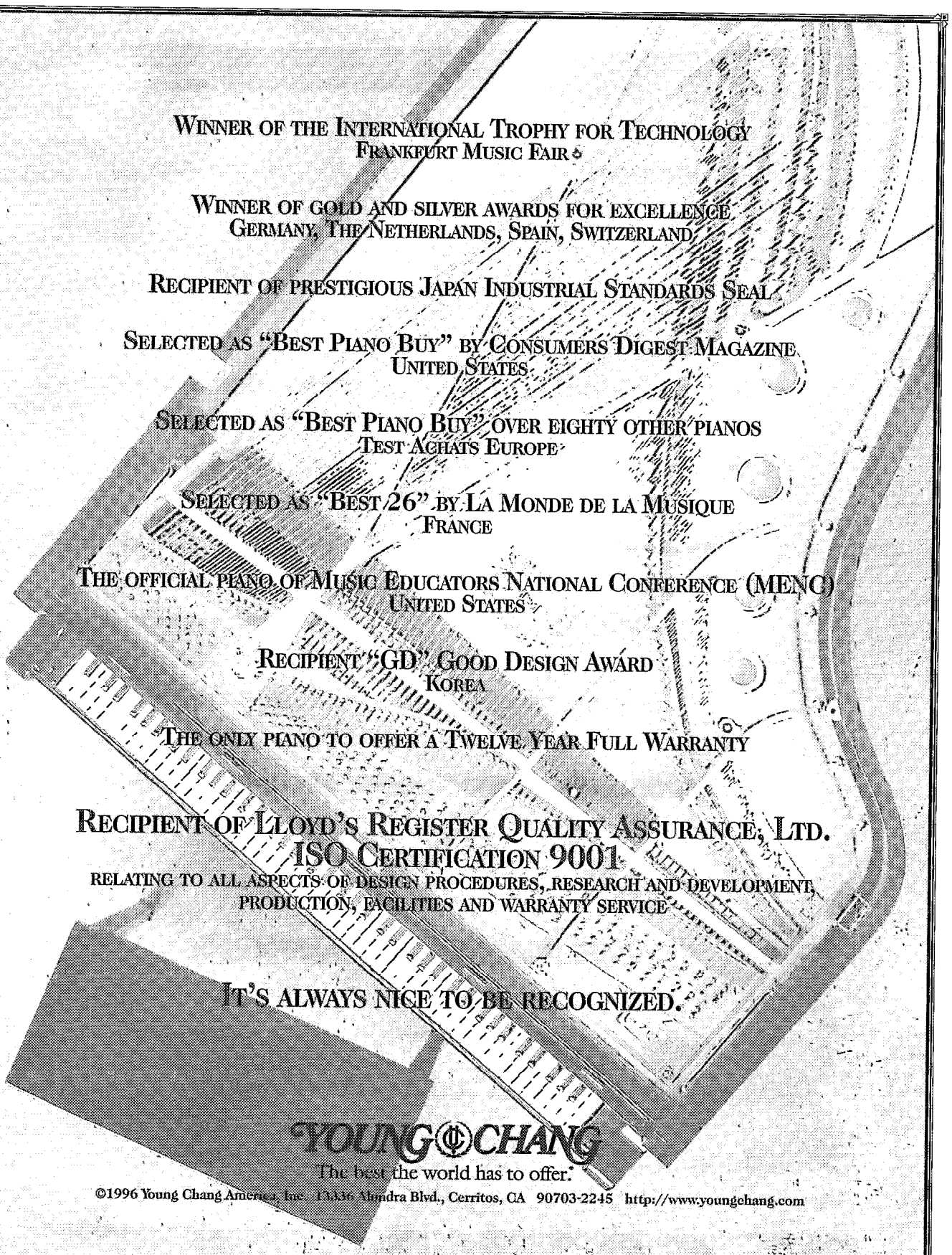
PIANO TECHNICIANS
Journal
Official Publication of the Piano Technicians Guild

August 1997 Vol. 40 • #8

Inside:



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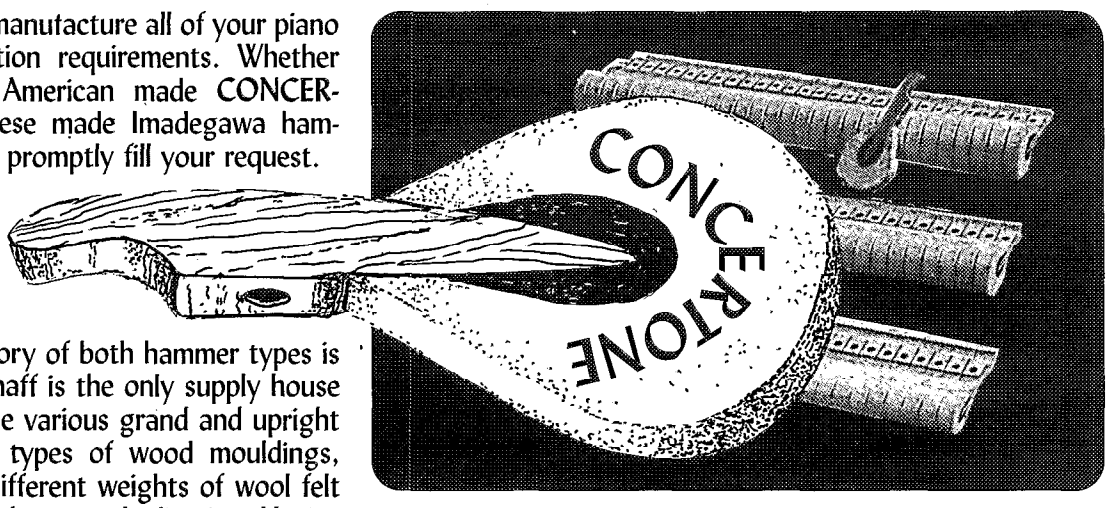

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DEADLINE: No less than 60 days before publication date (i.e., September 1 for November issue)
Send materials and letters to: Steve Brady, *Journal* Editor
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Subscriptions
Annual subscription rates: $55 (US) for Members; $85 for Non-Members(US)/1 year; $155 (US)/2 years;
Single copies: Current year/$10; 1 year/$5; back copies/$2 if available. Piano Technicians Guild members receive the *Journal* for $55 per year as part of their membership dues.

