themselves by decentralizing and setting up more flexible work teams.

Our workforce is aging rapidly. Trends toward more niche marketing and increasing specialization of our workforce seem likely to continue. In some areas, there are currently shortages of skilled office workers, a trend that probably will become more pronounced. Even for those who are not entrepreneurs, the workplace will assume a much more flexible structure as companies vie for relatively fewer skilled workers.

The global economy is changing. Not only is the term "superpower" beginning to sound hollow, but the entire nation-state economic structure is becoming weaker. The economic unification of Europe in 1992 threatens to make that combined economy the equal of any in the world. The eastern bloc is completely reinventing itself, and China, despite its current problems, will almost certainly become another major player in the world economic arena.

What can you do to keep up with trends? Here are some suggestions:

- Read a lot, and not just the evening paper. The number of specialized magazines and journals has increased dramatically in recent years. Try to pick those that focus on global issues. An evening in the periodicals section of any large library will broaden your horizons dramatically.
- Talk to smart people. It sounds ridiculously simple, but you can learn a lot by listening to people from other disciplines. Through their work, piano technicians have access to a wide range of people whose only common denominator is a presumed interest in music and the discretionary income to afford and maintain a piano. Good people to know.
- Listen to children. They're going to be running things before we know it, so their opinions, prejudices and lifestyles will have a lot to do with the quality of our future lives. Let's just hope they've all been taught the proper respect for age and experience.

PTG's Texas Roundup

Dallas 1990

Dick Bittinger
1990 Institute Director

Each year at the Thanksgiving season I like to take time to look back on the past and concentrate on the good things life has sent my way.

This year, because I am busy working on the 1990 Dallas Institute, I am very aware of the part that The Piano Technicians Guild has played in my life.

Without the help of chapter members, seminar and institute instructors I could never do the piano work that I am doing now. Is it enough to be grateful for all this? I don't think so. I think we need to say, "Thanks," and what better way than to write a thank you note!

I'm thankful for all the great instructors who unselfishly say, "Yes, I'd be happy to do a class." Yes, I'm very thankful to be a member of The Piano Technicians Guild, It's a unique organization. Where else are people so ready and willing to help each other?

Plan now to attend "PTG's Texas Roundup" and let us put our brand on you!

Downtown Dallas — A New Look

Fred Yonley
Dallas Chapter

Few American cities have changed as much in a 13-year period as Dallas has since our last National Convention here. The downtown skyline gives a hint of all that is new in Dallas. The sphere-topped Reunion Tower (1978) marks the sight of our 1990 National Convention at the adjacent Hyatt Regency Hotel (1978). Reunion Tower offers breathtaking views of the city from an observation level and a revolving restaurant. Within walking distance are historic buildings in the section of town known as the West End Historic District. Among these buildings are Union Station (once handling 100 trains daily), Old Dallas County Courthouse, and the John F. Kennedy Memorial. Another interesting part of downtown is the Arts District. The decision by the City Council in 1978 to concentrate new facilities for the arts in an eleven-block under-utilized area in the Northeast quadrant of the central business district has been a catalyst in the rejuvenation of downtown Dallas. The Dallas Museum of Art (1984), Trammell Crow Center (1984), and the Morton H. Myerson Symphony Center (1989) are some recently built facilities you may want to visit in the Arts District.

Various other new buildings with interesting architecture in the downtown and nearby areas include Eric Johnson Library (1982), First City Center (1983), Thanksgiving Tower (1983), Arco Tower (1983), First Interstate Bank Tower (1986), First Republic Bank Plaza (1985), Momentum Place (1987), Plaza of the Americas (1980), Texas Commerce Tower (1987), with its five story sky lobby, Anatole Hotel (1979) with its famous North Atrium, and Infomart (1985) the Nation's first computer marketing center. Various skyscrapers have been given face lifts in the last decade which adds to the ultra-modern flavor of this city's architecture. The Majestic Theater which was previously a site of vaudeville in the 1920s and later a movie theater has been remodeled into a spectacular Municipal Performance Hall after being donated to the city in 1977.

Costs Of Getting To The Job

Larry Caldwell
Economic Affairs Committee

The costs of operating a vehicle is a major expense in determining the cost of servicing a piano when travel is necessary to reach the customer's location. The initial cost of purchasing a vehicle seems to rise several hundred dollars each year. Insurance, vehicle registration, taxes, maintenance and fuel costs vary from one location to another. Have you ever stopped to think just what it actually costs to reach the customer's location? Not only do you have to figure your vehicle cost, but also the time it takes to get there and back.

First, let us consider the factors involved in operating a personal auto. The initial cost of purchase is of course the largest expense. Reasonably equipped standard automobile "sticker" price is about $15,000-$16,000.

Insurance rates vary as to your location. Rates are highest in New Jersey averaging about $1,000 per year in 1988.[1] The average cost of insurance comprehensive ($100 deductible) $102, collision ($250 deductible) $234, property damage and liability ($100,000, $300,000, $50,000) $309. These three total $645 for annual insurance costs. (Allow for increased insurance rates for business use.) If you carry lower deductibles, emergency road service, uninsured motorist, etc., your insurance costs increase accordingly.

Vehicle license, registration and property or use taxes also will vary as to location. The average nationally is $144 per year.[2]

My personal experience in license, registration and taxes varies from $40 in Boise, ID, to over $250 per year in Lincoln, NE, on a 1986 Oldsmobile.

Maintenance cost per year averages $285. Fuel cost (gasoline and oil) are $795. All above figures are calculated on a 4 year/60,000 mile cycle and a fuel cost of $1.059 per gallon charge for regular unleaded fuel.

Other costs that I have not included in the previous discussion are tires, depreciation and finance charges. However, if I add average annual total operating costs ($1,200) and average annual ownership costs ($3,395), I come up with $4,595. I divide this by 15,000 miles per year driven and I get average cost per mile of 30.6 cents. If you drive 20,000 miles per year the per mile cost drops to 27.4 cents.[2]

Let us say you have a customer 30 miles from your location. It takes at least one hour to drive there and back. You must decide what that hour is worth. Sixty miles times 30 cents per mile equals $18. If you tune two, three or four pianos that day in that location you can divide the travel costs among the number of customers which means at the very least figuring vehicle costs only adds $4.50 to the cost of servicing each piano. Remember that your per mile costs must be adjusted to allow for business insurance rates and registration, license and taxes in your area.

For comparison I checked with a local plumbing, heating and air conditioning business and found that they charge $20 per hour and 30 cents per mile to and from the job. Their trip charge for the above example would be $38.

You can figure your own driving cost by using the table below. I feel some further explanation is necessary to clarify how to use the table:

Gas And Oil — begin with a full tank of gasoline, record the mileage on the odometer each time you buy gasoline, note the number of gallons, how much you pay, and the odometer reading. Using an example of purchasing 26.4 gallons at the cost of $27.96, and driving 606 miles. Miles per gallon: 606 ÷ 26.4 = 23. Cost of gas per mile: $27.96 ÷ 606 = 4.6 cents. Figure oil consumption the same way. Remember to add the cost of every oil change.

License, Registration Fees, And Property Or Use Taxes — Record these as once-a-year costs. Do not include sales or excise taxes paid — they are part of the car's purchase price.

Depreciation — To calculate depreciation — take the difference between what you pay for your car and what you sell it for — subtract the projected trade in value of your car from its purchase price. Divide the difference by the number of years you plan to keep the car.[2]

Getting to the job is no small item in regard to time or expense especially in the area where I conduct business, but we can always enjoy the good life in Nebraska or anywhere we choose in harmony. ≡

1. "Car Care" Pg. 47
(*Black Enterprise*/November 1988)

2. "Your Driving Cost" 1989 Edition
AAA American Automobile Association,
8111 Gatehouse Road, Falls Church, VA 22047

Operating Costs (Yearly Totals)	Ownership Costs (Yearly Totals)
Gas & Oil per mile _____	Depreciation (Divide by number of years of car ownership) _____
Number of Miles Driven _____	Insurance _____
Cost per year (multiply miles driven by gas & oil per mile) _____	Taxes _____
Maintenance _____	License Registration _____
Tires _____	Finance Charge _____
Total Operating Cost (A) $ _____	Total Ownership Cost (B) $ _____
Other costs (car washes, repairs & accessories) (C) $ _____	
Total driving costs per year (Total A, B, C) $ _____	

THE TECHNICAL FORUM

'Dear Susan...'

Susan Graham
Technical Editor

Dear Susan,

My colleagues and I have recently discovered a problem which appears to defy logic. We hope we are not alone in the problem and that someone, somewhere has also discovered the problem and been able to come up with reasons and a solution.

According to rumor, German silver center pins operate with less friction and less need to overcome inertia than conventional brass center pins. Additionally, they are less prone to tarnishing. According to one source, German silver is composed of 15 percent nickel, 25 percent copper, and 60 percent zinc. I believe that these pins are actually ordinary brass pins that have been plated, much like the plate screws in many of today's pianos.

There appears to be a problem, though. We repin new parts because those we have received have generally flopped around because the centers were too loose. Our aim is to sufficiently ensure that a new set of hammers will be put on hammershanks whose flange tightnesses range from five to seven grams in the bass to one to two grams in the extreme treble. We occasionally do some reaming in this process, and we occasionally use alcohol and water to ease the tight ones. We have not used other liquids. The hammershanks we use are from Renner and Tokiwa.

Interestingly, wippen flanges do not seem to be affected. We suspect that the travel distance is too little to bring on the effects observed in hammershank flanges.

Typically, though not always, hammershanks newly repinned to provide about five grams or more of friction in the flange will tighten up shortly after being put into service. In some cases, we have taken shanks off the shelf and wiggled them only to see them go from five to ten grams of friction. Sometimes a very thin alcohol and water mixture (five percent water and 95 percent alcohol) will restore the parts to their previous looseness, although we have now discovered that over a period of hours, the problem will return, nullifying the previous effect of the alcohol solution.

Static electricity was presented as a possible culprit, but we have contacted physics and electroconductivity labs in the area, and have been repeatedly told that static electricity would be an improbable and nearly impossible culprit. This was our sole hope in finding an answer to this problem.

We have not employed the ironing technique, as we have seen that the effects of that treatment tend to be irreversible (meaning that unless you re-repin the bushing, the change becomes permanent), uncontrollable, and often exaggerated, the latter two defeating the purpose of the exercise.

Perhaps there is an obvious answer to what has evaded us. Assuming that there is, we hope someone will share it with us.

Ronald K. Torrella, Associate Piano Technician, University of Illinois

To respond to the final comment first, there is no obvious answer to the problems in action centers (or, if there is, it evades all of us, technicians and manufacturers alike). A multitude of factors make this so. This particular letter focuses on center pins as a possible culprit, so let's consider those pins and some of the questions about them.

In order to give a more informed answer, I consulted with Bob Beck, currently with American Piano Supply. Most of us know and respect Bob from his years in the piano industry, as a technician and working with several well-known manufacturers, both foreign and domestic. His experienced overview is invaluable in matters like these, and I appreciate him taking the time to share information with the *Journal*.

In almost all instances, center pins will be made of one of three possible compositions: solid brass, solid nickel brass, or plated. Brass is an alloy of copper and zinc: the proportions of each can be varied to produce characteristics for specific uses. The wire used to make center pins is usually 70 percent copper and 30 percent zinc. This is the solid brass pin: in a clean action center of good cloth, with other factors such as glue and wood movement under control, a clean brass pin works extremely well.

Nickel is added to the alloy to retard corrosion: this creates the alloy commonly called German silver. The proportion of nickel is not as high as suggested above, but is usually seven to nine percent. These pins also work extremely well, particularly when the same factors mentioned above are controlled. The added corrosion resistance from the nickel may be a benefit in particular situations of climate or chemical contamination.

Plated pins are more problematic. Plating is done to improve the appearance of the pin, and to try and improve resistance to corrosion. As many of us have witnessed, however, the plating wears through, often creating problems.

Before jumping in and exclaiming "Aha! Good center pins will solve all action center problems," keep in mind a few other considerations.

One is bushing cloth. Dyes used in manufacturing may contain acids, which may remain in the cloth and set up a corrosive reaction with the center pin. Many of us have seen instances where understring felt has reacted with piano wire due to the same cause: wire has rusted only where it contacts the felt. There was some thinking that this was due to the hygroscopic nature of felt (attracts and holds moisture) but it seems that acid left from the dyeing process is the main culprit. The same thing can occur in an action center. Particularly in the case of plated pins, with the thin layer of plating in contact with the felt,

the reaction between metal and compounds in the felt may be dramatic.

Bushing cloth is also abrasive. We use it to reduce friction between moving parts: keys, action centers, understring contacts, etc. Wool fibers are curly and hooked, however — they grab each other (which is what holds felt together) and they also grab at the center pin, creating some friction. This friction creates heat, bringing into play another factor. One eminent action manufacturer tried for a time to cycle all their action parts by creating machines which would "work" the parts before installation. After several hours on these machines, the action centers began to freeze up, becoming very stiff and resistant. It was determined that the heat generated by friction between pin and bushing under this heavy, constant use was softening the glue used to install the bushing. The glue was then wicking into the cloth, creating a gummy surface against the pin. This seems a likely culprit in the practice room phenomenon: pianos which start out with free centers but seize up after heavy use. Making a definitive diagnosis of this problem in the field can be difficult, however. It really is an area which must be controlled in manufacturing. Those who redo flange bushings, however, might be alerted to this possibility (use of hide glue — hot or cold — is preferred to aliphatic resin or other glues).

Graphite-treated bushing cloth creates more considerations. Graphite, too, while having lubricant qualities, also has galvanic properties which can make it corrosive. It "pools" — distributing itself unevenly where friction varies and will burn if attempt is made to heat-burnish the bushing to size it.

And then there's the machining and behavior of wood to consider.... Those who remember the discussion about balance rail holes in keys recall that a hole in a piece of wood shrinks as the entire piece dries out and becomes smaller. It may or may not temporarily become even smaller when moisture is introduced, and eventually will become larger as the piece expands with moisture. Where wood is in direct contact with metal, this can eventually lead to crushing of wood fibers and looseness of fit. In the short term, it can be responsible for either loose or tight centers. The bushing cloth does give us a little grace, since it has some "give" to respond to such changes and permit the center to continue to work (although the cloth itself responds to changes in humidity as well). Clearly, the better-seasoned and manufactured the wood parts, the better the chances of a well-performing action center. Just as clearly, however, the best action parts in the world are going to react adversely to extremes of climate.

With these three materials: metal, felt, and wood, in such close proximity, the potential exists for all sorts of chemical as well as mechanical reactions. Acid in felt, composition of plating, chemicals in the wood and so forth... again, factors which really can only be effectively controlled in manufacturing.

This should make us all think twice about addding more chemicals to action centers. Who knows what little corrosive monsters are just waiting for the right catalyst? The ideal center, as Bob Beck states, is a clean, solid metal (brass or nickel brass) pin, straight, undamaged, in a clean felt bushing in a well-manufactured wood part. These other factors emphasise the point that, before treating action center problems, an attempt should be made to determine the cause. We want the treatment to be effective and appropriate, and not to set up any adverse reactions or future problems, many of which are not within our realm to detect or control.

It seems to me that doing as little as possible is usually best. Repinning — altering the mechanical fit of pin to bushing, and insuring installation of a good pin — may be the safest, but it can be extremely time consuming. Of the chemical treatments, alcohol and water seems the most innocuous. According to Peter Van Stratum at Charles House felt manufacturers, wetting the action center will relax the fibers in the felt: it does not shrink them but sizes them around the pin. It can be done with alcohol alone (methanol or ethanol, not isopropyl, which usually contains oils and perfumes), or with the addition of a very slight amount of water (no more than one part water to six parts alcohol) and a crumb of ivory soap as a wetting agent. Wet the bushing sparingly (don't soak the action parts) and apply gentle heat from a hairdryer, working the parts as you do. As soon as the initial tightening begins to ease, quit heating and allow the parts to airdry.

Other chemicals used in treatment of action centers are cleaners and lubricants. Renuzit or a similar product designed for home dry cleaning (or naphtha) can be used to clean action centers which are sluggish due to corrosion (notably the older Steinway verdigris problem) although it is usually a temporary fix. Silicone oil is used as a lubricant: this is a product specifically made for piano use, available from Yamaha or Wurlitzer and is mixed with VMP naphtha. It was designed for use in actions which were mechanically fit correctly but still sluggish (probably due to some reaction between the cloth and the pin). The main disadvantages to its use is that it will not correct a tight mechanical fit, as will alcohol and water (in conjunction with heat); it also "waterproofs" the bushing, so that no other treatment can penetrate (rumor has it that it is sometimes used in manufacturing action centers for this purpose). it would also seem that application of silicone precludes any rebushing in the future, since the gluing surface is bound to be contaminated.

I do not have good luck with the "zapper" treatment, finding it very inclined to scorch the birdseye. I've also had only minimal success with vaporizing verdigris with a soldering iron tip ground to a fine point, finding it time consuming and also difficult to control.

This seems to bring us back to the point which has been made before about action centers: they can be very tricky, and the more techniques in your working arsenal, the better the chances of success. I hope this has at least answered a few questions about one aspect — the pin.

The Forum continues with a response to Ken Sloane's article on lengthening hammer tails to cure faulty repetition in new Steinway actions. The author has requested anonymity, although I can report that the source is another experienced and trustworthy technician.

For three years now I have been observing the same problems wth repetition in new Steinways that Ken Sloane describes in his article in the October 1989 Journal. *Although Ken seems to feel that this may be an isolated manufacturing problem, my experience is that these repetition problems occur in every new Steinway B I have seen. (I have not seen a new D.) Like Ken, I checked and corrected all friction possibilities, regulated these problem notes to within a gnat's*

eyebrow, and still had poor repetition. I had also observed that the repetition problems only seemed to persist in the new B models; the new S, M, and L models exhibited no unusual or intractable repetition problems. Although my experience with new Hamburg Steinways is limited, they do not seem to have this repetition problem.

I began considering the differences between the two largest models and the three smaller models. The most obvious was the fact that the B and D models are now fitted with Renner action parts, whereas the smaller pianos still use all American-made parts. But wait a minute: are the B and D models really outfitted completely with Renner parts? While the shanks and flanges and wippens are made by Renner, the hammers are not: the New York hammer is still used. The important difference between the New York hammer and the hammer that Renner makes for use in the Hamburg Steinway is that the Renner hammer is heavier. Since I was suspicious of the hybrid nature of the new B and D models, I focused on the hammer weight/repetition spring relationship.

I discovered that by installing a treble wippen underneath one of the troublesome low tenor hammers, I could get positive jack return, which in turn leads to good repetition. Then I got out my micrometer and measured the diameter of the repetition springs in a variety of Steinway wippens. To make a long story short, the diameter of the repetition spring wire in the wippens of both old and new American Steinway parts is smaller than the wire used in the repetition springs of new Renner parts. (Renner: .039, .037, .035, .033; 1927 American B: .036, .035, .032; New American: .035, .032.) This undoubtedly due to the fact that the Renner wippens were designed for a heavier hammer. (For the uninitiated, the diameter of the repetition spring should be mated to the weight of the hammer, which is why the spring size is graduated from bass to treble in all quality grand actions.)

In his article, Ken Sloane refers to what I believe to be the solution to the repetition problems. In the second paragraph of the article he acknowledges that downweight is increased because he added more material to the hammer; at the top of page 25 he mentions pinning problems and how a hammer that weighs too little may cause the repetition spring to have to be weakened to the point of compromising jack return. Once Ken added material to the hammers, he undoubtedly had to strengthen the repetition springs, thereby improving jack return. Although Ken's idea of checking the hammers closer to the strings has validity, his satisfactory results may also have been due in part to inadvertantly fiddling with one part of the hammer weight/repetition spring diameter equation.

Although one solution would be to increase hammer weight, the easier way is to install new, smaller diameter repetition springs throughout the action. This is accomplished by ordering a set of American repetition springs from Steinway. Since there are four sizes of Renner springs but only two sizes of replacement American springs, the largest Renner springs were replaced with the largest American springs: all of the rest of the wippens get the smaller new spring. I found it was also important to have the jack be as free as possible, so in addition to replacing the repetition springs I repinned the jacks, all of which were pinned too tightly (eight to 10 grams). The results were snappy jack return and good repetition.

It may seem puzzling — it was to me at first — that in order to get better repetition (or any at all, in this case) smaller gauge and not heavier gauge repetition springs must be used. Given two wippens with different diameter repetition springs, they both can be adjusted to the same speed of rise on release. The two springs therefore can be said to be equal in tension at the point when rise begins. But if they are equal in tension when rise begins, aren't they also equally supporting the weight of the hammer assembly when in rest position? Most definitely not! To show how this is the case, we only have to see how the parts work together. When we regulate repetition spring tension, we use only one standard: the speed of the hammer rise. We forget that we don't commonly measure what happens to the other half of the repetition spring, namely its effect on the jack. There are two clues when the wippen has a spring with inadequate tension at rest. The first is that you have to set the repetition lever height so that there is quite a large gap between the top of the jack and the lever if you want to get the jack to return when you wink the jack. The second clue is a little harder to notice because the parts are in the way. Follow as best you can the complete return of the jack to rest after it checks. Rise on release is completed when the repetition lever rises to touch the drop screw. As you continue to release the key you should notice that at the instant the lever returns to rest and hence leaves the drop screw when the jack should snap back under the knuckle. When the spring is not strong enough at its rest position, the jack doesn't return until some time after the lever has left the drop screw, that is, if it ever does return. Our wippen with the smaller diameter spring lets the parts work as designed. When the spring is under higher tension at its rest position, the repetition lever can more easily return under the knuckle. The earlier the jack can return under the knuckle, the faster the repetition will be.

The above solution has several advantages over lengthening hammer tails. It is less invasive, reversible, and suitable for on-the-spot repairs as well as wholesale part replacement. I believe this is the most practical solution to Steinway repetition problems for the average technician.

Many of us are finding cyanoacrylate glues (CA or super glues) to be increasingly useful and occasionally even miraculous as we become more familiar with them. Here is one of what will be many suggestions for their use. I recommend an article entitled "Secrets of the Superglues" which appeared in the February 1989 issue of *Popular Science*. (We are working to obtain permission to reprint in the *Journal*.) I can add a few comments at this time. The first is to reiterate the safety precaution: have the release agent *at hand* (within reach) whenever you use these glues. Don't wait until you've glued yourself to a bench top and had to wait all day for your loving spouse to come home and rescue you to develop the habit of taking out the release along with the bottle of glue. Another word regards the accelerator. It is a fluorocarbon — a chemical with hazards both to the body and to the environment (see below). Its use with the glues makes them so versatile it is difficult to shun, but please be sparing with it, and careful about fumes, skin contact, etc. By the way, Ed Dryburgh (an RTT who is also one source for the Satellite City products) passes on the handy suggestion that one reason for the chronic clogged cap on the super glue is our inclination to let the accelerator mist drift across the bottle of glue as it sits on the bench after application. Cap the bottle or move it out of the way before spraying the accelerator. Ed also suggests using the fine tubing available, cutting off the cap so the tubing fits tightly and pulling through a short length which serves as a renewable spout.

Dear Susan:

To those technicians who have been using epoxy in bridge repair work, I would like to suggest the use of a different product. I had used epoxy for many years myself, but now find that the relatively new cyanoacrylate glues are superior. First, this glue is much faster to use. No mixing is required; you use the material directly as it comes from the bottle. Also, the bridge pins do not need to be removed. The glue is applied directly on the bridge with the pins in place. Secondly, garnered from personal experience, I believe it is stronger than epoxy.

This glue comes in different viscosities from very thin to syrupy. The brand I prefer is called "Hot Stuff" and is distributed by Satellite City, P.O. Box 836, Simi, CA 93062; (805) 522-0062. See Figure 1.

The strings still need to be removed, of course. Then push the bridge pins and remaining wood back to their original positions. I apply the thin glue first; it has very deep penetration. Then I follow that with an application of thick glue (Hot Stuff Super T-Gap Filling) which replaces any lost wood and fills depressions. The glue sets in just a few minutes, but for really fast action (seconds) an accelerator can be sprayed on. In case you get any glue on your fingers, which you are warned against, a de-bonder is available.

Overnight drying is recommended. However, I repaired a bass bridge using the accelerator and put the strings back on immediately. After several months the bridge pins are still holding like new.

There are many, many uses for this new glue in addition to its use on bridges. The technician who wrote concerning a problem with tuning pin bushings that moved with the tuning pin could have solved this with a drop of Hot Stuff placed between the wooden bushing and the plate. Its great for a quick repair of a music rack that is broken at the screw hole. This glue works on almost anything; wood, metal, plastic or rubber and is available at hobby shops or woodworking stores.

Dennis E. Kurk
Twin Cities Chapter

To continue our discussion of safety and consciousness about the materials we use:

Dear Ms. Graham:

As a piano technician who also holds a masters degree in Environmental Science, I was surprised and concerned to see the use of Freon recommended in your Technical Forum column (July 1989). While freezing plastic elbows may indeed simplify their removal by causing them to shatter easily with slight pressure, environmental concerns should be considered as well.

Freon belongs to a class of chemicals know as chlorofluorocarbons (CFCs), which are the "bad guys" attacking the earth's ozone shield. Although the United States banned the use of nearly all CFC propellant products in 1978, loopholes in the law have, as Mr. Chambers pointed out in your column, allowed certain non-essential use of these chemicals to continue. While a concerted global attack on the use of Freon and related chemicals is being negotiated and implicated, individuals should evaluate their own responsibility in this matter. Personally, I'll stick to the more tedious and traditional way of removing plastic elbows with pliers.

Kathy Detweiler,
Philadelphia Chapter

Dear Susan:

There was a reader tip regarding the use of a Halon gas fire extinguisher in the home. The Halon as itself is harmless, but when used to put out a fire, the gas is transformed into a toxic compound, which, in an enclosed space such as a room, can be dangerous if inhaled in any concentration.

Therefore it is imperative to evacuate and ventilate the room as soon as one can after having put out a fire with Halon.

There also was a tip concerning the use of short bursts of Freon to "freeze" the remnants of old plastic elbows, to ease the removal of them. Freon contains a high percentage of chlorofluorocarbons, (CFCs). CFCs are known to weaken the Earth's ozone layer.

As such I would like to suggest that one think over one's priorities and the possible consequences before unnecessarily liberating CFCs into the atmosphere.

Mark Mestman
Sacramento Valley Chapter

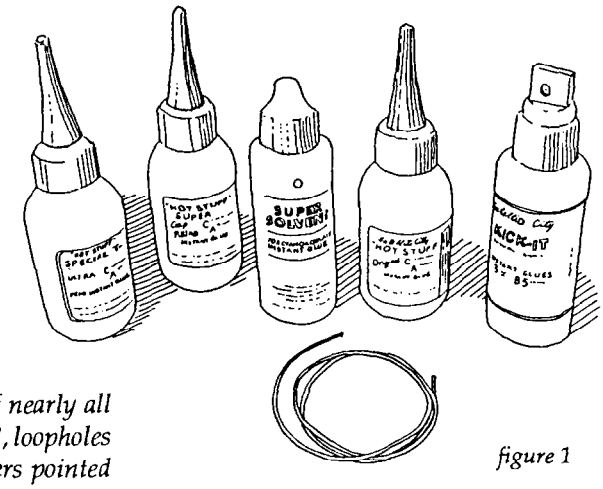


figure 1

When is a Phillips screw not a Phillips screw? When it is a Pozidriv (no, he wasn't a Russian composer of rather relentless string quartets). Pozidriv is a Phillips-like configuration of screw and driver with auxiliary vanes between the main blades for an extremely secure fit (particularly useful for powerdriven insertion/extraction). Figure 2A is a Pozidriv bit; 2B is a conventional Phillips).My thanks to Doug Wood, who supplied the bit and sample screw illustrated and the accompanying text:

Dear Susan:

I finally found a Pozidriv tip for my cordless screwdriver. I am astonished, and even appalled, at the lack of awareness of this screw drive system. The folks at Steinway had no idea that their action screws are of this type. Ditto those I talked with from Kimball (see their new grands!). Technicians generally look askance when I mention it. I have even found ignorance at several of the large screw suppliers here in Seattle. So perhaps you could make mention of Pozidriv in the Journal. *As you can see, a Phillips driver is a miserable tool in this screw, and vice versa. With the proper driver, the Pozidriv screws are, I find, much nicer than Phillips. Note that the easiest way to visually identify these screws is the hatch marks in the recess corners. There are corresponding ridges on the screwdriver tip.*

Of course finding the proper driver is another matter. I have found the one inch bits for magnetic multi-tip screwdrivers in many sets of bits. Regular screwdrivers I have found only at Snap-On (around $15.00) and Renner ($65.00 or so — ouch!). The enclosed two inch bit was at a local hardware/swap shop that has one or more of most everything.

Doug Wood, Seattle Chapter

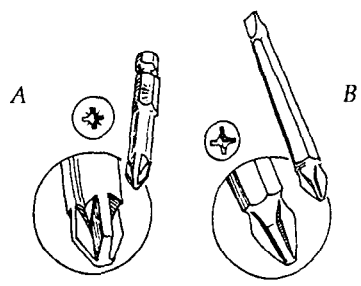
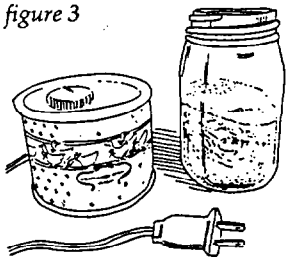


figure 2

figure 3



Finally, I received the following from one of our eminent research engineer/technicians:

Dear Susan,

I just discovered that K-Mart is now selling one of the best bargains of all time in Designer glue pots. Actually, I'm not sure they are aware of doing us piano technicians such a great favor. I think they think they are selling "Potpourri Crocks."

I picked up one of these little jewels the other day, plugged it in and measured the temperature after a suitable length of time and, guess what, it tested out right at 145° F. I suspect, though, that the temperature is not actually regulated, so before using one for a glue pot, it might be a good idea to check the temperature — any kitchen candy thermometer will be accurate enough. I suspect that the temperature of each unit is dependent on the consistency of the heating element wrapped around the ceramic crock.

The pot I purchased is a Rival Model 3206/1 and is rated at 35 watts. It holds about one cup of glue comfortably (just right for those smaller jobs) and looks much nicer than those old industrial strength glue pots I've been using. If you're handy with a lathe, you can make a nice lid for it. If not, you're on your own.

There isn't really much to wear out on this thing since it seems to be unencumbered with anything resembling a thermostat. I have found though that ceramic, even glazed ceramic, doesn't stand up all that well when fed a steady diet of animal hide glue. Oh, well, for $9.50, I'll just get another one when this one wears out in two or three years.

Delwin Fandrich

Memphis Chapter

Now listen. We are trying to run a serious technical magazine here! Of course, I couldn't resist and ran right out and bought one of these little dears. Del is correct about the temperature variation — my first one was a little too cool, but I just took it back complaining that it didn't seem to get hot enough (without specifying for what). I do think the ducks are a rather cheery touch around the shop....

Until next time.

TUNING UP

Pitch

Rick Baldassin
Tuning Editor

This month, we have a letter from Mike Osterberg, RTT, of Kearney, NE. Mike writes:

I have been tuning aurally ever since the beginning of my tuning career, using an A440 fork. Recently, I took out my C523.3 fork and have used it, along with a few different temperament themes, with positive results. I urge my colleagues to try different temperaments and/or tuning forks. In my case, it has really helped me to listen for different aspects of temperament that my usual temperament did not show.

Since we strive for A4 to be exactly 440 hertz, should we compensate for inharmonicity and sharpen our C forks, say 1/4 to 1/2 cent? I sharpened my C fork to a very slow roll sharp on a Sanderson Accu-Tuner set to C5, 0.0 cents, and this seemed to match it up quite well in the average piano when I compare A4 with the A fork, after the temperament is set. What is your suggestion as far as sharpening the C fork?

Mike is quite right in noting that because of inharmonicity in the piano, if A4 is tuned to 440 hz, C5 will be sharp of 523.3 hz. But by how much? This, of course, is going to vary from piano to piano, because the amount of inharmonicity varies. The only sure way to tune A4 at 440 hz is to use a pitch source for 440 hz, and tune A4 to it. Anything else is a stab in the dark. Sharpening the C fork could, of course, make the stab less painful.

Looking at the data which Dr. Sanderson sent to me some time ago, I find that for a piano with a 6.0 stretch number, C5 winds up being tuned 0.8 cents sharp. Dr. Sanderson explained that for a piano with a 3.0 stretch number, C5 would be 0.4 cents sharp. Since the stretch number is half, the amount sharp would be half. Following this logic, a piano with an 8.0 stretch number would place C5 at 1.0 cents sharp. Since the practical range of stretch numbers is from 3 to 8 cents, C5 could be anywhere from 0.4 to 1.0 cents sharp. That is the easy part. If all we had to worry about was how sharp C5 had to be, to leave A4 at 440 hz, the job would not be so bad. But the task becomes very complicated, as we shall see.

The real question is how many steps are there between the tuning of C5 and A4? If we follow William Braid White's sequence, there are at least six steps from the time C5 is tuned until A4 is tuned:

Step 1 - Tune C5 to fork.
Step 2 - Tune C4 to C5.
Step 3 - Tune G3 to C4.
Step 4 - Tune D4 to G3.
Step 5 - Tune A3 to D4.
Step 6 - Tune A4 to A3.

Because of this, we have a much greater chance for error in tuning A4 at precisely 440 hz, even if we correctly compensate for the amount of sharpness necessary at C5. I know that there are many other sequences possible, but the fact remains that the most accurate way is to start with A4.

I believe that Mike is correct in stating that different systems show things in a different light, and that we would all be well to acquaint ourselves with as many systems as possible. I see no way, however, in starting from C5 and having A4 tuned to 440 hz.

In many cases, it is not necessary to have A tuned precisely to 440, in which case the C fork might be acceptable. Not striving for perfection, but only to pass the PTG tuning exam can be perilous using the C fork. Assuming that we have not sharpened our C fork, we will likely be off by about 0.8 cents. Two of the six intervals tuned are octaves, and with octaves, one cent stretch deviations would not be uncommon. So far, we have the potential of being off by 2.8 cents. This being the case, even if the remaining four notes are only off by 0.1 cents, we will still have failed the exam, being 3.2 cents off, the maximum being 3.0 cents to score 80 percent. For this reason, I recommend using an *accurate* A440 pitch source when taking the exam.

This being the case, how do we then use these temperament systems which were designed to start from C? One simple way would be by transposition. Instead of tuning an F to F temperament starting from C, we would tune a D to D temperament starting from A. In many cases, however, this would put us into the wound strings, which is very undesireable. In addition, the beat rates for all of the intervals would change. Another possibility would be to go into the temperament sequence, and start on A instead of C, working backward through the sequence from A to C, then forward in the sequence from A to the end. Following this procedure, Braid White's temperament would look like this:

Step 1 - Tune A4 to fork.
Step 2 - Tune A3 to A4.
Step 3 - Tune D4 to A3.
Step 4 - Tune G3 to D4.
Step 5 - Tune C4 to G3.