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

Editorial Perspective

Hash & Rehash

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

A few years ago one of my most respected colleagues criticized the *Journal* as being mostly "hash and rehash." After thinking that over a bit, I had to agree that, yes, in the main, we tend to see the same material surface over and over again in the pages of the *Journal*. After all, what do we do with pianos besides tune them, voice them, regulate them, repair them and rebuild them?

But is it necessarily wrong that we read about and write about the same topics over and over again? I think not. I believe that what may appear to be "hash and rehash" to some is "think and rethink" — the fuel for growth — to others. It is only by a process of exposing ourselves to the same material over and over again that we can refine and improve our work, our attitudes and, ultimately, our lives.

Consider the articles in this month's issue. We have an article by Jim Coleman Sr. on tuning equal temperament with pure 5ths. This idea, radical or impossible as it may seem to some, has been around for many years and is used by many excellent tuners. The concept has probably never had as visible and credible an advocate as it does here, and although the idea has been around, we've never seen a comprehensive treatment of it in these pages before. It's old, yet new.

With Clair Davies' article, we find a "rehash," if you will, of material which first appeared in the *Journal* 10 years ago. The thing is, the press Clair presents in this issue is a much-improved version of the press he wrote about back then. In the interim, he's had time to find the flaws and fix them. No mere leftover, this hash has a much better flavor and texture than it did the first time around.

Skip Becker's series on the history of tuning contains material which has appeared in different forms before, both in the *Journal* and elsewhere, but here it has a special slant which is all Skip's, and that's what makes this "rehash" unique and rewarding. For with each new interpretation of history or technical procedure, we learn something, or at least broaden our perspective.

Some of us replace bridle straps every day. Others never have, and still others haven't done it for years. When we read an article on bridle strap replacement, or on anything else for that matter, we each bring our own previous experience to the reading. I could even read the same article twice, 10 years apart, and come away with a completely different response, simply because the intervening 10 years have left their mark — for good or ill — upon me.

Finally, as I read Carol Beigel's tale of woe, I am reminded of all the times I've "stepped in it," and I empathize with her. The fact that she has stepped in a different plate of hash than I have only enriches both the story and the reader.

Our existence has a spiraling, not-quite-circular quality to it. If we are intent on growing, we return constantly to old material and old scenes and view them differently.

As T.S. Eliot observed in *Four Quartets*:

> *We shall not cease from exploration*
> *And the end of all our exploring*
> *Will be to arrive where we started*
> *And know the place for the first time.*

And in this knowledge lies the true value of "hash and rehash."

Please submit tuning and technical articles, queries, tips, etc., to me:
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DEPARTMENTS

IN ADDITION

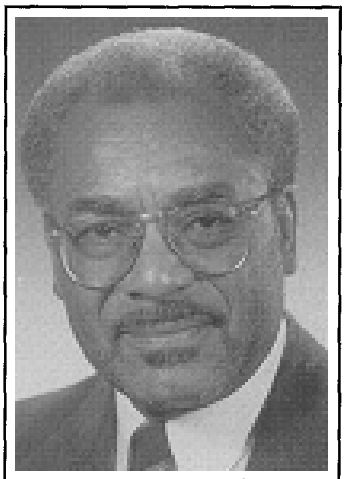
COVER ART

The 30-ton pneumatic soundboard press, designed by Clair Davies. See Clair's article beginning on Page 27.

PIANO TECHNICIANS **Journal**

Volume 40 • Number 8 • August 1997

Building on the Past... Looking to the Future... A 40-Year Tradition



Marshall B. Hawkins, RPT
PTG President

For some it may not be easy to realize that 40 years ago two groups of piano service people, the American Society of Piano Technicians (ASPT) and the National Association of Piano Tuners (NAPT), culminated some very in-depth discussions between the two groups. Much of what was discussed had to do with standards — and the need to unify piano technicians into one organization in order to achieve the highest possible service standards as well as to promote those standards throughout the industry and indeed the world.

Those discussxions were led by two men who we in the Piano Technicians Guild shall forever be indebted. Mr. Errol (Putt) Crowl of the ASPT and Mr. John Travis of the NAPT were the leaders of those discussions which led to the merger of those two organizations into what the world recognizes as the Piano Technicians Guild.

In this issue of the *Piano Technicians Journal,* which is our official publication, someone always has the opportunity to say thank you. This time I have that opportunity for the fourth time. Not in succession, but nevertheless, the fourth time. I feel tremendously proud and privileged to again say: "Thank you." Thank you to all of the voting membership who have once again chosen to place their trust in me to be your spokesman, your leader and your president.

What a fantastic time to be alive. Our 40th anniversary and another association year to look forward to as we move ever closer to the turn of the century, at which time we officially celebrate the 300th anniversary of the invention of that magnificent musical instrument the piano forte. Indeed — our reason for being.

As we proceed through the remainder of this year, it will be my goal to continue to promote in every way that I can the highest professional standards of craftsmanship for our membership. It has been my experience that when we provide excellent quality service on a daily basis within the framework of fairness and decency, the economic standard we desire will improve accordingly.