Braid White's procedure could then be followed as the original from A3 forward. In a sequence of fourths and fifths, it doesn't really matter much where you start. Starting from A in this manner has the advantage that the temperament octave would remain the same, which would not be the case if we had transposed the temperament.

There have been many temperament sequences published which do start from A, and I would suggest becoming familiar with many of these. It seems that most of the historical temperaments did start from C, and that A would almost never be at 440. The only consolation would be that an instrument tuned to

one of these historical temperaments would seldom be required to be precisely at A440.

In conclusion, the only way to tune from a C fork and leave A at 440 is by accident. It is much more safe and reliable to start from an A fork (or other A440 pitch source), and alter the sequence to suit. Though sharpening the C fork by 0.5 to 1.0 cents might help, the number of steps involved in getting from C to A makes the job of getting to 440 very difficult. For some situations it could be said that with a C fork one can get close enough, but I would not count the tuning exam as one of these.

Much of this month's column has been devoted to the subject of pitch. In the third part of his series, Michael Travis also adresses the subject of pitch. I think you will find it most interesting. Until next month, please send your questions and comments to:

Rick Baldassin
Tuning Editor
2684 W. 220 North
Provo, UT 84601

'Acoustics, What's Acoustics?'

Norman Neblett
Los Angeles Chapter

The late world-renowned cellist, Gregor Piatagorsky, was once cornered at a party by an engineer discussing acoustics. Annoyed by this boring man and wishing to join his other friends, he replied, "Acoustics, what's acoustics? Good acoustics is a full house."

This may be an over-simplification of sound phenomena, but acoustics play an important part in the work of concert technicians. When there is a complaint about the sound of a piano, we are often tempted to make major changes in the voicing, especially if the pianist is upset. In most cases, this is a grave mistake, especially if we have used the same piano with success for other artists.

A pianist is influenced by the sound he perceives in the hall and by his ability to technically control the keyboard. The latter is usually a function of good regulation.

Today was case in point. One of the younger gifted pianists, Jeffrey Kahane, arrived at El Camino College, to try the piano and rehearse for his concert tomorrow night. When I arrived home, a call was waiting to talk to him. Our conversation concerned the lack of projection of the tone, in general, and the dullness of the sound from C40 to C76. In this case, it is wise to make an appearance, even though Mr. Kahane spoke about it being an imposition. Please never forget that this is a service business, and that we are the one who is serving. The financial aspects have no priority at a time like this.

At first, it appeared that the stage sounded dull and that the sound was good in the hall. This proved to be incorrect, as I asked Kahane to listen in the audience as I played. We both agreed that the piano did not project. "Could you file the hammers?" he asked. "Yes," I replied. "Would that help?" he inquired. "Maybe," I responded.

As he sat there playing in front of the Wenger acoustic baffle, the big light came on. I asked, "Would it disturb you if we moved the piano closer to the baffle?" He replied, "Not at all." The stage manager moved it in about two feet. Suddenly Kahane smiled as he played, and it was obvious in the hall that a big change had taken place. It was simply a case where the carrying power of the piano was not being reflected into the hall, but projecting upward into the loft. This is often a problem when playing with orchestra, as there is no baffle behind the piano. However, proper placement of the instrument often indicates positioning it out on the apron, close to the edge. This usually works, and prevents the orchestra from overpowering the piano.

Kahane then stated that the piano was out of tune. "It will be tuned for your concert tomorrow, twice if necessary," I replied. "Will you make any major changes?" he asked. "Only if you are able to come back and evaluate them," I responded. He indicated that he did not want to do that on performance day, so I assured him that no major changes would be made, and that I looked forward to hearing him play tomorrow. "Oh, are you coming?" he asked. "I would not miss it," I replied. With that, he left the stage.

Listening to the performance convinced me that this man is a great artist. In my opinion, he will one day be recognized as one of the premier pianists of the world. From my standpoint, he is a very agreeable person, and appreciates the work of the piano technician. So, colleagues, look forward to servicing his pianos.

Many Musicians Make A Pitch For Lower Tuning

Stephen Wigler
Baltimore Sun **Music Critic**

Editor's Note: The following appeared originally in the Baltimore Sun, *September 24, 1989. It deals with the subject of rising musical pitch. ©1989, The Baltimore Sun Co.*

Music's high notes have never been higher.

When the thoroughly modern Baltimore Symphony Orchestra tunes up Thursday in Meyerhoff Hall, the players will make sure their instruments play an A at 440 cycles per second. That's much higher than the A that Pro Musica Rara, which strives for historical authenticity, will tune to this afternoon before its performance in the Baltimore Museum of Art. Pro Musica Rara's A will be 415 — a half step below the BSO's A or a modern A-flat, the note below A on the piano.

In other places, the diversity is even wider: A is 442 at the New York Philharmonic and Boston Symphony; it is 447 at the Vienna and Berlin Philharmonics; and in Paris, A is rumored to be ascending past 450. And the differences drive some musicians — particularly woodwind players and singers — to distraction.

A note's cycles per second or hertz (the scientific term, abbreviated Hz) are simply the number of waves — really ripples in the air — that playing each note creates each second. Those ripples make our eardrums vibrate, and we experience the vibrations as sound....

We experience a higher pitch — such as the A the BSO tunes to — as more brilliant and penetrating; a lower one — such as that of Pro Musica Rara — sounds more mellow and resonant.

In a century that seeks ever greater brilliance, the ascent of pitch periodically has caused controversy. Earlier this year in Italy, a bill was introduced by opera-loving legislators to return A to 432, where it had been in Verdi's time; a conference of instrument makers in that country claimed that increases in pitch threatened priceless, centuries-old instruments.

To say that pitch has historically ascended in a straight line is an oversimplification. Pitch was not standardized until the late 19th century and it has often varied dramatically from country to country and from city to city.

But pitch has had an upward trend in the last 150 years because music was transformed from an aristocratic diversion performed in relatively small rooms into a middle-class entertainment in large theaters. In large spaces, sound needed more carrying power and brilliance. As woodwinds and brass instruments became more powerful, stringed instruments had to be strung more tautly so that they could compete. But more tautly strung instruments are more highly pitched, and tuning pitch began to rise.

The tuning fork was invented in 1711 and the first proposals of a standard for pitch date from that time. But standardized pitch was not agreed on until 1885, when an international conference of musicians at Vienna designated 435 as A.

"The language of music is universal," wrote Giuseppe Verdi, a leader in the standardization movement. "Why then should the note that has the name A in Paris or Milan become a B-flat in Rome?"

A did not stay at 435. Another international conference in Vienna in 1939 set 440 as standard, and though that figure has been confirmed by subsequent conferences, most orchestras tune somewhat higher than 440. Pitch has risen in the 20th century for the same reasons it did in the 19th: Larger halls and more powerful brass instruments forced pitch to rise among the strings.

While the difference between a performance at A-435 and at A-440 is too subtle to be detected by most listeners, increased pitch upsets many musicians.

"Not so much string players and brass players, but woodwind players, who must worry about shortening their reeds, and singers, who become absolutely livid on the subject of rising pitch," says BSO music director David Zinman. "Singers care the most because higher standards of pitch puts greater stress on the upper limits of their range. It's easier to hit a high B-flat when it's pitched low. When singers have to strain, it shortens their careers."

At A-447, Vienna is the worst offender. While singers are not any more likely to turn down an engagement at the Vienna State Opera than they are at New York's Metropolitan Opera (where A remains 440), many would agree with mezzo-soprano Frederica von Stade, who has said that "what's happening (in Vienna) is against the laws of nature and threatening the art of singing."

Star singers have been so threatened before, but they usually right such situations to their own advantage. In the late 19th century, the adored soprano Adelina Patti led a protest at London's Covent Garden when pitch approached the A-450 level. As a result of her protest, London pitch was reduced to 435.5, and pitch in that city remains — with that of Moscow — the lowest in Europe.

The threat to the priceless stringed instruments made by such people as Guarneri, Amati, and Stradivari may be a more serious one.

James W. Cox Jr., a Baltimore instrument maker admired by many musicians, acknowledges that 18th century instruments were modified in the 19th century to withstand greater stress. But when musicians tighten their strings to attain higher pitch, they put more pressure on the centuries-old wood from which their instruments are made.

"The people who designed those instruments never imagined the kind of stress that they would be put under," Cox warns. "If musicians want to push A much farther up, they're going to have to have different instruments made."

It's hard to believe that will happen. Just as high-priced singers such as Patti and — in this century — Renata Tebaldi — have been able to force orchestras to tune down because they didn't want to hurt their voices, it seems string players — some of whom have invested millions in a single instrument — will not want to endanger their investments.

GOOD VIBRATIONS

A Question Of Rib Dimension

Nick Gravagne
New Mexico Chapter

This January 1990 issue marks three years since I've been writing for the *Journal*; not that that is anything in particular, except the subject matter has wandered very little from soundboards and downbearing and, despite the amount of ground covered, I don't feel as though we've ranged very far. Take the following question, for example, which is not a single question (from a single person) as put to me per se, but rather a broad composite inquiry built upon several narrower questions along with their implications and possible ramifications. It boils down to this: what is the "how-and-why" of rib dimensions and how does it impact soundboard strength and flexibility? Extrapolations of these ideas suggest that rib dimensions and panel thickness do not necessarily have to be copied in a replacement soundboard; in fact, duplication may simply amount to an exacting experience in recreating a disaster — a weak soundboard, for example, one which might again flatten out or distort. Another twist on this causes one to wonder why, if (in various makes and models) ribs differ not only as to how many are present but as to widths and depths as well, the aggregate downbearing load should (or could) be the same in all instruments.

What I love about this is how apropos it all is: the answers to these questions are precisely what certain piano rebuilders would want to know. After all, similar questions have been raised about stringing scales, hammers and action geometry. And as a result many rebuilt instruments are, either in part or in full, superior to what they were when new because the technicians acquired the nccessary knowledge and skills to effect responsible "design change" improvements, or at least to leave the corners intact which were cut at the factory.

What I hate about these questions is how they hit us where it hurts; that as far as we have come there exists still the murkiness of guesswork, or shrugged resignation — "they must have had good reason to build it this way." (You will be cured of this axiom by reading from cover to cover the book "Piano Tone Building.") I do, however, propose what amounts to a suggestion of an answer (at least for the time being), and beyond that an awareness of where a deeper search begins.

The first steps, however, have to do with strength of the soundboard. A weak board, no matter how flexible and resilient, is like the weight lifter straining under a too-heavy load. In a short time both must quit the struggle. The question is, if we can assume a dense case and rims along with a proper string scale, how strong does the soundboard assembly need to be to support in confidence 880 pounds, or 1,000 or 1,200 if that is what is desired? But let's go back to the opening decades of this century, and to a generous, British pianomaker who cared enough about piano manufacture that he went to no small trouble in writing a good deal of the process down, not only for his own generation, but for ours.

There exists a little known tidbit of technical information in Samuel Wolfenden's book* — Will Snyder says we're all disciples of the man — which, unless the reader is keen to perceive the nature of it, is simply taken in stride as something that the "proper" people are surely aware of, and so all is well. All is, perhaps, not so well. In the two sections where the author discusses soundboard manufacture (as carried out in his day) he states in reference to the ribbing:

There is no rule as to the number and dimensions of the bars (i.e., ribs), and yet there is an unconscious approximation to the agreement as to the total sectional mass of them.

Examination of the barring used by high-class makers, shows this mass to be equal to about ten square inches, the width and thickness of each bar being measured in the middle of its length.[1]

And later in the text:

... there is reason to consider the aggregate weight (of the ribs)... the practice of many makers shows, in upright pianos and short grands, a sectional average equal to about 10 sq. in. ... Perhaps the best grading is to make the longest bars about one inch deep by 7/8" wide, slightly reducing both dimensions, in proportion to the reduced length ...

They should not be made wide and thin *(author's emphasis). A bar 1 3/4" wide by 1/2" deep would contain the same amount of wood as that above specified, but its power to sustain ... downbearing would only be one-fourth ...*[2]

To be sure, Wolfenden's phrase "unconscious approximation" is vague, especially to us in these multi-digit times. But if this technical criteria for soundboard strength amounted to solid, empirically grounded hard-knocks advice, or beyond that to a mechanically based imperative, many piano makers of his day — which produced many of the instruments we are rebuilding today — either did not subscribe to the practice or, if they did, fell woefully short of hitting the mark.

Consider the data in Table 1. The soundboards listed have been removed from pianos owing to their having been flat or collapsed or badly cracked. Of those listed, only the Bechstein and Mehlin still had crown. The columns speak for themselves, but notice in particular the right-hand column. Except for the Bechstein grand, the aggregate cross-sections for the other pianos con-

tain less than 10 square inches. (See Table 2 for how to find individual and aggregate cross section.) Even more curious is that all ribs are (on the average) noticeably wider than they are deep. Although averages were taken so as to condense the data to handy size, they are almost perfectly typical in proportion to the individual ribs. Still, the differing numbers of ribs seem to skew the results unfairly in favor the higher-number-ribbed boards. Moreover, Wolfenden's text suggests that a ten-ribbed board's cross-sectional aggregate should approximate that of a 13-ribbed board by allowing for more compensating mass in the ribs. But it turns out that there is more to it than that.

All this might seem like gnat soup if it weren't for the troublesome existence of so many old, flat and sunken soundboards — and these in the "high-class" instruments. And even more perplexing is the existence of differing rib cross sections (as much as 0.100 inch in depth) in the *same* model piano, only several years apart in age. I do wonder, in light of Wolfenden's instruction, and seeing as how some of these old soundboards are otherwise holding together at most of the joints, if these boards were minimally built as to strength — or, if they were strong enough for a particular load, whether a mismatched downbearing load overpowered them. It is important to remember that Wolfenden also advises downbearing to be set at 1.5 degrees in the middle sections of the long bridge and one degree at the ends: the resulting load brought to bear (when tension averages 160 pounds) would be 800 to 900 pounds. Since 10 square inches in aggregate rib cross-section is also suggested, it seems reasonable to assume that the stated bearing angles, along with the delivered load, will not collapse a soundboard that is so ribbed. Also implied is that shallower ribs should be mated with less of a bearing angle. And that may very well have been the case many years ago, as possibly evidenced by some 65-year-old shallow-ribbed soundboards boasting plenty of crown although perhaps riddled with cracks).

If we can take Wolfenden, with his panoramic knowledge and experience, as knowing what he was talking about — and I see no reason to doubt him — the modern-day soundboard installer faces some puzzling questions. Should the original rib dimensions be copied? And if so why? And finally, what angle should be chosen for downbearing given certain rib cross-sections?

The mathematics are alarming. A soundboard installed in a case, although harmless enough looking, is a complicated thing It is roughly spherical in shape as it presents itself to the strings, the shape of its boundaries strangely alluring from an esthetic point of view, but just another problem in analytical geometry from a cooler perspective. The assembly is arched and rigidly fixed to a beveled rim, thereby frustrating in part the use of usual flexure formulas relied so heavily upon for straight beam load investigations. And no two soundboards contain quite the same distributions of mass in either the panel or ribs or bridging. I suggested to a civil engineer aquaintance of mine that we sort these things out solely from the standpoint of strength. He mumbled something about having easier fish to fry since he and his company were hard at work designing a suspension bridge. If there is a mad scientist in our midst who has already worked all this out, now is the time to emerge from the shadows. If not, a brief outline follows, what I call an interim step, explaining an approach I use in certain cases when considering altering the rib dimensions. But first, this 10-square-inch business bears closer inspection.

It is obvious that if a piano, such as the Steinway M, is ribbed with 10 ribs, each rib would require a cross-section of one square inch if a total of 10 square inches is desired. Or if it is agreed that the shorter ribs should be less bulky and stiff, (the usual practice), the center ribs would have to be considerably larger in cross section than one square inch. It occured to me to calculate the missing square inches of aggregate cross-section for this particular Steinway M soundboard, and to theoretically assign the additional mass equally to each rib. It turns out that in order for these ribs to contain a combined 10 square inches each rib would need its cross-sectional area increased by as much as 0.350 square inches — which is out of the question. A similar analysis of the Steinway O ribs concludes that a less radical addition of 0.145 inches to each rib's cross section is necessary, but even this seems excessive. In fact, the number of ribs present does play a more important role here than might have first been suspected. And Wolfenden's plan as to how many ribs should exist on a soundboard is even sketchy when he suggests setting out, "11, 12, or 13 bars practically equidistant from each other,"[3] for soundboard design. Something more proportional seems in order relative to aggregate cross section and numbers of ribs.

Taking 10 square inches of aggregate cross section in 13 ribs as a starting point, the direct proportions for fewer ribs works out thus:

10 square inches for 13 ribs
9.25 square inches for 12 ribs
8.50 square inches for 11 ribs
7.70 square inches for 10 ribs

Considering these (albeit, somewhat arbitrary) parameters, the Steinway M ribs now only fall short by 1.20 square inches when taking into account the actual rib dimensions of that soundboard, can be made up by adding, 0.133 inch to the depth of each rib. Likewise, additions to the Steinway O are negligible; to the Steinway A would be 0.046 inches to depth; and to the Mason & Hamlin would be 0.036 inches to depth. These are calculated according to the formula:

$$a = c/wn - d$$

Where: a equals the necessary dimensional addition to rib depth;
c is the desired aggregate cross section;
w is the average width of existing ribs;
d is the average depth of existing ribs;
n is the number of ribs

For example, the computation for the Steinway A ribs is:

$$a = 9.25/.946 \times 12\text{-}.768 = .046"$$

Proof is by adding the answer of this equation to each rib depth and then calculating aggregate cross section as explained in Table 2.