Allow me to invite you to join me in making this goal a living reality not only for our entire membership, but also for those who will no doubt be seeking to join us in this journey.

I want to spend some time talking about year 2000, the International Year of the Piano. Back in January of this year the Piano Technicians Guild was invited to be a part of a planning conference held at the Smithsonian Institution in Washington, DC. This initiative is being called PIANO 300 which, of course, signifies the 300th anniversary of the invention of the piano.

Among the proposed components of PIANO 300 will be what I understand an extended exhibition beyond the Hall of Musical Instruments at the Smithsonian Institutions National Museum of American History. Literally thousands of people from around the world visit the museum yearly. What better contribution can we as piano people make as the year 2000 approaches than to on a daily basis speak out individually concerning PIANO 300, the 300th anniversary of the invention of the piano?

We definitely have the opportunity of making a bigger impact on the general public and specifically the piano playing public than ever in our history. Make it a part of your daily activity.

The following statement was made earlier this year. While the piano is now clearly an historical instrument, its association with history does not make it of merely sentimental interest. Building copies of earlier pianos and the restitution of earlier performance styles has helped revitalize both concert life and the academic study of music, and the use of the piano as an historical instrument is itself becoming part of the history of the piano. The piano connects us to our past in ways both personal and universal; for young people it can provide an understanding of the lives of their parents and grandparents; to our culture as a whole it offers insight into the evolution of our modes of socializing and entertainment, our habits of training and discipline, and our concepts of beauty and pleasure.

So, during this 40th year of the Piano Technicians Guild, be sure to do your part as we continue to build on the past as we look to the future.

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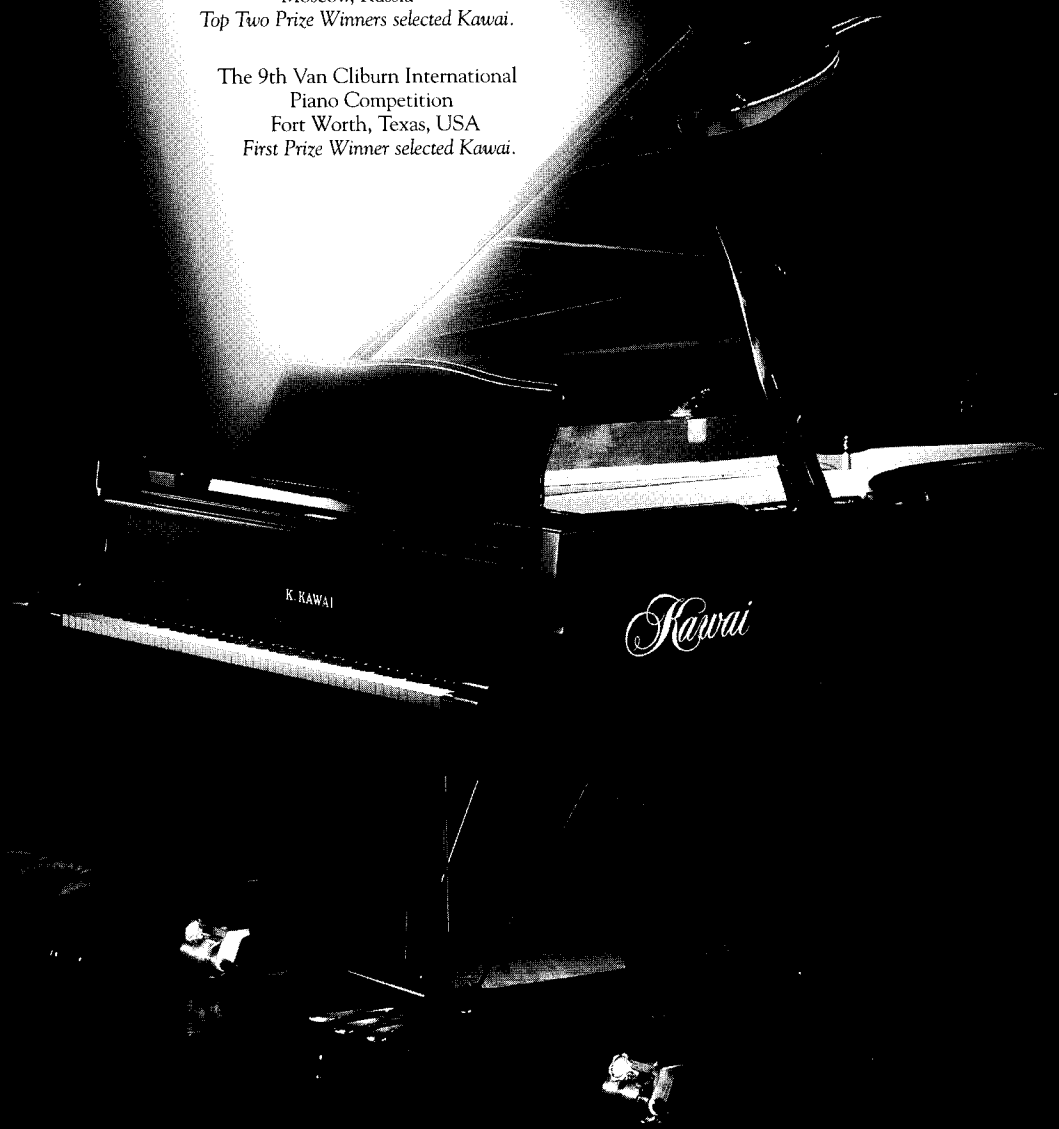

It's becoming a familiar refrain.

TT&T Improved SAT Light Pattern in Fifth Octave

Well, I have solved the great mystery of how to get the fifth octave to show a good and discernible pattern, and, like many a mystery, it is very simple. I have not made an extensive study of this solution, but I am sure I will hear of it if someone finds it does not work on a particular piano, but that's okay, too.

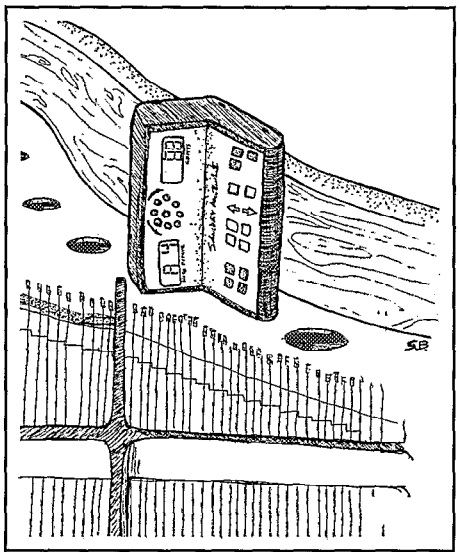

Figure 1

If you are having difficulty seeing a pattern when tuning the top of the fifth octave, you can turn the SAT on its left end (see Figure 1). The wavelengths up there are on the order of six to seven inches, so setting the SAT on its side will elevate the microphone just enough to catch the anti-node. If you need more elevation set it on one of the plate strut junctions. Happy Lighting.

— Newton Hunt, RPT
New York City Chapter

TT&T More on Tool-kit Minimalism

As a technician who can't drive, I was interested in the New York City Tool Kit (see *PTJ*, May, 1997, pp. 17-21). I use a driver when I carry my big Emil Fries tool kit, and I have a small Genck case I carry when I use public transportation. I have tried to stock the small one with combination and miniaturized tools, and can do quite a bit with that kit. I noticed that no one mentioned (in the article) the Leatherman™ tool. I learned of it in 1993 when I returned to the Piano Hospital to learn methods of work for my recent visual loss. My brother-in-law across the river in Milwaukie, Oregon introduced me to the Leatherman™, which he developed. It is a stainless-steel, fold-up tool with tempered blades. When opened or unfolded, a pair of solid long-nose pliers is exposed, with a tempered steel wire cutter up the nose near the handle pivot. In the fold-up handles are professional screwdriver blades, three sizes of slotted, one Phillips, along with a sharp knife, a working file, and a bottle opener. When closed, the handle can be used for measuring. Rivets or dents can be added for those measuring by touch rather than eyesight. Mine was free (a birthday present), but I think they cost around $60. And I hear that they come with a little pair of scissors in the handle now. When closed, it measures one inch by four inches by 1/2 inch. I have found it a very useful and high-quality tool for such a little thing.

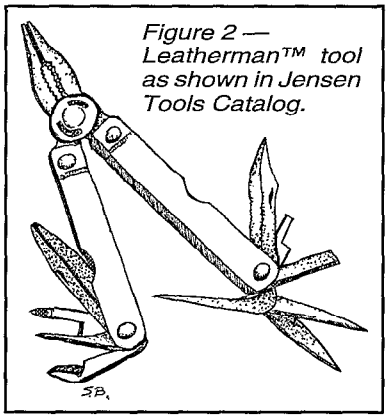

Figure 2 — Leatherman™ tool as shown in Jensen Tools Catalog.

Since the 1960s I have always used the Emil Fries Tool case, since I believe it can carry more in one container than anything else [*EDITOR'S NOTE: See David Severance's article in the October 1996* PTJ *for more information on this case. SB*]. With my first one in 1966 I had a lot of regulation and combination blades and tools. I had some 1" x 12" plastic tubes made; I keep three of these tubes full of various combination tools, and the tubes fit in the tool roll. Compared to putting the combination tools in a pallet, these plastic tubes save space in the tool box. I'm having a couple of 1" x 18" ones made for the Genck case.

— Paul Houghtelin, RPT
Twin Cities, MN Chapter

TT&T Lifetime Sandpaper?

Is there something like "lifetime" sandpaper? Probably not, but the closest thing I've seen is European Industrial Quality abrasive cloth. This bright yellow-colored, cloth-backed material comes in three grades (fine, medium, and coarse), and besides being practically indestructible it is the most expensive sanding medium I've ever seen — over twice as expensive as some average stuff! Costs run about $20 (includes shipping and handling) for a 5" x10' roll, to about $46 for a thirty-foot roll. Phew! But ... cost is commensurate with time and production, so all in all if you do a lot of sanding it's a good buy. It is available from Minuteman, Inc. 1-800-733-1776.

— Bob Bartnik
Richmond, VA Chapter
Reprinted from The Richmond Update chapter newsletter