But as might be imagined, it is not that simple; there are always existing conditions which bias the final decision. The answer does not come solely from puttering in front of a computer screen, neither from blind obedience to the past, nor from the stoney doctrines of a few linear personalities. It comes from amalgamating all of these — a slant on Chris Robinson's idea of eclectic learning — to

a point where something sensible emerges. In the Steinway A soundboard for example, the higher-numbered ribs (as counting from the bass), i.e., numbers 7, 8, 9, 10, 11, and 12 are noticeably deeper than the harder-working ribs one through six, which carry the bass bearing as well as tenor bearing. Interestingly, and perhaps not surprisingly, the downbearing tests, both with strings on and off, revealed flat to negative readings on the lower half of the long bridge as well as the bass bridge, while the upper half of the long bridge showed positive (if not wonderful) bearing. Soundboard deflection (upward crown) tests indicated similar readings: more deflection in the upper half of the board than in the lower, although all deflections were minimal. (The soundboard reversed crown after removal, but I don't think this was due to poverty of rib strength.) My decision was to increase the depth in ribs one through six by 0.050 to 0.100 inch, with the total still falling short of the 9.25 aggregate cross section; but I was intuitively satisfied.

There are other parenthetical maxims that I have assigned myself, as well as practical limitations to consider: for example, I won't add more than 0.125 inch to the depth of any long ribs, and generally never more than 0.100 inch. Short ribs, say around two feet and under, average 0.050 inch, if in fact they get anything at all; and of course it would be silly to increase a rib depth to the point where it bumped into the case braces upon installation.

I suppose that I must add here that none of this is intended as either canon or even recommendation: although it is my practice, you might consider it food for thought.

I spoke earlier of a deeper search into these matters. But the journey is arduous. It requires extensive side trips into thick forested territories of statics engineering, acoustics, and esthetics, with the dual purpose of extracting the pertinent information and both integrating and synthesizing it. Moreover, the results of the investigation need to be distilled and broken out into the most practical and formulated end-uses.

Still, the rewards seem worth the trouble: an old soundboard assembly could be analyzed for strength and resilience relative to a given (or proposed) downbearing load, and optimum dimensions selected for the replacement soundboard which should fulfill the composite needs of strength, flexibility, and beauty. And far from standardizing the rebuilding art this approach would open wide the possibilities of individual departure and personal expression, at least to the point where inherent limits of the instrument obviate further refinement. If piano rebuilding is truly an art form (rather than a truncated version of it), then growth and discovery are incumbent upon its artificers. In this, then, we not only get a glimpse of the seeker's journey — and where there is art and philosophy there are seekers — but more than a hint that as one horizon is reached another stretches, and that perhaps the final answers lie hidden just over the curve of the earth. It's what keeps us going.

Table 1: Rib Data

piano	*# of ribs*	*average width*	*average depth*	*widest rib*	*deepest rib*	*aggregate cross section*
Steinway M	10	.897"	.725"	.930"	.900"	6.50 sq. in.
Steinway O	11	.975	.784	1.020	.910	8.40
Steinway A	12	.946	.768	.980	.920	8.72
Bechstein	13	1.021	.804	1.100	.920	10.67
Mason & Hamlin	11	.935	.790	1.020	.900	8.13
Mehlin	10	1.047	.835	1.080	1.040	8.74

To obtain aggregate cross-section, measure each rib (with calipers) for width and depth and multiply. Then add the individual cross-sections to get aggregate cross-section.

Another method, which lends itself to working with the formulas in this article, is to add all the widths and then divide by the number of ribs to get average width; do likewise with the depths; and then multiply average cross-section by the number of ribs to obtain aggregate cross-section.

Table 2: Steinway A Rib Data

#	*Length (approx.)*	*width*	*depth*
1	26"	.955"	.660"
2	34	.960	.680
3	39	.940	.680
4	44	.960	.720
5	46	.970	.790
6	48	.960	.805
7	40	.980	.800
8	33	.975	.920
9	26	.950	.875
10	21	.900	.780
11	18	.900	.750
12	15	.900	.755
Total		11.350"	9.215"
Average		.946	.768

Aggregate cross-section = .946 x .768 x 12 = 8.72 square inches

"A Treatise On The Art Of Pianoforte Construction"; Samuel Wolfendon; (1916 & 1927)
1. pg 97
2. pg 246
3. pg 245

At Large

Hammers: The Limits Of Power

Ari Isaac
Toronto Chapter

Editor's Note: The following is an article from an RTT who also supplies a product. His experience in the field is apparent and his observations are worth consideration. It is Journal *policy to publish articles to distribute information; publication is not intended to serve in any way as advertisement or endorsement of his or any other product, and opinions expressed are those of the individual author(s).*

"This violin was built in 1656," said Karl Haas on the radio this morning, and started to play the record of the Bruch violin concerto — the first solo phrase — on a violin built in 1656! That's a long time ago, and how did it sound? It had good dynamic range, beautiful color range, and plenty of power, or carry. I was suddenly reminded that musical tone is a very old concept. It reminded me also that we all wish to be heard, we want someone to hear us: if not when we speak, then, at least when our work speaks. The master who built that violin in 1656 is being heard — and being recorded — more than 300 years later. Why? Are we going to be heard more than 300 years hence? Are we being heard today? Is what we are saying, musically, worthy of being listened to?

With notable exceptions, I would humbly submit the answer is negative. Judging from dozens of pianos I hear around the country in teaching studios, private homes and on the concert stages, for the most part, we are subjecting audiences to both orally and digitally pitched noise: All because we wish to be heard. Listening to those early violins on the radio set me thinking about being heard. I'd like to share my thoughts with you.

Music is a form of communication. It has the unique advantage of communicating intimately in public. No other form of audible, intelligible communication speaks intimately to each listener while being performed in public. The power that we piano technicians wield, is control over the subtlety and range of the musical communication — a great power, I think.

To say that a piano requires as responsive a sounding board as can be built and as correct a stringing scale as possible, is to state the obvious. What is not so obvious, I think, is the answer to the question: what tone do we want out of a piano? Taking it one step back — what is tone?

These days it has become fashionable to state that there are as many tones as there are functions for pianos. While I think that we need to be responsive to recording studio owners and sound engineers, I believe our reputation both as individuals and as a profession is strengthened most effectively when we leave a piano sounding as pianistically excellent as it is capable. I think this because when a musician, jazz or classical sits down and plays a piano, it either gives him the latitude to express his musical ideas or it doesn't — regardless of sound engineers' preferences. The engineers can perform their black magic anyway. They can add brightness at the turn of a control. When they ask us to make the piano sound like something that will shatter glass, they are merely asking us to cut down their work at the cost of our own reputation.

Let us proceed from the premise that when we leave a piano, we should leave it producing tone at its full potential. What then, is tone? Tone consists of a fundamental and high partials — we won't get into the lower partials here. What is to be done with them? My son would say forget it and let's go party — but this is meant to be a serious look at the subject of tone. What do we do with the fundamental and the upper partials which, together make up musical tone? The answer, in my view, depends on answers to two further questions: First, are we going to use musical guidelines and, second, are we after short term or long term results?

Composers and performers have always looked for a lyrical quality in instruments as the prime musical requisite. A singing quality has been crucial for most instruments, especially stringed instruments like violins and pianos. What is meant by "singing quality" is, it seems to me, the capacity to change tone color according to the players' will. This presumes the instrument has such a quality built in, or else no player could ever effect such changes. Since the instrument we're talking of is the piano, the part whose function it is to deliver the changes of tone color is the hammer. How does the hammer do it?

Before considering how the hammer effects a change in tone color I think we need to define tone. This definition will serve for my purposes here. (Other definitions may be equally functional for other purposes.) If the tonal spectrum is made up of a fundamental frequency and frequencies of upper partials, it follows that a change in what we perceive as "tone color" will be a change in the mix of audible partials along with the fundamental. I've thus evolved this definition for the term "tone": Tone equals the ratio or proportion of partials to fundamental as a function of energy applied to the string. What this means is a change of the number of partials audible at each energy level of hammer/string impact.

The above definition becomes useful only if tone color is deemed important. Some of the hammers made today, and with them, some pianos made today do not appear to have the capacity for changing tone color; playing the range from soft to loud does not produce a change of fundamental/partials mix. I think the capacity for a tone-color range along with, and as a funtion of the volume range are the finest and most essential features of a piano.

There are three parameters of piano tone I'd like to consider next: power, projection (or carry), and sustain. I hear these words used with great abandon and why not? They are wonderful words. When I started examining them carefully, I discovered some very interesting and surprising concepts.

Power

When we play a note on the piano at any level of loudness, we want to hear the note as distinctly (in loudness or its decibel level) from the ambient background noises as possible. The power of a note has little to do with most of its other features. We look for a note's power during the first 1-1.5 milliseconds of its sounding. As long as power is our most critical tone criterion, we have it easy. A note's loudness during the first few moments of its sounding requires little more than a very hard, inflexible hammer. Every time that note is played, it will sound as loud as possible for that level of hammer impact. Will it have projection? Will it sustain? Not necessarily, but it will have power.

There is another aspect to the question of tonal power — which part of the tonal spectrum is perceived as delivering power? Is it the fundamental with the first six partials or is it the partials from number seven and up? It seems to me that when most technicians speak of tonal power they are thinking of the partials number seven and up. This concept is both musically unsatisfying and it flies in the face of musical tradition since it spurns consideration of any lyrical quality.

Projection Carry

When we speak of projection, we think of a pair of ears situated as far as possible from the piano. How clearly do those ears hear the tone emanating from the piano? All too often, it seems to me, the highest partials or the brightest tone is associated with a note's projection. It is my observation that the lower frequencies are more powerful and travel further than the highest ones. It has often occurred to me that the rumble of a jet engine can be heard from very far away, whereas the high-pitched whistling of the turning turbine becomes audible only when the plane is practically overhead. I have listened to many concerts sitting at the back of the balcony, at which pianos with extremely bright, and accordingly extremely thin treble sections were featured. To my ears, the notes in the treble were barely audible and quite indistinguishable. In order for a note to project so it is perceived at the back of the concert hall in the same way as the tenth row in the orchestra seat it must have a clearly audible fundamental — along with the first five partials — and it must have sustain to carry it to that distant pair of ears.

Sustain

By sustain we mean the length of time between the first moment a note is sounded and the moment it is no longer audible or functionally audible. Do we want sustain as an essential feature of musical tone, and if so, why?

We know that a treble note has only a fraction of the sustain of a note in the tenor section. The same is true of the partials and of the fundamental within a given note — the higher the partial, the shorter its life. It is at this point, I feel that we have to make a decision whether we want a tone color range or an unrelentingly bright tone throughout the volume range.

If we wish to use a piano for making music we need to be aware that music from Bach to Barber and from Joplin to Elton John demands a tone-color range. This requires a hammer which at different intensities of blow can make audible a lorge number of distinct combinations of partials/fundamental. There is, in my experience, only one way to acheive this capacity for tone-color range — the hammer must flex. By flexing I mean that the hammer will change shape, however minutely, upon impact: inward at the striking point and outwards at the shoulders. It must then recover its shape while still in contact with the strings.

If we do not want a tone-color range our life is simple. All we have to have is a hammer that is so hard, so inert as to not allow any flexing to take place. Since most of us want to get as big and as rich a sound out of the pianos we work on when installing hammers and when voicing, I will make the assumption that most of us do regard a tone-color range as a desirable objective. I shall try to describe how I think tone-color may be achieved.

The first thing to remember is that you can't achieve tone-color out of some hammers sold today. This is my opinion. You may disagree. To get tone-color the hammer has to function like a preloaded, very stiff compression spring. For the hammer to function in this way, the felt of which the hammer is made must be very dense and more than that, must have a graduated density, dense in the bass and getting denser toward the treble.

How do we know that a hammer, when we take it out of the package, is going to give us a tone-color range?

Install a hammer out of a new set in the piano in the high tenor or the low treble. Play it and listen: you want the sound to be powerful and on the bright side. I play the key through the volume range, from soft to loud, and listen for the loudness and for the change in tone-color — if any such change is audible at this stage. Next, I push a single needle (size ten) through the sliced side of the hammer, halfway between the striking point and the top of the molding. The needle is pushed right through and withdrawn. I listen again. Two things have to happen: the sustain has to increase and the fundamental or the lower part of the spectrum must be more clearly audible. Remember: it is the fundamental and the first five partials that give us the sustain. Next I push the needle through again close to the same spot and listen to the note. By now the hammer has to sound right on or very close to right on. The difference will be real and easy to hear. An increase in sustain and a strengthening of the fundamental after two insertions and withdrawals of a single needle is what I look for. If I don't observe these results after the just described procedure, I know I won't achieve a satisfactory tone-color range with that set of hammers. I may make them work for a while, but I know there won't be a tone-color range.

What tone can we expect from a truly fine set of hammers? The tone will have body: a clearly audible fundamental, sustain, and lots of power. The power will not be restricted to the first 1.5 milliseconds of the attack, but will be spread over the long sustain of the note. The tone will give an impression of roundness or fullness. It will sound as though the high end of the tonal spectrum is enveloped by the lower part of the tone. The volume will naturally increase as the key is played with more force but the increase in volume additional partials will become audible; falling away as the key is played more softly. How much work will we have to invest on this set of hammers to get the above results? Yes, we will have to make sure the hammer strikes all three strings of a unison simultaneously; we may have to do a little filing. Precious little voicing will be needed — two or three needle thrusts per hammer. The needle, or needles, will go in easily and we can feel the resilience of the felt.

If you think the method for testing hammers for their tone-color potential, as well as preparing a fine set of hammers is deceptively easy — well... it is. That's how you know you've got a good set of hammers. ≣

EXAMINATIONS

How To Pass The PTG Tuning Exam: Part III

Michael Travis
Washington D.C. Chapter

Part 3: Pitch

One of our sacred duties as piano technicians is to tune all the pianos we see at A440 pitch unless there's a real good reason not to. In recent years we've had the means to do so with a high degree of accuracy; our new electronic tuning forks and crystal-controlled oscillators are capable of producing A440 within 0.1 cent, though some do require periodic calibration. Pitch is one of the first things we observe about a piano in tuning, and is the first scored area of the PTG Tuning Exam. With an accurate pitch source and proper aural checks it should be a relatively easy area to score well in, since your score depends only on how close you leave your A4-fundamental to 440 Hz.

A440 And Us

You may think you have a dilemma when the visiting maestro demands that the piano which you have diligently maintained at A440 must be tuned at A442. Imagine how you would feel if instead of 442 the call was for A457! This situation may have faced some of our professional predecessors during the first years of this century when there were at least two pitch standards in use in the USA — A457 and A440. As you might have guessed, piano technicians of the day (NAPT members, c.1924) who no doubt liked A457 even less than we like A442 now, strongly supported establishing one and only one pitch standard, and helped significantly to move the music world to the current standard of A=440 Hz at 72° F. The old international standard of A=435 Hz at 59° F was essentially retained (with respect to some wind instruments), but adjusted to account for a more convenient temperature.

About forty years later, in 1963, we flexed our muscle again by chastising conductor Leonard Bernstein for his supposed disregard of the A440 standard in his use of A442 with the New York Philharmonic. An apparently successful publicity effort by PTG, the action focused public attention on the existence of the A440 standard and some reasons why such a standard is a good idea, though it didn't change the Philharmonic's pitch. Les Hoskins summed up as he wrote in 1966: "The piano technicians feel that since they were so instrumental in having a standard adopted, they have a vested interest in guarding it. Their accurately designed tuning forks are a reference where pitch is concerned. They, in effect, do the pitching for the world of music; they would like to do some umpiring as well." (*Journal*, May 1966, p.19).

A440 And Temperature

Part of being a savvy piano technician is to be aware of the influence of temperature on the pitch of musical instruments. For example, you wouldn't want to go into a relatively cold church and immediately set the pitch of the piano to an A4 on the pipe organ. Wind instruments get sharper as they get warmer, because they depend on vibrating air columns and sound travels faster through warmer air. It wouldn't be too unusual for a pipe organ that's 10-20 degrees cooler than normal to produce an A at 435 Hz. So if you're going to set the piano's A4 to that of the organ, get the organ warmed to performance temperature first.

In general, if you are tuning for a piano and wind ensemble group, you can legitimately allow a one Hz. variation in the pitch of A4 on the piano for every 10 degrees difference from 72° F, and without necessarily violating the pitch standard. A440 at 72° becomes A441 at about 80°, A442 at about 90°, A439 at 60°, etc. The musical pitch standard is not completely stated without a reference to temperature even though we're used to hearing "A440" as if it were an absolute frequency standard independant of temperature. We are fortunate in that we do not usually have to account for temperature extremes by tuning at a non-standard pitch.

However, compromises may be necessary in particular situations to minimize deviation from the A440/72° F standard at the time of a performance. If a conductor asks for A442, he/she may be doing so in realization of what happens to the pitches of the piano and of the orchestra's wind instruments under hot stage lights. If you value your relationship with that conductor, you'd better be able to tune at A442. I know of concert technicians who use a specially calibrated A442 tuning fork for such situations, and for those who have visual-display instruments that can be accurately offset, it's a simple matter to offset to +8 cents, and tune as usual, going over the piano as needed for stability.