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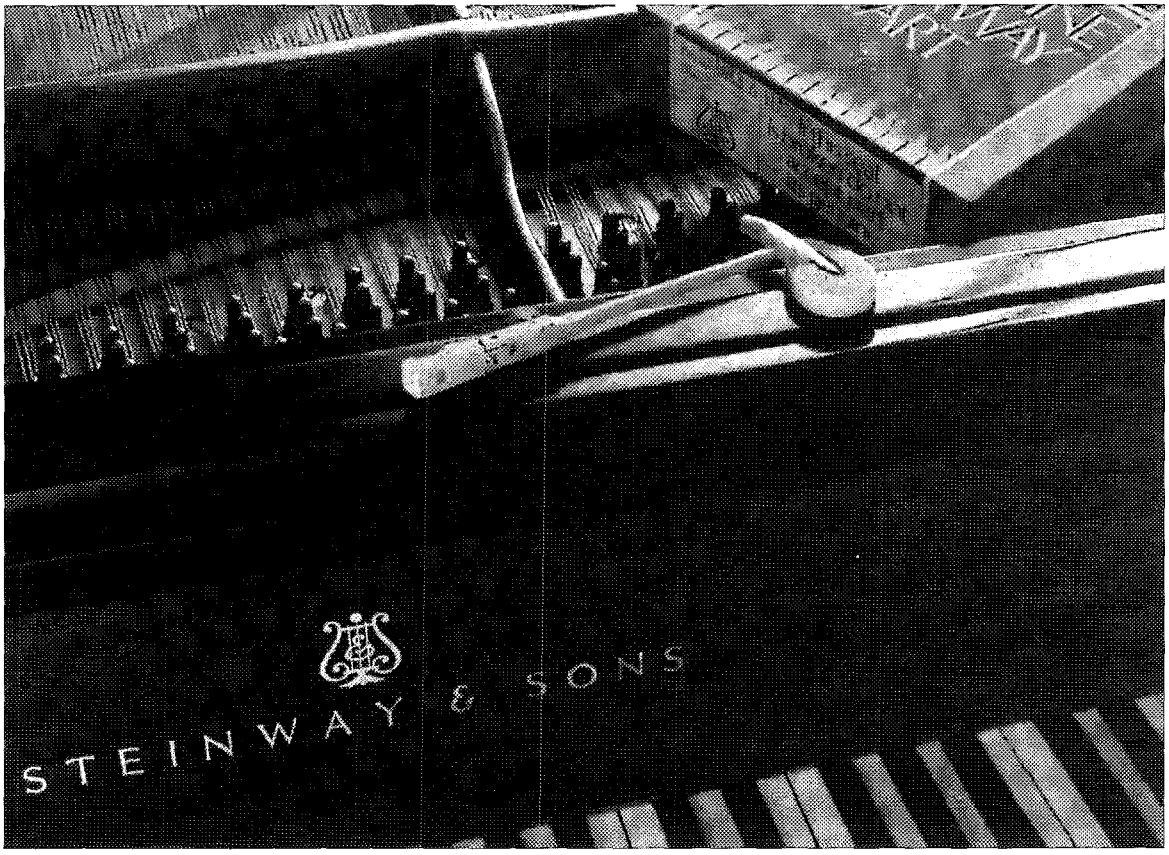

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Q: Chickering Grand Dampers

I have inspected a 1903 Chickering 6'4" grand. It needs an action rebuild and I would like some input before taking on the job.

The design of the damper system baffles me. There are no damper wire screws in the damper lift flanges. The damper wires are threaded and screwed into the top of the damper lift flange. It appears that setting the damper lift from keys would be very difficult. There are no capstans or any sort of adjustment between the damper under lever and lift rail to even out damper lift from pedal (which doesn't bother me as much as the lift from key problem). ***Is something so obvious that it evades me?***

If this system is just another weird Chickering experiment that is a bear to regulate, is there any replacement systems available?

Thanks for any input!

— Lorlin Barber, RPT
Nebraska Chapter

A: ***From Les Smith:*** Having done many of these, I can say that it turns out to be a piece of cake to regulate. Their basic design was very creative and well thought out. To regulate damper lift from the key you simply turn the damper in or out. For example, if the damper is lifting too soon, your merely turn the damper clockwise however many turns it takes to get in lifting properly. If the damper is lifting too late, you simply turn it counterclockwise. Simply remember that turning the damper clockwise ***increases*** the distance between the damper lifter felt at the back of the key and damper flange and turning it counterclockwise ***decreases*** the distance. In order to make these adjustments the damper stop rail must be raised as high as possible so that you can get the necessary clearance to turn the dampers without interfering with the neighboring ones. Sometimes you have to even raise the stop rail completely above its screws and temporarily hold it in place with tape until the regulation is completed. Because there are no set screws, a tiny bit of burnt shellac was originally used to secure the damper wires where they entered the top flanges. Also, as designed, the dampers are threaded onto the lifter wire in such a way that they are free to rock back and forth slightly to permit perfect seating (see Figure 1). If you have a problem with them rocking too much, their front-to-back movement can be restricted with a similar dab of burnt shellac. Only the front of the damper lift rail felt is glued down to permit the insertion of paper shims to even out damper rail lift. Where many people run into problems with regulating damper lift from the keys is in not securing the wire to the top of the flange with the burnt shellac. If you don't do this, the damper will sometimes twist sideways because of the lack of a set screw and the damper felt won't seat properly. This leads to all sorts of bad language directed towards Jonas Chickering and his sons, who actually came up with a pretty nifty damper design once you understand how it works. ***One big caution.*** If you are contemplating replacing the pinblock in this piano, be aware that it is one of the most difficult pinblocks to replace that was ***ever*** designed. It will be in ***four*** pieces, with all sorts of nifty compound angles and curves. These are very difficult and time-consuming to replace. Be prepared and charge accordingly! They make a Steinway pinblock replacement seem like child's play. Lots of luck!

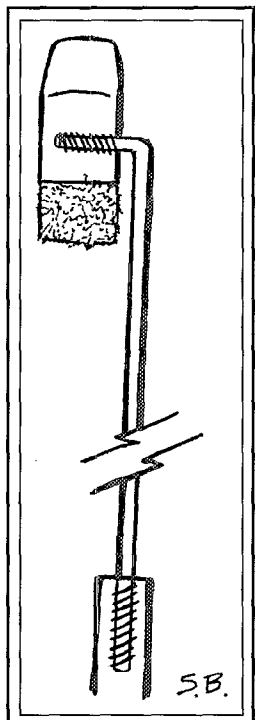

Figure 1 — Old-style Chickering damper, showing wire threaded into damper head and top flange.

From Norman Barrett: I have successfully modified a Chickering damper system such as you described but it is some trouble. If you want to take the time, I believe that the results greatly simplify the regulation in the future. The first step is to drill the damper lift block vertically so the damper wire drops freely in it. Next drill horizontally to accept a damper bushing. These bushings are shown in American Piano Supply's catalog on page 76, Part #33965A. Be sure to order the screws to go with them. These steps modify the damper lift block similar to most damper systems and can be regulated normally. The drilling is not too difficult if you set up the proper jigs. Another point to consider is damper lever flange. The piano I worked on had these flanges glued to the damper rail. The glue was breaking loose on some of these levers so I drilled a hole through these flanges and used screws to secure them to the rail. I hope that this information is clear and of some help to you.

From Rob Edwardsen, RPT: Another option is to replace the entire system with a damper underlever kit from Renner, USA. It might be the same amount of labor (or maybe a little bit more) than rebuilding the original. I'm not sure it would work, but I would certainly look into the possibility if it were my job.

From Bill Ballard, RPT: No it won't, you won't see a Chickering with damper lever square to the assembly until the point where Aeolian started to put the Chickering name on Knabe scales (sometime in the '30s). Your back action has fanned underlevers (spreading outwards to meet the fan of the keyboard and top action). The underlever flanges must be mounted horizontally. Let me know when you've accomplished this on the Renner replacement back action.

From David Stanwood, RPT: I once replaced a Chickering Brown action with modern Herz-Erard type parts, using the old stack rails and modifying the balance rail position. The old wippens were "fanned" so I made vertical cuts on each

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Continued from Page 10

flange where they meet the rail to match the angle. The hardest part was thinking of the idea. Actually doing it was quite easy. I suppose you could do the same to a back action but the original method can be made to work quite well if the parts are restorable. However, if the mice had chewed up the back action I might have contemplated replacing it. I'm sure that museum conservators would have a strong opinion on the side of keeping things original.

Q:

How do you do the dampers next to the plate struts? Even lifting the stop rail doesn't really give enough clearance for these, at least in my experience. It's hard to turn them without damaging the felt.

— Tom Rush
Lookout Mountain, Ga.

A: ***From Bill Ballard, RPT:*** This is where you turn the damper head completely vertical (the wire is threaded into the head as well as the underlever). As you turn the damper wire into the correct depth at the underlever you may still have to scrape by the plate strut and the neighboring damper head. But heck, I've seen rats get through smaller openings!

From Les Smith: The dampers next to the plate struts are somewhat more difficult to do, so you might find it easier to do these before even installing the other dampers in order to minimize ***their*** interference. As I noted in my previous message these damper heads are screwed on to the damper wire. This allows you to rotate the damper head 90 degrees so that it is literally standing on its end and then turn it in whatever direction is necessary to adjust its lift with relation to the key. You can still regulate these dampers near the struts once the others are in place by first turning them on end, but it ***is*** a squeeze.

As for securing the damper wires to the flanges with burnt shellac, if you don't have any, an acceptable substitute is PVC-E glue. Note that hot glue (hide) as well as glues like Titebond™ and Elmer's™, do not stick well to metal and in time will come loose. So use PVC-E glue if burnt shellac is not available.

The beauty of the Chickering damper system is that the lift of all the dampers from the keys can be regulated without ever having to remove the action from the piano. Just remember to put the stop rail back in position after doing the regulation! This damper system is different, but it is well thought out and works beautifully once you understand its operation. I've been rebuilding 1875-1930 vintage pianos for 30 years and can assure you that there in absolutely ***no reason*** to "mickey-mouse" this Chickering damper system by trying to modify it or replace it with another. To do so is to destroy the integrity of the instrument and that's what we're supposed to be preserving. A vintage Chickering with its damper system replaced is no longer a Chickering, but some sort of hybrid. Those old, turn-of-the-century Chickerings were high-quality instruments, much different from Chickerings seen during the last 75 years or so. As such, they deserve better treatment than that. Once again, the damper system, as designed, works beautifully and it's a piece of cake to regulate once you take the time to learn how it works.

Q:

Doesn't the fact that the damper wire is not free in the top flange limit somewhat the amount of fine adjustment you can do with key lift? What do you do, for example, if the ideal spot for optimum damper lift with the key is other than the spot allowed by turning the damper 360 degrees (for example, 180 degrees)?

By the way, I agree that you can and should preserve the older systems found in these pianos, but by their very nature they don't seem to be capable of as fine a regulation as the more modern systems (or am I being way too picky?).

— Tom Seay, RPT
Austin, TX Chapter

A: ***From Les Smith:*** Actually, the ***very*** fine thread on the damper wire permits extremely close regulation of the damper lift, although you're correct about only being able to regulate it by full, 360 degree turns. Additionally, the system provides for adjusting the damper ***sideways.*** The damper head is screwed on to the horizontal portion of the damper wire. If you find that the left-most string is leaking, for example, you simply turn the damper head in a turn or two, If the right-most string is leaking, you turn it out a turn or two. Thus without ever having to remove the action from the piano you can regulate damper lift from the key and adjust the damper from side to side with relation to the strings. Neat, huh? Further, the damper "floats" on the horizontal portion of the damper wire, which allows it to rock slightly forward and backward to achieve perfect seating. By the way, it is common practice to completely clean all the corrosion off damper wires when rebuilding a piano. You might, however, want to leave a small amount of corrosion on the horizontal section of the damper wire in an effort to restrict the rocking motion. When cleaning the wires, check the rock by screwing on a damper head. A little back and forth movement is desired; too much can be a pain and require a dab of burnt shellac or PVC-E where the wire enters the damper head in order to limit it.