I hasten to add, however, that we should continue to disparage the practice of tuning to higher pitches only for some imagined enhancement of brilliance. Such effects are in part attributable to wind instrumentalists being forced to play out of tune in at least parts of their registers, which they will unless their instruments happen to be specifically designed for the higher pitch. If not, I imagine that at some point in their careers with a higher-pitched ensemble, they may give in and go buy the higher-pitched instrument so they can play in tune without straining their embouchures. The initial "brilliance" of the group begins to fade when enough of the wind players have done this. Then comes the urge to "go a little higher," and we're off and running. It's up to us to try to put a stop to this kind of nonsense from time to time. Unless there is a good reason not to do so, we should always strive to maintain pianos at A440, or as close as we can get away with.

A440 And The Tuning Exam

To be a good "pitcher" or "umpire" you have to know where the "strike zone" is. Pitch is the first scored category of the PTG Tuning Exam, and your score here depends only on how close the fundamental pitch of your note A4 is to A440. As in other areas of the test, your score depends on your ability to control what you are doing. Examiners take care to measure the A4 fundamental as soon as possible after your initial tuning to avoid drift due to environmental changes. If it is within one cent of A440, you score 100 percent on pitch. A strike! More than three cents off drops your score below the 80 percent level, which won't get you to first base on this test.

In the earlier years of the current exam, scoring pitch involved measurement and special treatment of the tuning fork or other pitch source and a simple but nevertheless troublesome little calculation which resulted in a pitch score that could not always be aurally verified. Scoring pitch from A4 directly as we do today avoids these difficulties. The CTE Handbook (Tuning Exam Manual) explains our present procedure with respect to the tuning fork as follows:

"Most CTE's were trained (in the old method) to measure the accuracy of the examinee's tuning fork before starting the exam. Even though this is no longer required, many of you still feel a responsibility to the examinee and check the fork prior to the tuning."

This is a commendable attitude and we do not want to discourage examiners from following the dictates of their conscience. We do expect all examiners to have with them an accurate, non-visual, pitch source for A440. However, it is no longer your responsibility to provide this source unless requested. The examinee, who wishes to be rated as a craftsman, is expected to be responsible for the tools and technique necessary to tune a piano to A440.

We no longer advise the examinee to place the tuning fork on the plate to equalize the temperature of the fork. Many tuners use a shirt pocket or place the fork under their arm to bring its temperature to what they think is proper. If their method is faulty, they will learn that from the exam.

Keep in mind that the new pitch scoring procedure really allows a three cent difference before anyone fails this category of the exam. We want to be courteous and helpful, but we do not want to remove any of the examinee's own responsibility for tuning at A440.

Some people feel that in most situations tuners do not "really" put the piano at exact pitch — and that may be true enough. However, we do feel that a craftsman should be able to accomplish this feat at least once, upon demand, and exam time is the proper time to prove this ability."

Tuning Fork Tips

We are fortunate to have available today a variety of amazingly accurate electronic alternatives to the standard tuning fork. Exam rules allow any non-visual pitch source for aural tuning. I recommend you obtain one of these for greater hands-free ease in setting pitch. One of the problems with a standard fork is that it's awkward to sound both the fork and the piano while manipulating the tuning hammer. Also, though all pitch sources are prone to some variation with temperature, it's usually less of a problem with an electronic source. Any pitch source may be checked for accuracy with a Sanderson Accu-Tuner, which will show deviations of 0.1 cent or more.

Hint #8: Obtain and use an accurate A440 pitch source. If you tune with a C523 or other non-standard fork, you should always double-check to be sure A4 comes out on A440.

Hint #9: Have the fork or other pitch source calibrated at the temperature you intend to use it, and bring it to that temperature before using it. Keeping it on the piano plate will stabilize it to essentially room temperature. Keeping it under your arm will stabilize it to near 98.6° F. If you always keep it at room temperature (instead of in your car overnight) temperature-induced pitch errors should not be a problem for you.

Hint #10: Retire your aluminum fork, or if you've been tempted to get one, don't. There are better alternatives available. Aluminum forks are big, easy to handle and produce a clear tone with exceptional sustain, but are too temperature-sensitive to be reliably accurate. It's not much of an exaggeration to say that looking at an aluminum fork causes it to warm up and go flat.

Hint #11: Insulate the handle of your small steel tuning fork with plastic tubing (should be a tight fit, leaving only the very end uncovered). In addition to assisting with its pitch stability by avoiding direct contact with warm hands, this will allow you to grip the fork in your teeth for hands-free tuning without shaking your fillings loose. It's the next best thing to a good electronic pitch source for convenience, but don't hold it between your teeth longer than necessary.

Hint #12: The hefty 5 1/2" Deagan chrome-plated deluxe pitch-master fork that you would normally keep in a nice fuzzy pouch and bring out occasionally just to impress certain customers has a rounded knob on the end which suggests the following technique. Sound and hang it — fork down, palm up — between the second and third fingers, touching the knob to the keybed below a note you want to hear it with. Then reach around and play that note with the thumb of the same hand, leaving your other hand free to operate the tuning hammer or play a different note.

The Q & D Tuning — Prelude To Pitch Setting

In starting to tune a piano, the first step after your normal structural inspection is checking the pitch to develop a plan of attack. Normally, pianos are either flat or sharp, in varying degrees, over a fairly wide part of the scale. In pitch-raising, for example, you might want to strip mute the piano, overshoot A440 by 1/4 to 1/3 the degree of flatness, set a quick and dirty temperament, tune solid-string octaves up and down without much checking, then pull in the unisons, and then tune the wrapped strings to what's left (avoiding overstretching these), all the while moving at a speed just this side of light.

Why so fast? Because you don't want to waste time on fine tuning when the instrument is shifting around on you. Even on fairly slight pitch changes of three to six cents, it's a good idea to get the piano in tune before tuning it.

Although pitch-raising itself is not involved in a tuning exam, the similar approach of a fast pre-tuning may be useful. If you can pitch-raise and rough-tune unisons on a piano in 15-20 minutes, you should be able to pre-tune an exam piano in half that, or less — because you're only dealing with one string per note. And that could be a good investment for a better score.

If you remember last month I

suggested that one way to avoid penalties for lack of tuning is to be sure you get to every required note at least once by a quick pre-tuning. Now although this is neither an overall pitch-raising or lowering, each note is off enough that you have to do something to avoid a bunch of points, and you might as well get it out of the way fast. The test piano is set up with notes de-tuned alternately sharp and flat, and you should get them all in the ballpark on the first pass. You need not be overly concerned about precise pitch setting at this time. Just sound your pitch source and tune a simple unison to it on the piano, reasonably carefully, and then pretend you're doing a pitch-change operation and move out fast. This will also serve to help relax you and get you in the groove with this piano.

If you feel more comfortable tuning precisely and carefully all the way, that's okay too, and will work provided you do finish. A hybrid technique would be to tune the midrange fast before starting over; then after carefully finishing the midrange, tuning the bass and treble fast before carefully going back over these areas. Depending on your technique, you may get a more stable result if you make the gross changes on one pass, then follow up with the fine changes.

Transferring A440 To The Piano — The 17th Test

However you've chosen to get here, now we're up to the point of transferring pitch from the pitch source to the piano, and really honing in on the accuracy. Let's look at some of the ways you could do this, and some of the common mistakes you should avoid.

There is basically only one correct way to be sure you are transferring pitch accurately from a tuning fork or other aural pitch source to the corresponding note on the piano. (Those using a non-standard pitch will have to transpose what follows). First, check the reference note F2 to the A fork (17th below the fork = double octave + M3) and adjust F2 as needed for a comfortable beat rate (three to five beats per second), on the wide side of pure. The pitch of F2 is not critical. Second, sound the fork and unison-tune A4 as pure as you can to it as a first guess. Then, to see how well you did, test F2-A4 vs. F2-fork; this is an example of the 17th test for pitch transfer. If the beat rates match, you have properly transferred pitch from the A fork to the A4 string on the piano.

The two pairs of coincident partials producing the beats are the fundamentals of A4 and the fork and the fifth partial of F2. In this test, because you're working with the upper end of an expanded interval, sharper beats faster. For example, if F2-A4 beats faster than F2-fork, lower A4 slightly. A difference in beat rate of one bps corresponds to about four cents at A4. Using a metronome set at 60, or looking at a watch that shows seconds, tap on a table and compare three taps to four taps per second and get an appreciation for the sensitivity of this test; if these taps were beat rates pitched near A4, the difference between three and four taps (or between five and six for that matter) would correspond to one bps or four cents difference on the 17th test. To pass the pitch section, you just need to tune and stabilize the A4 string so that the beat rates F2-A4 vs. F2-fork are so close you can't tell the difference.

Hint #13: Borrow a Sanderson Accu-Tuner and practice setting pitch aurally, using the SAT to check your results. Try intentionally de-tuning A4 by one cent and see if you can detect this interval using the 17th test with your A4 tuning fork. Practice until you can set pitch consistently within 0.5 cents of A440.

It is possible to use other notes as reference notes, but none work as well as the 17th below the fork. Just as an exercise, for example, we could consider using the 12th (octave + fifth) as a reference note. Note that you'd have to contract the 12th, D3-A fork to hear three to five bps first, before testing D3-A4 vs. D3-fork for equal beat rates. This uses the third partial of D3 at A4, which is a valid reference. If D3-A4 beats slower than D3-fork, it means that you have to contract the interval D3-A4 to increase the beat rate; in this case we're dealing with the upper end of a contracted interval, and "flatter beats faster" is the rule. Unfortunately, this procedure has two problems. Though the 12th is normally contracted, it beats slower than three to five bps, which means that after you've done your tuning and want to go back and recheck A4 you'll still have to go to the 17th test for a usable beat rate check. Also, you could get some interference from a higher pair of coincident partials at A5, the sixth partial of D3 and the second partial of the fork. The 12th test for the fork, though theoretically valid, is not much better than would be a single or double-octave test (very slow beating, and therefore useless), which would employ these intervals' 2nd and 4th partials at A4, respectively. Another valid but practically useless (also due to slow beats) reference note would be the one having a sixth partial at A4, the double-octave-fifth. To summarize, of all reference notes having partials at A4 that could indicate by a direct beat-rate comparison how accurately A4 matches an A fork, the 17th test is the most useful.

Some Common Mistakes In Pitch Transfer

Other reference notes can be real troublemakers. Here are the most-frequently made mistakes in checking pitch transfer:

Mistake #1: Using the note a 10th below as a reference note, matching beat rates from F3-A4 vs. F3-fork, produces a flat error at A4. The first set of coincident partials between F3 and A4 is at A5, the second partial of both A4 and the tuning fork. Matching 10th beat rates here, you will succeed only in matching the second partial of A4 to the second partial of the fork, 880 Hz. However, the fundamental of A4 when the second partial is 880 Hz is not 440 Hz, but from one to three cents flatter. This is great for demonstrating inharmonicity, but not so good for passing the exam!

Mistake #2: Sounding the fork and tuning the octave below the fork, while checking with the 17th below the fork, matching beat rates F2-A3 vs. F2-fork produces a sharp error at A4. The first set of coincident partials between F2-A3 is at A4, the second partial of A3. Setting the second partial of A3 at 440 Hz and then tuning A4-A3 is not the same as setting the fundamental of A4 at 440 Hz, unless you are tuning a pure 2:1 octave. Because pianos are inharmonic, midrange octaves must be expanded beyond 2:1 to sound good, and even a little wider than 4:2 in most cases. If you make this mistake, by the time you get to tuning A4-A3, you will have to set A4-fundamental sharp of 440 Hz for the octave to sound good.

Mistake #3: Confusing fork partials. You sound the fork, hold it to your ear while playing A4, and hear no beats. Just to be sure, you check the 17ths F2-

A4 vs. F2-fork, and they beat the same; so far so good. Now you make the mistake of setting the fork on the bridge or keybed of the piano for amplification, because you really want to make sure everything's okay before going on. Lo and behold you hear a beat between the fork and A4, just when you wanted to hear a nice unison. What happened? Should you change your A4? *No*! Your initial test with the 17ths was valid and proved that the A4-fundamental was the same pitch as the fork. The fact that you get a unison beat when the fork is amplified is a demonstration of the inharmonicity of the second partial of A4, which runs sharp of the second partial of the fork by one to three cents.

Standard-type tuning forks produce a very weak second partial in air which you probably won't hear. Touching the tip of the fork on a resonant surface (grounding the fork) allows you to hear its second partial, a harmonic overtone. An A440 fork would produce an 880 Hz second partial. An electronic fork, in this relation, behaves like a grounded fork, usually producing audible harmonic overtones to the fundamental, which can confuse you in the same way a grounded fork can.

Though listening to a comparison between an airborne fork and A4 vs. a grounded fork and A4 can give apparently conflicting results, it's still okay to set the fork on the keybed or bridge and play the 17th test. Since the fork's fundmental (at A4) is so much louder than its second partial (at A5), and since the fifth partial of F2 (at A4) is so much louder than its tenth partial (at A5), you probably won't hear any interfering beats between the weaker coincident pair of partials, the second partial of the fork and the 10th partial of F2. So listen to the A4-fork unison with the fork held in air next to your ear, (not grounded on the piano or between your teeth), but use the 17th test with the fork however you like; grounded or airborne, the 17th test will work.

A440 Pitch Or A4 Temperament/ Midrange?

If you've set pitch and tuned your midrange notes, and then go back and re-check your pitch note only to find it has changed with respect to the fork, but still sounds good in interval checks, what should you do? This question has come up occasionally, and is a dilemma for the examinee working under time constraints.

Simply stated, the choices are:
1. leave everything as is and risk losing points in the pitch section;
2. correct A4 to the fork and risk points against A4 in the temperament and/or midrange sections.

I would tend to favor the first option, but I don't like either. I have not considered starting over, setting pitch and re-tuning the midrange, due to the time factor (and also because we tend to be less careful to tune with stability when we're in a hurry), although this might be an option for some speedy tuners. I would suggest a compromise: make whatever pitch correction to A4 you can without totally destroying your aural checks with A4, and you'll probably be okay. It's probably more important that you finish the other sections (bass, treble, high treble) rather than get stuck here. If you're satisfied with your pitch result but had to accept some undesirable interval checks with A4 to get it, your best remaining option might be to avoid selecting a temperament for scoring that includes A4, since points off in the temperament are weighted heavier than elsewhere in the midrange. Remember, you do have a choice in the matter. But since every tuning is different, I have no basis for stating that one or another of these options will be most advantageous for you anytime this situation arises. Just be aware that it could come up in your exam, and that you do have options.

Hint #14: Recheck your pitch setting after you've tuned your temperament, (or about one octave in the midrange), and make whatever small correction might be needed. If you're not satisfied with A4 as to pitch, and you're running out of time, make whatever pitch correction you can without too severely compromising the aural checks with A4.

Whew. Got through that whole article without once mentioning "perfect pitch!" Next month: Temperament.

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SOUND BACKGROUND

Pitch Measurement And Vibration Theory; Science Of Acoustics Established

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Hooke's Direct Measurement Of Pitch Frequency

Like Isaac Newton, his more famous contemporary, Robert Hooke (1635-1703) was an eminent British physicist who made some discoveries that advanced the development of the science of sound although he did not specialize in the study of acoustics. Hooke was educated at Oxford University where he received his M.A. degree in 1663. He began to teach mechanics and mathematics at Gresham College, London, during the following year. He remained a professor there for the rest of his life. He also was quite active in the affairs of the Royal Society.

Hooke and Newton were scholarly rivals in their work in mechanics and optics where their interests overlapped. Although Hooke was not equal in stature as a scientist, he did anticipate Newton in some concepts of the law of universal gravitation.

Hooke had outstanding mechanical aptitude and was especially skillful as an instrument maker. While a young man, he became interested in clocks and watches. After he discovered in 1658 that a spiral spring vibrates in a regular period the same as a pendulum, he began to work on designs for watches and chronometers with spring-controlled balance wheels. Hooke's contributions to acoustic science were by-products of his work on watches. His only previous experience in acoustical experiments had been as an assistant to Robert Boyle in his "bell-in-vacuum" tests. (*Journal*, November 1989, p. 28)

Hooke made an important acoustical discovery of his own when he originated the first method for direct determination of the frequency of musical tones. This was the result of his work with rotating toothed watch wheels. Hooke noticed that when he held the edge of a flexible piece of cardboard against the rapidly moving cogs, a musical tone was produced. He then proceeded to investigate the production of sounds from other watch wheels with different patterns of cog size and spacing made up for his tests.

Entries in his diary for the year 1675-6 which was published, record his observations on the production of sounds by "the turning of a watch wheel." Hooke published nothing more on his experiments with toothed wheels, however a contemporary description of a demonstration by Hooke at a 1681 meeting of the Royal Society stated he, "shew'd a way of making *musical and other sounds* by striking the teeth of several brass wheels, proportionately cut and turned very fast round, ... equal or proportional stroaks of the teeth, ... made the musical notes." Similar tests with unevenly cut cog wheels produced unmusical noise. The frequency of the musical tones was calculated as the product of revolutions per minute times the number of cogs.

Hooke's Law Of Elasticity

Hooke is best known for the law of elasticity, called "Hooke's Law," that he derived from his research on coiled springs for watches and chronometers. He observed that there was a direct relationship between the elongation of a coiled spring and the applied force. For example, if a 2 lb. weight hung on a cylindrical coiled wire spring lengthens the spring 1 in., a 4 lb. weight lengthens the spring 2" and a 6 lb. weight lengthens the spring 3". After removal of the weights, the springs will return to original length because of the restoring force of the elastic properties of the wire. Technically *elasticity* is defined as the ability of a body to return to its original size and shape after the deforming force is removed. The *elastic limit* is the maximum external force that can be applied without causing permanent deformation.