Continued on Page 14

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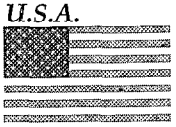

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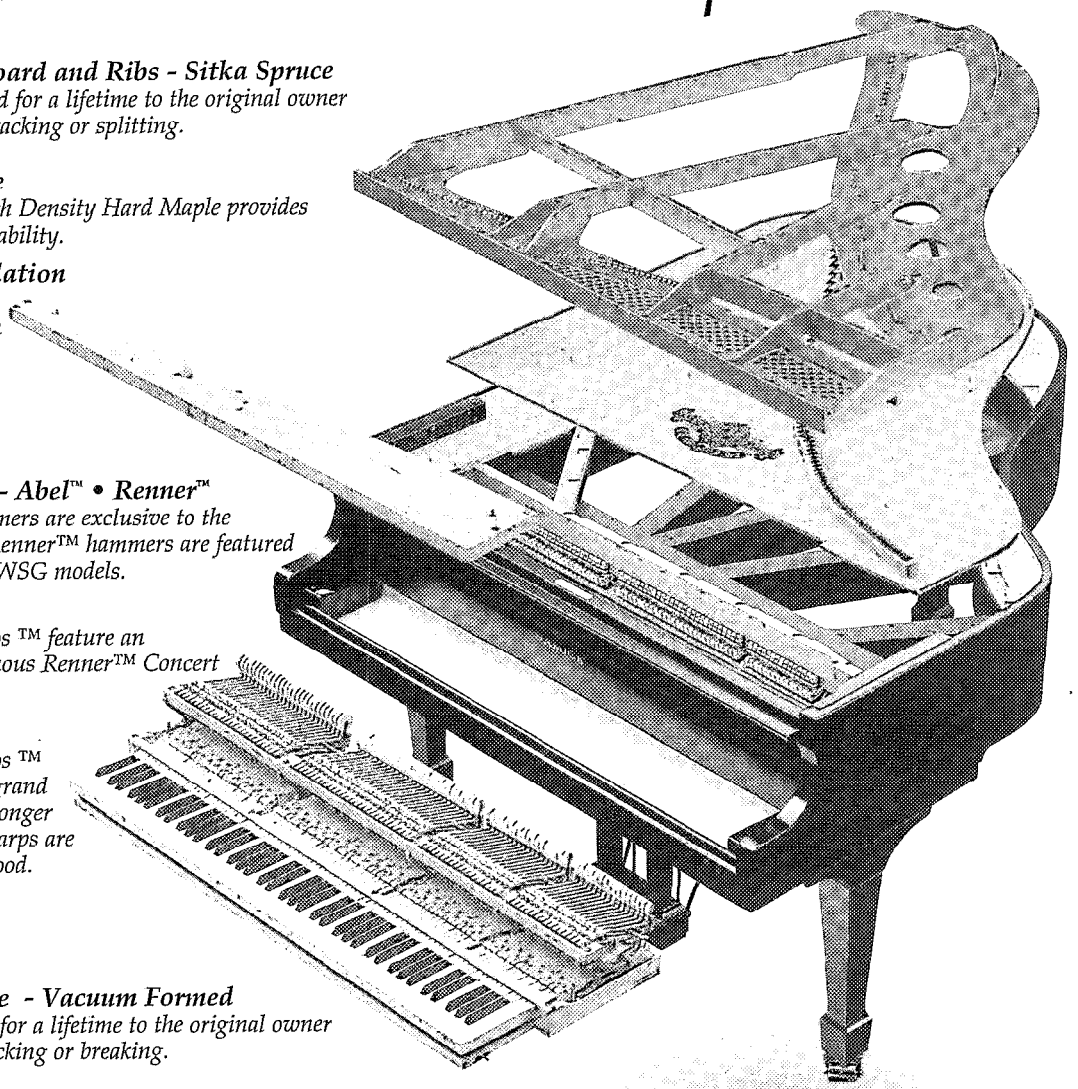

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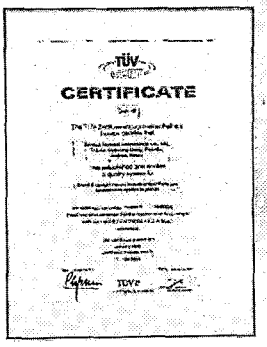

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SAMICK

Continued from Page 12

Q:

Could you describe the preparation and application of "burnt" shellac?

— Tom Rush
Lookout Mountain, Ga.

A:

From Rob Edwardsen, RPT: Burnt shellac is made by mixing orange shellac flakes with just enough alcohol so that you have a thick gooey paste. You can get shellac flakes from Player Piano Supply. It is called burnt shellac because originally it was made by taking premixed shellac and "burning" off the alcohol by heating over a burner or hot plate.

Q:

Tightening Plate Screws

I'm interested in what tools (i.e., torque wrenches, etc.) and procedures other tuners are using in the field to tighten down plate screws and bolts prior to tuning. What about the screws partially under strings? Thanks in advance.

— John Peters, RPT
Berkeley, CA

A:

From Dean Reyburn, RPT: I use two small tools that fit into a tuning hammer star tip. One is a Phillips, the other is a regular (slotted) screwdriver. I also carry several sockets and an adjustable wrench for those pianos which have bolts, not screws.

Last time I checked, Pacific Piano Supply carried the two small tools made by Francis Mehaffey. Any of Francis's tools I have used are great, especially his impact tuning hammer.

I do not use a torque wrench, but do it by feel. Hand tight is fine. I prefer to tighten all accessible plate bolts on new customer's pianos, on the first service, and once every few years after that. The best time to check them (in Michigan, at least) is in the winter when humidity is low.

Watch out for several types of grand pianos which do not need the plate rim bolts tightened, namely newer Yamaha "F" series grands and, I believe, Baldwin grands built since the 1970s. I don't tune many Baldwins, so maybe someone else could comment on that. These grands (and some others possibly) have bolts that set the height of the plate, and should not be turned. The other screws and bolts around the tuning pin area of these pianos still need tightening.