Hooke presented his law of elasticity at a lecture at the Royal Society during the 1670s. His lecture was included in a book published in 1678 containing a collection of his papers. As was the custom then for communicating learned discoveries, Hooke's Law as he stated it in Latin is *"Ut tensio, sic vis"* which translates literally into "As the extension —, so the force." In modern physics this is interpreted as: "Within the elastic limit of a body possessing elasticity, the *stress* acting on the body produces a strain directly proportional to the size of the applied stress." Among the common types of stress that cause deformation are: tension, compression, and torsion or twisting. Mathematically, *stress* is the ratio of the applied force to the area over which it acts, for example: pounds per square inch or kilograms per square centimeter. *Strain* is the relative change in dimensions or shape of a body as a result of the applied stress. Longitudinal strain or *elongation* of a body is the ratio of stretched length to the original length.

Hooke's Analysis Of Harmonic Vibration

During the lecture on his law of elasticity, Hooke also presented a dynamic analysis of spring oscillations. He showed that the internal restoring force in an elastic spring set into motion by an external impulse, would cause the spring to vibrate back and forth about its equilibrium position in regular periodic movement. Although Hooke's reasoning was not completely accurate he is given credit for being first to perceive the role of elasticity in periodic vibrations. Such vibrations are now known as "harmonic" because the vibrations of bodies emitting musical sounds are of this nature.

Wallis' Studies Of Vibrating Musical Strings

John Wallis (1616-1703) was a third British scientist prominent during the latter half of the 17th century with some interest in the physics of music. Wallis was educated in both science and theology at Cambridge and Oxford and he was an ordained minister. He spent most

of his time however as a mathematician after he was appointed professor of geometry at Oxford in 1649.

Although not a practicing musician, Wallis occasionally wrote papers on music theory, ancient Greek music and the mathematics of tuning and temperament. His most important writings on an acoustical topic concerned the vibrations of musical strings. In a report published in 1677, Wallis discussed his experiments showing that a stretched string can vibrate in several parts so that at some points there is no motion while the segments in between vibrate vigorously. He demonstrated such motion by setting small paper riders on the string where they either remained or were thrown off depending on where they were placed. He reported that if a string were struck or plucked at one of the motionless points, that tone would not be a *"clear sound* at all, but very confused."

He also demonstrated sympathetic vibration, "the trembling of consonant strings" by showing the resonant response of one string to vibrations from another which had been struck, if both strings had been tuned to produce some partials at the same pitch. Wallis gave examples of sympathetic vibrations observed by practical musicians including a report "of a thin Venice glass cracked with the strong... sound of a trumpet... sounding an unison or consonant note to that of the tone or ting of the glass. And I do not judge the thing very unlikely."

Acoustics Established As A Separate Science

Before the start of the 18th century, the development of the physics of sound and music was carried on scholars with other wide interests in philosophy, music, physics and mathematics. Recognition of the study of sound as a separate physical science was first proposed by Joseph Sauveur (1653 French mathematician and physicist. Born in LaFleche, France where he received his earlier education), Sauveur went to Paris in 1670 where he studied mathematics, physics and medicine. He remained in Paris for the rest of his life. In spite of a lifelong difficulty with a speech problem, he was successful in his career in public communications as well as in teaching.

After completing his education, Sauveur served as a teacher and tutor in various posts. During this time he was primarily interested in and wrote on practical mathematics. He also was active in military engineering projects. By 1686 after he had established a reputation for excellent scholarship, Sauveur was appointed professor of mathematics at the College Royale. In 1696, he was elected to membership in the Academie des Sciences, a government supported scientific society. Members were granted both pensions and living quarters allowing them to give up other work and to devote more time to independent research. Sauveur now was free to pursue his interest in acoustics, an interest to which he devoted most of his time for the rest of his life. Although he had not studied music, he based his research in sound and vibration on musical sounds.

Sauveur's first written account of his work in acoustics was a paper "Systém Générale des Intervals du Son" which appeared in the 1701 scientific journal published by the Académie. In his preface he proposed the establishment of a new science to which he gave the name *Acoustique,* taken from the Greek work meaning "hearing." Lindsay's translation of his statement is "I have come to the opinion that there *is* a science superior to music and I call it *acoustics;* it has for its object sound in general, whereas music has for its object sounds agreeable to the ear." Sauveur originated the use of other acoustical terms that appear in the reports on his research published by the Académie.

Sauver's Measurement Of Interval Size

Sauveur drew up the first system of mathematical units for measurement of intervals. At the time he began his research on acoustics as a member of the Académie in 1696, the performance of music in Europe was undergoing a transition in musical temperaments. This was a period in which Werkmeister and other theorists were debating the merits of the various temperaments in use or proposed. Sauveur made his own investigation. His writings discuss 25 different tuning systems then known, some practical, others theoretical. In addition to the 12-note temperaments, he included information on tuning cycles of 17, 31, 43, 55 and other mathematical divisions of the octave. As a result of his study, Sauveur recognized the need for a more convenient mathematical system for interval size than the difficult and confusing practice of using fractions which sometimes contained large numbers.

Sauveur proposed a new system based on division of the octave into 43 divisions or degrees. It was his conclusion that this was the smallest difference in pitch just perceptible to the average listener. He called each division a *meride.* (equivalent to 27.9 cents in modern units). Smaller divisions were 1 *meride* = 7 *eotamerides* and 1 *eotameride* = 10 *decamerides* giving a total of 301 *eotamerides* or 3010 *decamerides.*, a much finer division than the modern units, 1200 cents to an octave. Sauveur's interval sizes were expressed in *merides:* a fifth = 25 *merides* (697.57 cents) and a major third = 14 *merides* (390.70 cents). These figures are close approximations to the size of the same intervals in 1/5-comma meantone temperament. Sauveur reported that he had found that contemporary harpsichord and organ builders adhered more closely to the 1/5-comma than 1/4-comma or 1/6-comma meantone temperaments that were popular then.

Sauveur Determines Absolute Frequency By Counting Beats

Sauveur was the first to recognize that the beating of intervals was due to differences in the frequencies of vibrations of the tones. He used this discovery to devise a method of determining absolute frequency from the beating of intervals of pairs of tones from organ pipes. Sauveur conducted experiments with the help of an organ builder in Paris. He obtained the best results with a pair of pipes approximately 5 1/2 feet long. The pipes were tuned a small just semitone apart. This could be done accurately in steps by tuning up two just major thirds, for example C:E and E:G#, and then down a major fifth G#: C#. The interval ratio for C:C# produced is 5/4 x 5/4 x 2/3 = 25/24. The organ pipes were pitched in the second octave below middle C, low enough for fairly accurate counting of the beats. The calculated frequency of one of the pipes was 100 Hz, at that time the pitch of A2. Sauveur's frequency agrees with a later determination of the frequency of an 18th century Paris tuning fork.

Sauveur's data was used by Newton for another observation discussed in the second and third editions of "Principia." Reasoning that velocity of sound equals frequency times wave length, Newton showed that the wave length of a tone from an open organ pipe equals twice the length of the pipe.

Sauveur's Concepts Of Harmonic Tones

Sauveur's writings on his concept of harmonic vibration originated the use

of the terms "harmonic," "fundamental" and "node" in acoustics. He stated "In addition to the undulations which the string makes throughout to form the fundamental note, the string divides itself into two, three, etc. equal undulations to form the octave, twelfth, fifteenth, etc. of the note." Sauveur then did not know that Wallis had reported similar conclusions 24 years earlier. Sauveur described how he demonstrated such string divisions when he produced "harmonic sounds" (*sons harmoniques*) by placing a small obstacle, such as a feather at various points along a vibrating monochord string. He called these points *noeuds*. which has been translated into "nodes" instead of "knots," the literal meaning. He theorized that columns of air in long wind instruments also divided into "equal undulations" and in an instrument such as the trumpet, overtones can be forced by changes in the manner of blowing.

Sauveur was the first observer who stated that harmonics are present in all musical sounds and that they influence the timbre of the tone. He pointed out the changes in timbre produced by combining the sounds of organ pipes from different registers. He defined "harmonic" as: "the sound which makes several vibrations while the fundamental makes only one." In modern acoustics the term "harmonic" is usually used for modes of vibration that are whole-number multiples of the fundamental. "Partial" as a more inclusive term for other modes or components as well came into use during the 19th century.

Sauveur wrote in a clear style easily understood. His writings in publications by the Academie were widely read. His work on vibrating strings and harmonics had considerable influence on developments in physics and mathematics as well as in musical acoustics.

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The Auxiliary Exchange

President's Message

This is my moment to wish each and every one of you a healthy and a very happy New Year. In addition I want to extend the congratulations of all our membership to the following "winter babies" who will be celebrating another birthday. We know of 16 January birthdays, but perhaps there are a few more. Lynette Hollingsworth — 6th; L. Paul Cook — 10th; Barbara Fleming — 12th; Marjorie Fritz — 14th; Charlene Scheppe — 15th; Shirley Martin — 19th; Jeanette Jellen — 20th; Nona Caddell — 23rd; Wilma Erlandson — 24th; Linda Hansen — 24th; Catherine Boettcher — 27th; Mary Hale and Willie Mae McDonald — 28th; Mary Roseburrough — 30th; Florence Reigelman and Jeanne Scheneman — 31st.

And now for our feature article by one of our members who spent three weeks traveling with technicians through Asia last May and June.

Agnes Huether, President

Reporter At Large In The Orient

Who says piano technicians are boring? I find them anything but. Take for example our latest tour by the Piano Technicians Guild to the International Association of Piano Builders and Technicians Conference. I went along as a member of the PTG Auxiliary.

I will tell you how we made history, observed history and saw some of the most beautiful and interesting places in the world. This was the second tour that I have been on with the PTG. The first was in 1986 through Europe. If you recall, Chernobyl had just blown up (or melted down) and terrorists abounded as we tiptoed through the European countries. This time it would be Hong Kong, China, Korea and Japan. Once again, at a most historic time.

History was made when craftsman member Claudia Ellison and I exchanged our wedding vows as we crossed the International Date Line on the way to Hong Kong. United Airlines and the Piano Technicians Guild were most cooperative. What a way to break the ice, but then we knew most of the tour members already. Even our minister was a craftsman member of the Guild, Reverend Edwin A. Hilbert, Jr. of Vermont.

We were wed precisely as we crossed the International Date Line. This puts our wedding dates on May 25 and 26! For those of you wondering how exact the timing was, it was choreographed to the second by the computers of the United Airlines and documented by the Captain, Second Officer and chief purser. We exchanged our intentions (I do's) on one side of the line, Anne Doerfler sang "Evergreen" as we crossed the International Date Line and Ed directed us through our vows on the other side of the line. Guild and Auxiliary members toasted us with champagne as they feasted on wedding cake supplied by United!

Hong Kong was exciting. New York hasn't seen anything in terms of population and high rises, I can guarantee you. We rode on a sampan to tour the boat-people's homes in the harbor; went to the top of Victoria's Peak and shopped till we dropped. Then it was off by train to Guangzhou (Canton) for a most interesting tour of the city and the Pearl River Piano Factory. There they make some 30,000 pianos annually. This factory operation is the second largest manufacturing company of any type throughout all of China.

I was especially fascinated by the myraid of teeny-weeny little parts being assembled and stuffed with little felts and so forth practically all by hand. Unlike the European factories, the Pearl River Piano Factory manufactures apparently every single little part besides the big parts for its Pearl River pianos right there in its own factory. It does not buy other parts from Renner, Roslau or any other parts manufacturer. That was very impressive to me. The local T.V. crew followed us through the tour, and we made the 11 o'clock news.

OSHA apparently has never been to China because the working conditions, sound levels and safety features were deplorable. It was extremely hot and muggy in the plant, and the average wage was $1200 to $1800 per year for the highly technical advanced staff members.

Pearl River Factory was our host for lunch and after eating many mystery foods (didn't know what we ate) we were off to Guilin to observe some very interesting limestone formations, pagodas, pavilions and so forth. Guilin is said to be one of the most picturesque places in all of China, and I agree.

Our hotel accommodations were superb in all cities — of the five star United States variety no less. Transportation was provided by China Airlines in planes made in the Soviet Union. Flying in a Russian plane was very interesting!

Guilin is also the place where a few of our tour members (I declined) wandered off to dine on fresh snake and eel with the locals. The snakes were fresh-killed; the tails flipped around on the sidewalk and made quite a sight, I am told. The Chinese even gathered around to observe the Americans eating one of their delicacies. I understand it was quite good. Certainly very adventuresome to say the least.

Then off via China Air once again to Xian where we first observed the "Pretty-Good-Wall." We knew the "Great Wall" was coming later so the wall around Xian, as big and straight as it was, was deemed by me to be the "Pretty-Good-Wall" of China. Xian is a desert-like city, hot but dry with tree-lined streets for the millions of bicycles that are so plentiful all through China.

Remember, with annual incomes of $200 to $1800, it would be impossible to afford a vehicle let alone pay for the maintenance and fuel of one. Consequently everybody rides bicycles, pedicabs, carts with the fortunate few having motorcycles. There are vans and buses for public transportation.

Xian is the location of the Terra Cotta Soldiers. We were fortunate enough to visit the museum — a vast hangar-like structure that has been built to protect this extraordinary archeological find. Over 6000 archers, foot soldiers, cavalry men, chariots and horses exist within a vast well-defined area.

We also visited the conservatory and listened to the orchestra perform the famous Ninth Symphony of Beethoven with a chorus of one hundred performing the "Ode To Joy" in Chinese! These young adults rose above the poverty in China through their music. We were very impressed.

Before leaving Xian to go to Beijing, I spoke with a young lady who had just left Beijing that morning. I was told that the students were extremely friendly as was the army. The students wanted their pictures taken with the Americans — they loved Americans! It was said to be like the hippie sit-in days of the 60s. "We would enjoy Beijing."

However, Beijing turned out to be something quite different as you all know by now. Our daytime flight was cancelled so that we were able to tour another museum and a commune in Xian. There are three levels of commune dwellings according to income. We were told that we would be visiting with families of middle income level. We were allowed to enter individual people's homes and shops.

After our flight from Xian we arrived in Beijing in late evening and the people were gathering around the various army vehicles on the road between the airport and our hotel. We were told that the trip of 18 miles via bus would take an hour and a half, and that we would *see* why!

The demonstrators who were of all ages, and not just students, were surrounding the very young army and discussing things with them. Although I couldn't understand a word they said, they and their exchanges seemed to be friendly and cordial. The demonstrators even brought food to the Army and swapped cigarettes. The army personnel were smiling and relaxed. It was exactly as I had seen pictures of them in the *Los Angeles Times* prior to our departure. Interesting, not scary.

As we got closer to the hotel, the crowds got larger and noisier which was somewhat unsettling. Just before we arrived at our hotel, the Hotel Beijing-Toronto, we passed a crowd that had set fire to several army vehicles and a bus which were set in blockade fashion. Literally thousands of people were on the streets, sidewalks. It seemed impossible to get through. Yet the driver persisted with his microphone and exterior speaker. He would shout to the crowd to get out of the way. We slowly inched along into the crowd before coming completely surrounded.

At one point the driver had to open the tour bus door to move a bicycle out of the way. Opening the bus door caused the interior lights of the bus to come on. This made our faces visible to the crowd for the first time. When the crowd saw that we were a busload of Americans, they cheered and became excited. Just think how happy they would have been had they known we were piano tuners too! They gave us the victory "V" symbol with their fingers. They were very happy to see us. Thank God!

Well, we inched our way through and finally got to our hotel. I awoke the next day at 4 a.m. to the sound of gunshots, but in my grog and in my American stupidity, I assumed that it must be fireworks or perhaps the guards shooting into the air. I rolled over and went back to sleep. The next time I awoke it was about 6 a.m., and the gunshots continued until about 6:15 when all went quiet. At our beautiful buffet breakfast (Western style) that morning we were told that another army had moved into the area and had killed over 300 students! The demonstrators had been cleaned out of the square and the army had taken the city back. "It was all over." The army had control of the intersections and Tiananmen Square. Again, "it was all over!"

Believing it really was "all over," we got on the tour bus, headed toward Tiananmen Square only to be turned back by the thousands of people mobbing the area. We saw tank tracks, broken bricks and other evidence of a confrontation.

Our next stop was the zoo, but we were disappointed to learn that the zoo and Panda Bear exhibit closed. This was about 10:30 Sunday morning. We were then driven to the Emperor's summer palace on the outskirts of the city, spent the balance of the day there including a cruise on the lake, a visit to a temple and the ubiquitous souvenir shops. Following lunch and a visit to a Friendship Store we boarded our bus and were told that the situation was such that the trip to the Great Wall the following day had been cancelled. We sensed that the situation was getting dangerous but the tour guide was circumspect about mentioning dangerous conditions. Some of our companions who understood Mandarin Chinese were aware that a crisis was brewing.

That evening we saw 96 tanks pass in front of our hotel. The Square was just "down the road a piece." Earlier, four of the tour members (craftsmen) went out of the hotel to see what they could see in the Tiananmen Square. They were actually shot at by the army! They had to hit the deck and run for cover. Thank God they made it back safely to the hotel.

Ohhh — these piano technicians certainly are an adventuresome bunch! We were told the next morning that the university had been blown up by the tanks and that 30,000 people had died!! I could not comprehend this and therefore did not believe it. I still don't.

Despite what the guide told us the previous day, a tour was put together for those of us who wanted to go on to the Great Wall. Twenty-five of us were

bused out to the Great Wall. On arrival we noticed there was not another bus there. We had the "Wall" to ourselves. It was a sight to behold. This was a newly refurbished section of the wall. The Germans in a co-venture with the Chinese had just dedicated it in May of 1989.

On our return we passed many army vehicles with machine-gun toting guards. Our cameras were buried in our cases because no pictures of the army or the demonstrators were to be taken under penalty of death. Streets that were open upon our departure were now closed. We had to take a tiny little rear street about the size of an alley in order to return to the hotel. We were alarmed. We all cheered and sang upon our safe arrival.

That evening soldiers marched down our wide avenue shooting hand guns into the buildings and people. Our hotel took three bullets, two in the bar and one in a marble column. It was scary and dangerous.

We were told that the piano factory in Beijing was "closed for remodeling." Unfortunately we were not permitted to see any part of the Beijing piano plant.

Our main concern was whether there'd be an airplane for us at the airport when it was time to depart. Craftsmen member and our tour organizer, Charlie Huether, and our Chinese guide had spent four hours getting our boarding passes the day before, while the rest of us were sight-seeing at the Great Wall.

United Airlines flew in empty from Tokyo to get us out. When the plane took off with not one empty seat in that huge 747, everyone cheered and on cue from a song leader, sang Watts' "Praise God From Whom All Blessings Flow." While Seoul, Korea is on a direct line from Beijing we had to fly direct to Tokyo, Japan and then back to Korea. There are international matters to be settled between China and Korea over air space and other matters, so our flight was extra long.

Korea was clean, no bicycles but beautiful cars, much traffic, good shopping, good deals and beautiful, warm, friendly people. We liked Korea. we visited Young Chang, Samick and Sojin Piano factories. We saw their automation and high technology piano assemblage. I was impressed with the size of their operations and evident technical skills. We were shown the local PTG meeting place in a piano store in downtown Seoul. Each factory treated us like royalty. They wined, dined and entertained us beautifully. Then it was off for a city tour and more shopping.

Next stop — Kyoto, Japan. We attended the IAPBT conference which was held in one of the most modern, high tech conference centers I had ever seen. This was an especially warm and friendly time.

At the opening cocktail party and reception each country represented took turns singing folksongs in their native tongue: the Taiwanese, Japanese, Korean and American. It truly was a warm, wonderful and heartfelt evening. Saki flowed like water, superb hors d'ouvres, sashimi, teriyaki beef, shrimp — you name it, we had it! It was wonderful.

After two to three days one of which included a tour of quaint, charming Kyoto, Japan's oldest and most "templed" city we resumed our tour and left for the Kawai and Yamaha factories in Hamamatsu. Each company gave us a tour of their operation and hosted fantastic cocktail parties in the evening. It was a food extravaganza like we had not seen since the days of our European factory tour. Our gracious hosts could not do enough for each one in the party, and they showed their great respect for the technicians who service their products in American homes. If you've never felt like a dignitary, a tour with The Piano Technicians Guild is certainly one way to become one.

Thanks to the Japanese Piano Technicians Association, the Auxiliary members and other members of our tour who were not delegates to the convention went on a tour of Kyoto, a shopping spree and a beautiful traditional Japanese sit-on-the-floor luncheon. We had a fabulous time!

Then it was all over. The trip had finally come to a close and we were back on the plane for the eight and a half hour flight to San Francisco.

After 20,000 miles and some 13 flights, our fabulous trip came to an end. We are looking forward to the next one though. Perhaps next time it will be in Columbia, South America! Or in Beirut, Lebanon! You should join us!

L. Paul Cook

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Mar. 2-4, 1990	**South Central Regional Spring Seminar** Hilton Hotel, Santa Fe, NM Contact: Joanie Wagoner, Rt. 4, Box 50-C, Santa Fe, NM 87501 (505) 984-8179
Mar. 29- Apr. 1, 1990	**Pennsylvania State Convention** Warrendale Sheraton Hotel Contact: David Barr, 524 Jones Street, Verona, PA 15147 (412) 828-1538
April 3-5, 1990	**Pacific Northwest Conference** Spokane, WA Contact: Scott Colwes, 1315 Coeur D'Alene Avenue, Coeur D'Alene, ID 83814 (208) 667-3393
April 7, 1990	**East Tennessee One-Day Seminar** Heritage Music, Inc., 7212 Kingston Pike, Knoxville, TN Contact: Tom E. Graves, 228 Hillcrest Drive, Knoxville, TN 37918 (615) 688-0916
Apr. 20-22, 1990	**Michigan State Conference** Lansing, MI Contact: Les Jorgensen, 4201 Wabaningo, Okemos, MI 49964 (517) 349-5959
Apr.26-29, 1990	**NELCRO Seminar** Hotel Auberge Des Gouverneurs, Québec, Canada Contact: Roland Bessette, C.P. 364 SNCC, Brossard, Québec, J4Z 3N3 Canada, (514) 444-1135 or (514) 465-8076
Apr. 26-30, 1990	**Central West Regional Seminar** Henry the 8th Hotel, St. Louis, MO Contact: Liz Baker, 16301-A Manch Road, Glencoe, MO 63038 (314) 664-4914
May 18-19, 1990	**Intermountain Seminar** Provo, UT Contact: Jack Reeves, 486 N. 300 W., Orem, UT 84057 (801) 225-1757
July 7-11, 1990	**33rd Annual PTG Convention & Technical Institute** Hyatt Regency Dallas at Reunion Contact: Piano Technicians Guild, Inc., 4510 Belleview, Suite 100, Kansas City, MO 64111 (816) 753-7747

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Wanted

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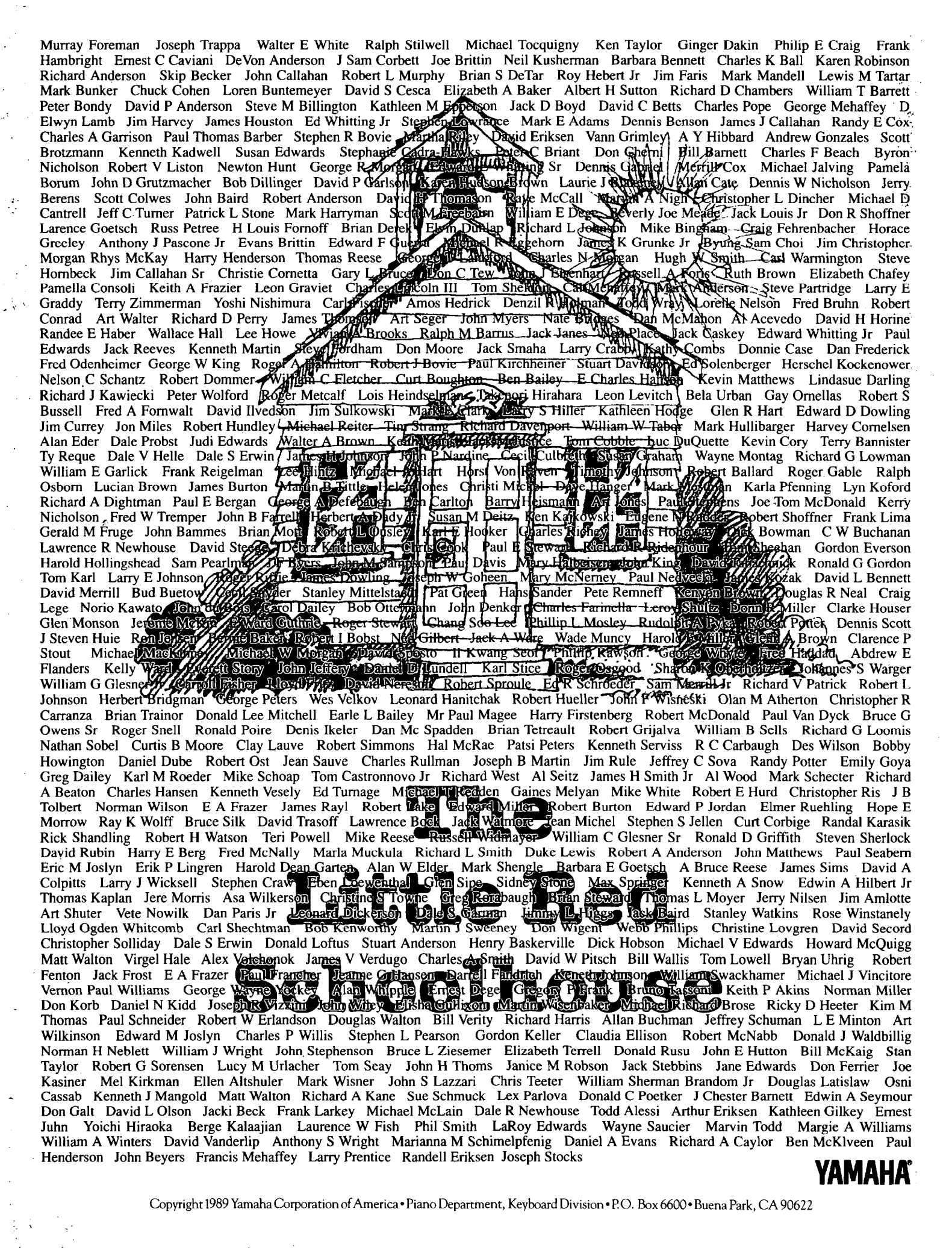

YAMAHA

JAN. **UPDATE** 1990

Published Monthly For Members Of The Piano Technicians Guild, Inc.

Dates & Deadlines

January 1, 1990
1990 dues due.

Deadline for submission of awards nominations to Awards Committee. Contact: Bob Morris, 1729 D Valley Road, Champaign, IL 61820.

January 20, 1990
RTT Tuning & Techncal Examinations. Sacramento, CA. Contact: Neil Panton, 5 Cedar Ct., Menlow Park, CA 94025, (415) 854-8038.

January 13-14, 1990
RTT Tuning Examinations. Southern California Area Examining Board. Contact: Carl Leiberman, (213) 392-2771.

January 31, 1990
1990 dues delinquent

February 1, 1990
Deadline for submission of officer nominations to Nominating Committee. Contact: Teri Powell, 1666 W. 261 St., Harbor City, CA 90710.

Proposed bylaws changes due to Bylaws Committee. Contact: Sharla Kistler, RD #8, Box 461, Allentown, PA 18104.

February 24, 1990
RTT Tuning Examinations. Central Illinois Test Center, Millikin University, Decatur, IL. Contact: John Baird, (217) 429-5651.
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Regional Profile:

Diversity Is Key In Southeast Region

Don Valley, RTT
SE Regional Vice President

The Southeast Region — with Maryland as the northernmost state — extends all the way down the Eastern Seaboard including Tennessee, Alabama, Mississippi, the Virgin Islands and Puerto Rico. Sounds like fun, doesn't it?

Because of the topographical character, the region holds all of what everyone desires for vacationing and relaxation. The mountains of western Maryland, Virginia, the Carolinas, and Georgia. The prolifery of lakes all over the region. The beaches of the Gulf Coast with their snow-white sands and gentle waters as well as those of the Atlantic seacoast surrounding the Virgin Islands and Puerto Rico and all the way from the Florida Keys up through Miami, the playground islands of Georgia, Myrtle Beach, the Outer Banks of North Carolina, Virginia Beach and the Eastern shore of Maryland.

No better fun and spectacular thrills can be had than at Florida's Disneyworld. The visitor in Florida has a never-ending array of unique and different attractions. For the golfer, the east shore locations of South Carolina and Georgia are tops. The auto racing enthusiast will instantly identify with Daytona and Charlotte. The lover of great music will relate to the symphony orchestra centers of Washington, Baltimore, Atlanta, Memphis, and Miami. Those who love to tour always enjoy the quiet openness of Alabama, the Great Smokies of Tennessee, and the Blue Ridge Mountains of North Carolina.

In no other region of our great country can one live where history has always been in the making as dramatically as in the Southeast Region. In the harbor of Baltimore,
Continued on page three

Editor's Note: This issue of the Journal Update *includes articles on the Guild's Southeast Region, and its Regional Vice President, Don Valley. Future issues will profile other regions and other Guild officers.*

SE Members Aid Hugo Victims

After Hurricane Hugo took its toll on the Eastern coastline, Southeast Region PTG members reacted quickly to find those in trouble and help them.

Baltimore Chapter President Preston Hutt called chapter members in the the region to find those in need of assistance. Christie Cornetta, of the Baltimore Chapter, volunteered to collect and disperse contributions, and Don Valley of the Western North Carolina Chapter wrote letters to the Southeast Region Chapter Presidents asking for chapter or individual
Continued on page four

The Soundboard

Letters from readers on organizational matters will be published in this space each month. Letters should be concise and may be edited for length and style. Send letters to: Soundboard, 4510 Belleview, Suite 100, Kansas City, MO 64111.

To The Soundboard:

I was greatly honored to have been elected to the Hall of Fame at the National Convention in Portland 1989. There is no greater honor than being recognized by one's colleagues for his contribution.

It has given me great pleasure to share my knowledge and experience with the members of PTG as an instructor, advisor and author. It is known as the legacy for what I have received.

As a charter member of the Guild, I have been privileged to observe the improvement of the quality of technical classes over the years. The sharing of knowledge and experience is the lifeblood of this organization. I encourage the newer members to take what my generation has given, improve it, administer it, and provide the continuity necessary for the survival and excellence of this organization.

Norman H. Neblett
Los Angeles Chapter

To The Soundboard:

I was recently quite surprised by the answers I got from the technical services department of a well-known piano manufacturer, after inquiring about a couple of problems encountered in two of their new pianos. One problem was negative downbearing on the bass bridge (crown was okay) as well as practically no side bearing across the bridge, which made some of the bass strings buzz on a hard blow. I was told to simply bend the bridge pins to create side bearing, and pin down the strings to the bridge.

The other problem was excessive downweight (57-62 g.) and high upweight (28-34 g.).The solution? Silicone and naphtha! Where? on the hammer flange centers (what a stupid question).

This is the kind of technical advice we're receiving? I think we can do without this kind of advice, actually.

Vince Mrykalo
Baltimore Chapter

To the Soundboard:

From time to time, there exists a subject that raises the necessity of observation, evaluation, and comment. This time there are several.

It seems that the word "guild" has lost its significance in our organization. The definition of guild, brings with it several obligations. For instance, the upper, or Craftsmen members of a guild have the obligation to guide and teach the lower members, or students. That student, or in the context of a guild, apprentice, has the obligation to attend to the organizational needs as the association dictates, and the preeminent obligation to advance their position within the guild. Advancing one's position is a way to pay back the debt incurred from the upper members in the form of education, by giving to the lower members.

Somehow, I'm afraid, the obligation of advancement has eluded some of us for what it is, an obligation. Members who have been at the student or apprentice level for more than five years have missed the point. If that member has no intention of improving their status, then there exists a circumvention of the scheme of a guild, and with that, another obligation, and that is to relieve the organization and the business of their unimpassioned participation.

For some, the time for leaving is long overdue. They are professionals in another field who have neither the time, nor the feeling of importance necessary for learning the skills of a secondary profession. For others, the test necessary for advancement is an impossibility. By the usual guild's standards, these tests are minimal requirements. If one is not able to pass such a scarce standard, then another obligation follows, and that is to abstain from the peddling of inferior skills on the public. It is further an obligation, to portray one's guild as having the highest standards possible. To belong as a student member certainly has its place. But after a normal period of time, its place no longer exists.

There are those who would agree with the preceding. And those, who would reserve membership only for individuals who can demonstrate the skills necessary to service a client's piano properly. If those skills are lacking, the Guild certainly has the obligation to guide and to educate. But the more important encumbrance rests squarely on the shoulders of the apprentice. To learn and to perform; advancing in an orderly and timely fashion.

If the movement to retain only those members who have demonstrated the necessary skills is in some way accepted, there will be many left out in the cold. They will be left outside the doors of the Guild, with no obligation on the part of the Guild to attend to, guide, or educate. Only the achievers will be able to fly the banner of the Guild.

Perhaps the lack of enthusiasm for advancement is in part the fault of the Guild itself. Since the Student/Apprentice Status was eliminated from the Guild's guidelines, the incentive for advancement has lapsed. The

SE Region...

Francis Scott Key was inspired to pen our National Anthem. The nation's capital is a standing record — past and in progress — of a country's ongoing development. The awe inspiring monuments — the archives — the museums — the gardens — the home of our presidents — the Capitol building — the pomp — the patriotism — no where else can one acquire so much quality for the time spent.

The Civil War battlefields of Virginia are silent reminders of those who not only stood for their rights, but were willing to die for the cause. Annapolis — the Naval Academy — lives to inspire men of the sea-loving kind to serve their great country. Historic Charleston, once our nation's Capitol, preserves the memories of yesteryear for today's inquiring mind. Just down the coast is another community with similar purpose and pride — Savannah, Georgia. On down the same coast is St. Augustine — acclaimed to be the nations's oldest city, when in actuality, Pensacola holds that distinction.

The war between the states was fought on Southeast Region soil. The Mason-Dixon line was drawn here. The United States of America began here. Many of our presidents have lived here. The early settlers found the Southeast Region to be very inviting, and so will you.

The climate is generally moderate; Maryland has snow emergency routes for good control during those rare dustings of snow. Snow doesn't last long, except on the ski slopes of western Maryland, Virginia, the Carolinas, and Georgia. The year-round summer of Florida, Alabama, and Mississippi invites the vacationers

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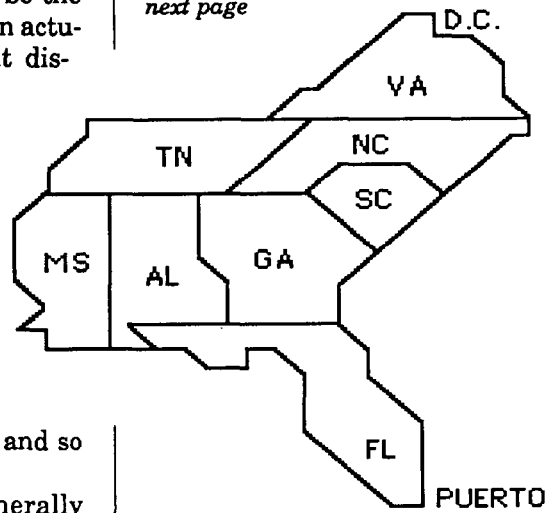

PTG's Southeast Region

In Respectful Memory...

Sam Becker

Sam Becker, of Grand Island, NE, died November 22, 1989. He was born April 7, 1907 at Marion, SD, and married to Ella Unruh in 1934. They have three children. He was a graduate of Moody Bible Institute and served as pastor to four churches and as State Chaplain of the Nebraska Veterans Home for 15 years. He was an active church musician and as a family they gave concerts in 14 states. The need for tuned pianos for these concerts led to piano tuning as a hobby and as a profession at retirement. He became a member of the Piano Technicians Guild in 1963.

Soundboard...

obligation involved with association in the Guild has been forsaken. And finally, inundated with lesser qualified members, the Guild, in a diluted state, suffers badly because of it.

The quest for a solid membership base, in character, quality, and numbers, is inherent in any organization. But the shortsightedness which comes from recruitment, with only numbers as criterion, will most assuredly take its toll in time, if it hasn't thus far. For our logo to mean something, it must stand for something.

Ralph Joseph Onesti
Philadelphia Chapter

Dates & Deadlines...

March 2, 1990
Members who are delinquent in 1990 dues to be dropped from roster.

March 23-24, 1990
RTT Tuning & Technical Examinations. Cincinnati Regional Testing Center, College-Conservatory of Music, Cincinnati, OH. Contact: Tuning Exams: Michael Wathen (513) 556-9565; Technical Exams: Don Gibbs (513) 575-1616. Note: payment due 30 days in advance.

April 9, 1990
RTT Tuning & Technical Examinations. San Francisco-Bay Area, California. Contact: Neil Panton, 5 Cedar Ct.; Menlow Park, CA 94025; (415) 854-8038

July 7-11, 1990
33rd Annual Convention & Technical Institute. Hyatt Regency Dallas. Contact: Home Office 4510 Belleview, Suite 100, Kansas City, MO 64111; (816) 753-7747.

Meet Your Board Members: Don Valley, RTT

Lisa Gray
Assistant Editor

In 1979, thinking of the three children he would someday put through college, Don decided to leave the field of education, and concentrate on his part-time business of 10 years, piano rebuilding and service. Don also has a satellite business in Cape May, NJ, where he works during the summer.

Prior to becoming a piano technician, Don taught vocal/choral music for 22 years at the high school and college levels. Don did his undergraduate work in Greenville, SC. He received a Master's in Music at the University of Michigan, and completed some advanced graduate work at Oberlin College in Ohio. Don and his wife, Mary, have three children; Deena, Ingrid and Gentry, and two grandchildren.

Elected Southeast Regional Vice President in July 1989, Don was charged by representatives at the North Carolina State Conference to appoint and encourage a committee to study the feasibility of Southeast regional conferences augmented by one-day local seminars. He also served as chairman of a committee that conducted an extensive study of the Guild's continuing education needs.

Asked for his predictions for the piano business in 1990, Don said, "The acoustic piano will stand and stand firm. There may be a perifery of attatchments such as MIDI units and electronic player units because of the demands of the entertaining performer lounge/club scene. But all in all, these people who play electronic sounds still prefer to work at the acoustic keyboard. Therefore, we as technicians should broaden our horizons somewhat to include these items as accessories to our piano service. These are not here to replace the acoustic piano. They are here to enhance it."

Hurricane Relief...

contributions. Christie and Don called members to see if they were okay, and ask for donations to help those who were not.

"We were happy with the outpouring of generosity from members and chapters in the Southeast Region," Christie said, "It's nice to have the support from other members in the region." Christie reported that approximately $2,400 was collected and sent to the Charleston, SC, Chapter.

Don added, "What impresses me is that when the Southeast Region is aware of a need, they rise to the cause."

Christie received thank you letters from the members who were helped. They were very grateful to receive this help when they needed it the most, and the Baltimore Chapter would like to thank everyone for their contributions.

Southeast Region...

from other regions to spend their tuning and repair riches here.

PTG membership is solid throughout most of the region. Heavy concentrations are in the Baltimore - Washington and Northern Virginia areas. Regional seminars of North Carolina and Florida are full of vitality, North Carolina having risen in recent years to attract national interest.

Thirty-one chapters span the region; most are alive and doing better! Regional testing centers are being created now so as to facilitate the handling of exams. Momentum is increasing on the idea of regional seminars with local one-day meetings as a compliment to this development.

Keep your eyes peeled to the *Journal* for new and different types of events; then make your plans to fit into our plans as the Southeast Region rises to meet the demands of the ongoing causes of PTG.

Membership Status By Region

Northeast Region	849
Northeast RTTs	546
Southeast Region	608
Southeast RTTs	401
South Central Region	344
South Central RTTs	219
Central East Region	630
Central East RTTs	404
Central West Region	376
Central West RTTs	262
Western Region	624
Western RTTs	417
Pacific NW Region	338
Pacific NW RTTs	227
Total Membership	3,819
Total RTTs	2,476

Running Fair Technical Exams

Bill Spurlock
Chairman, Technical Exam Subcommittee

At the recent Council session in Portland, the new PTG Technical Exam was designated as the one official exam (the LA version will not be allowed after June 1990). With this move, we have removed the most obvious hindrance to uniform testing: that is, the use of two completely different exams.

The new exam was developed through a lengthy process which included experience with the old bench test combined with development and usage of the original LA and Chicago exams, development and usage of the revised LA exam, and finally the combining of the best features of both the LA and Chicago versions into the new exam. Although tedious and time-consuming, this process amounted to a study, from several different viewpoints, of technical testing methods. Exam content and procedures that were troublesome or unfair to the examinee were revealed and dealt with. Fairness became a major priority in the writing of the new exam, along with simplicity of props, an easily understood manual, economy of examiner manpower, and simplified paperwork.

Throughout this process I had been aware that examinees would frequently perceive the exam as unfair if it included content that they were not expecting. After all, if they had been in business for several years and had never done a certain job, that job must not be typical and was therefore unfair; never mind that other technicians might do that job routinely. In some cases the solution to this was to eliminate the test problem. However, the bigger fault was usually a lack of available information on basic technical procedures in Guild and industry media.

I have attempted to address this need as much as possible through exam features such as the examinee letter (describing the specific jobs to be done and the time limits allowed for them) and the pre-screening questions contained in the exam book (which are designed to give both the examiner and examinee some idea of the applicant's readiness). In addition, I have produced a number of auxiliary projects including an 11-page study guide, convention and seminar programs on preparing for the exam, and the current *Journal* series, "Basic Skills."

While every effort has been made to make this exam as fair and objective as possible, there will always remain the big variable of examiner conduct. No exam can be immune from some examiner influence; I would like to point out some of the more common problems in this area in an effort to promote a high standard of fairness in examiner performance. The following points deserve special examiner attention:

1. Pre-Screening - This procedure, although strictly voluntary, is strongly recommended. Too often an applicant will be encouraged to take the exam before he/she is really ready. This happens either because the advisor is unfamiliar with the exam, unfamiliar with the applicant's actual skill level, or unwilling to tell a peer that he or she is not ready yet. The pre-screening questions provide a device, somewhat removed from the personalities involved, to advise and inform the applicant without insulting. The results of this pre-screening *do not* provide a basis for refusing to test an applicant, no matter how unprepared he/she may seem.

2. Letter to Examinee - Located on page eight of the manual, this letter should be sent out as far ahead of the exam date as possible so the examinee has ample time to review the specific exam tasks.

3. Adherence to Procedures - Examiners should study the exam book ahead of time. Exam procedures are clearly detailed in the manual; examiners should follow these procedures and not improvise.

4. Action Models and Props - These should be thoroughly prepared according to the instructions in the manual. The examiners must try them out ahead of time to make sure that it is possible to get a perfect score using those props. For instance, a vertical action model with tight wippen centers may require so much lost motion to allow jack return upon key release that the regulation job would then lose a point for excessive lost motion. Models and other props must be re-inspected before each new examinee uses them; if the previous examinee damaged the wippen pinning it must be corrected so the next examinee can properly space the wippen. Many people have incorrectly assumed that an actual piano can be used for the string repair jobs. The exam manual specifies a simple stringing jig which is clamped to a table, so the examinee has free access to all parts. In contrast, a real piano has more limited access, crowded tuning pins, additional bearing points etc. which could slow the examinee down. All time limits are determined for the props and models specified; to be fair to the examinee, these should be simple and straightforward.

5. Work Areas - The exam manual specifies a separate room for each examinee. The intention here is to provide privacy for the examinees as they work, as well

Continued on next page

as privacy for the examiners as they discuss scoring of another examinee's work. If such privacy and quiet can be provided in a single large room such as one with dividing walls, etc., that is okay. However, frequently there are new examiners being trained during an exam session, so conversation among examiners can intrude upon the situation and influence the results. For example, I was involved in an exam in which three examinees were working in a confined area. As we scored a key bushing job and commented on the excessive depth of bushing cloth in the mortise, we were overheard by another examinee. When it came time for him to do his key bushing he deliberately overcompensated and left far too little cloth in his key. He even told us that he usually leaves more but since he had heard us mention "way too much cloth" he changed from his usual method. In this case the lack of privacy distracted the examinee from the task at hand, as well as causing him to lose points on his next job. Fairness requires privacy for both examiners and applicants.

6. Answering Questions - As stated in the exam manual, examiners should explain any special features of the action models and props, and answer any questions the examinees may have. Common sense must be used here; for example, if the examinee asks whether or not he is required to bed the key frame on the grand action model, he should be told no. However, if he asks what let-off distance he should set, the examiner must refuse to answer. In general, examiners should make sure that the examinees understand what job they are supposed to do. It is the examinees' responsibility to know how to do that job. Examiners should stay nearby during the test in case examinees have questions during their work.

7. Tools and Supplies - As stated in the letter, the examinee must come equipped with all necessary tools and supplies to do the jobs listed. The intention here is to make the exam work as familiar and comfortable as possible by having the examinee use his own tools. Here again, common sense should be used. If an examinee shows up with all necessary equipment but discovers he is out of upright hammer shanks, the examiners should provide one; the exam does not intend to test for one's inventory skills. However, the examinee who states "I've never bought one of those hammer shank extractors. Could I borrow yours? How does it work?" has not followed instructions and the examiners may decide to discontinue that exam section. Applicants sometimes ask whether they are allowed to use regulation checklists or other printed material during the exam. This is allowed (like good hand tools, written materials are a tool which technicians should be encouraged to use, whether regulating a piano on the job or regulating an action model during the exam). However, the examinee should be advised that if they feel completely dependent upon notes or checklists they may not be sufficiently prepared to challenge the exam.

8. Scoring - As stated on page four, number three, of the manual, there are many scoring criteria that are not measured with a ruler but instead require judgement calls by the examiners. The examiners should realize that all measured items have +/- tolerances within which credit is allowed and should apply a similar tolerance to these non-measured items. For example, if it can be seen that a hammer is very slightly off-center to a string, "hammer to string alignment" should get full credit. However, if the hammer is significantly off center and could be easily improved, no credit should be given. Here again, common sense must be used. we simply cannot accurately measure hammer fuzz with a micrometer. All scoring must be done by at least two examiners to improve objectivity.

9. Personnel Problems - personalities being what they are, situations arise where an examiner will intimidate an applicant or vice versa. The anxiety of being tested by one's peers can make the applicant especially sensitive to unfair or perceived unfair treatment. It is essential that all exam personnel be aware of possible problems and make every effort to maintain a relaxed but professional atmosphere during testing. When there is a pre-existing problem between an applicant and an examiner, the exam committee should avoid trouble by removing that examiner from duty for that applicant's test; or they may suggest that the applicant travel to another test site. Examiners are encouraged to discuss the results with the applicant at the end of the test session. This is especially important if the applicant feels that his/her work was unfairly judged. While the actual scoring criteria are never shown to the examinees, their work should be discussed in such cases to point out the specific errors. Ideally they can come away with the feeling that the exam has been a learning experience and with offers of assistance in helping them improve any weak areas.

Conclusion

The technical exam exists to measure one's level of expertise, compared to a standard we call Craftsman level. For the technician willing to work to achieve this goal the Guild provides many educational resources. As examiners, our responsibility is to do our best to ensure that when we judge our peers we do so fairly and with the motive of helping them progress.

Improving Our Public Relations

Jim Hill
Chairman
Newsletter Committee

The chapter newsletter is or should be a vital element in gluing the local chapter together; both as it relates to the chapter members and also their customers. It is a primary tool for organizing, informing, and training. In the area of training, *How about public relations?* Is this something about which we really need to concern ourselves?

There is no other area of our profession that is more important to our being successful than our individual treatment of public relations. Every day we meet and work for other people with backgrounds infinitely more varied than our own. The way that they perceive us (our attitudes, competence, personality, and appearance) will determine whether we work for them now and/or the future.

One of the major non-technical concepts which I try to stress in the piano technology class which I teach is this: *People never see the real you, only what you appear to be.*

Is it wrong or unethical then to try to the best of our ability to appear to be the very best that we can? Each of us is an individual and is unique. No other person in the world is like us or has shared the same experiences since birth that another has. But, to fall back on that uniqueness with a statement such as "I won't try to be anything but myself," is in my opinion the epitome of egotism.

Each one of us should at all times be attempting to be "better than we really are." Not to do this is to stunt one's personal growth. And, one way to do this is to act the part until, by habit, we become what we are acting. Shakespeare, in one of his plays, wrote a verse that goes something like this: "The world is a stage and all of us are but actors on it."

In the major colleges around the country it is taught that only 20 percent of your business will come from the asset of competence. The other 80 percent comes from the asset of public relations: how you meet and treat your public.

Think about that for a moment. Of all your customers (past, present, or future), how many can you count that really have any correct idea of how competent you are? Even with the best music teacher customer you have, how many of them know how to sit down and evaluate the work that you have done or propose to do?

The point is just this. If we want to be more successful in our chosen profession, one thing above all others is important for each of us to improve; our image. This does not change what we are; only how we appear to others. And, that is not being phoney. It is being aware of the reality and necessity of practicing good public relations. Constantly improving our techniques in that area is as important if not more important to the growth of our business than improving our technical competence.

That is not to say that technical competence is not important. Without that, one is surely to be found out as a fraud in short order. But, given that one has an adequate degree of technical competence, public relations has and always will have a more profound effect on the growth or failure of a business.

In order to improve our public relations, it is necessary to improve several areas of qualifying our customer and to act in conformance with who and what we perceive the customer to be. But, before we can get a good perception of the customer we must recognize that he is within four basic recognizable personality types. These types are the following:

1. The Sanguine. This person is a socializer. Things must relate to being fun or joyful. A person such as this is usually quite a good story teller; and, it does not matter much whether the story is completely factual or not. The idea for this person is to make things interesting and fun. They are party people.

2. The Choleric. This person is a director. Things must be done their way. They must always be in complete control of the situation. If things are not done their way, regardless of the outcome, things have been done wrong. They can be loud, abusive, abrasive, and generally hard to get along with. Yet, they can not understand why people might not like them.

3. The Melancholic. This person is a perfectionist. He is a bean-counter. He is never happy with people as they are but is always trying to change people and conditions. They are thinkers.

4. The Phlegmatic. This person is a peaceful one. He is interested in relationships; how to make them more peaceful. He seldom has any great accomplishments because he will refuse to assert his own way even when in danger. If backed into a corner, he will just be silent.

It is interesting to note that these personality types have successful marriages with their opposite types. For instance, Sanguines marry Melancholics and Cholerics marry Phlegmatics.

In order to perceive how you might best relate with your customer, here are six primary points of qualifying him:

1. Determine what his personality type is. Talk to him at his level and with understanding of his personality.

Continued on next page

Public Relations...

2. Always dress appropriately and practice good personal hygiene regardless of what the customer does.

3. Always talk to the customer about things which concern him/her; not about yourself. That is, never show your dirty laundry to your customer.

4. If asked about a competitor, always respond with something positive or nothing at all. To bad-mouth your competition only degrades yourself in the eyes of the customer regardless of what the customer may have said or may say about your competitor.

5. Never argue with the customer. He is and shall always be your boss. Give him the facts and your evaluation of a situation and let him make the decision. But, never agree to perform service which is below your own standards; walk away from the job first.

6. Always appear successful and professional.

There are many other ideas which could be listed, but learning to improve on just these six should help all of us.

1990 Dues Due This Month

Membership dues for the 1990 calendar year were officially due at the beginning of this month and will be delinquent on January 31. Those whose dues remain unpaid by March 2 will be removed from the roster.

Where chapter dues are collected by the Home Office, invoices and statements include those amounts. According to the Guild Bylaws and Regulations, all members must belong to a Guild chapter as well as the parent organization. Chapters that collect their own dues are requested to notify the Home Office as soon as possible after the drop date of any outstanding chapter dues. Members who have not paid their chapter dues will also be dropped from the Guild. Chapter dues collected by the Home Office will be disbursed as soon as possible after the March 2 drop date.

The 1990 Guild membership directory, which traditionally has been published in December or January, will be printed after the March 2 deadline, and only those members whose dues are current will be listed in it. Members should verify their addresses and telephone numbers as printed on the dues invoice, because that information will be used to produce the new directory.

By mid-December, almost half of the Guild's membership had completed their 1990 dues payments.