I do not like to tighten "nose" bolts on plates; they don't ever seem to loosen from seasonal change like other plate bolts (and tightening them can be risky). I don't do heroic measures to tighten bolts such as moving strings, unless it is a problem piano.

Plate bolt/screw tightening is more critical on pianos with tuning pin bushings such as Yamahas, than it is for pianos such as Steinways that have no pin bushings. Pianos without tuning pin bushings rely more on the tuning pin-to-pinblock connection to transfer pressure. At least that's my experience. I still tighten bolts on Steinways, but with Yamahas and Kawais, I have seen several instances where pianos went from holding tune poorly to holding very well after tightening bolts/screws on the plate.

Just my opinion and experience.

From Laura Kunsky, RPT: I use an adapter for my tuning lever and bits I got from Schaff. I check plate bolts on every new piano (new to me) and every piano I tune in the spring after our long, dry winters. If I can move those screws significantly, I'll loosen strings to reach the hidden screws. This system saves room in my tuning case!

From Newton Hunt, RPT: I have two screwdrivers made to fit into a brace that have been ground down to fit into the tip of my tuning hammer. Using this arrangement I turn the screws until they stop at about 100 inch/pounds (a guess based upon tuning pin tightness). I skip alternate screws going around the perimeter in one direction and pick up the loose ones on the return trip. Inaccessible screws cannot be turned, which is a shame because I would like to tighten them as well.

I don't think torque standards can be set because wood types, hardness, age and support systems vary too greatly. Examples:

— Maple vs. mahogany
— Soft maple and hard maple
— Maple 100 years old and maple 10 years old
— Dowel support of the plate vs. wood blocks.

The purpose of tightening these screws is to integrate the plate and wooden structure into one cohesive unit.

CAN YOU HELP ??

Every day future technicians inquire about education and training programs in piano technology.

The School List provided by the Home Office is very limited, containing only 26 sources of training locations around the country, and outside the U.S.

If you are a Piano Technician educator, are employed within a training facility, or know of a course offered in piano technology, please contact the Home Office at 816-753-7747, or submit the information to 3930 Washington, KC, MO 64111, so we can add the name and location to our existing list.

... Thank You!!

Letters

Clarifying Working with Keys

The article "Working with Keys" in the March 1997 issue of the *Journal* contained incorrect information regarding the key balance hole repair system of Ralph Onesti, RPT. The article states the need for a shop and power equipment. In fact, the tool is made so efficiently that its use does not necessitate heavy power equipment or a shop facility in order to affect repairs. All that is needed is a small, tabletop model drill press. In an effort to demonstrate this, I offer an event that took place at the Kansas City convention in 1994.

A hands-on technical class was in operation and keys from action models were used so much that they had become worn past their usefulness. Ralph was called upon to use the key balance hole repair system to restore them. An available drill press was used and some chisels and sandpaper were borrowed from Kevin Leary's class. Although this is not the equipment one would want to use on an entire set of keys, it was easily demonstrated that even the most sparse equipment could be utilized to affect repairs with this system.

Any questions or further information can be had by calling 1-610-833-1657.

— Grethchen Raichle, Manager
Onesti Piano Restorations

Becker Correction

I would like to point out an error near the bottom of the right column of Page 26 in the March 1997 *Journal* article by Skip Becker. The string diameter has an inverse *linear* relationship to the pitch, i.e., reducing the diameter by half increases the pitch by an octave. The string mass per unit length affects the pitch in inverse square proportion so that reducing the mass per unit length by 4:1 increases pitch by an octave.

— St. Clair Logan,
Leeds, England

Tips, Tools & Techniques

Continued from Page 8

TT&T

Protect that Rim!

We protect the rims of grand pianos in our shop with these handy protectors made from aluminum roof flashing. Simply bend the pieces as shown in the photo and glue some regular inexpensive felt to the insides (see Photo 1). If you use enough of these, they help protect both the inside of the rim from damage when raising and lowering the plate and the outside. I got the idea from Bill Spurlock's class on soundboard repairs.

— David Vanderlip, RPT
Orange County, CA Chapter

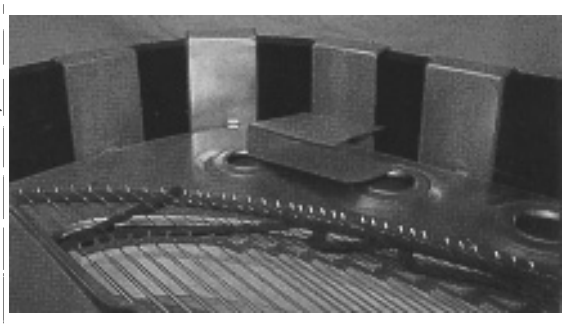


Photo 1 — Rim protectors in use on grand piano.

Equal Temperament by Pure 5ths

By Jim Coleman Sr., RPT
Contributing Editor

A temperament built with pure 5ths. Impossible, you say? That's what I always thought. The early organ and harpsichord tuners soon learned you can't tune a circle of pure 5ths to complete an octave so they began various schemes to go as far as possible with the pure 5ths. This was the basis of Pythagorean tuning. Of course it would have been nice to have pure Major 3rds, Perfect 4ths, Major 6ths, and Minor 3rds and 6ths as well. But alas, it was not to be. Actually, the 3rds and 6ths were quite busy. And watch out for those wolf 4ths and 5ths!

Next came the Meantone tunings, where it was possible to have as many as eight pure 3rds and a number of pure 4ths and 5ths. But, alack and alas, there were those wolves. Then came the various modified Meantone schemes. Now they were really cooking. It was possible to play in all keys with just a little careful attention to the writing and voicing of parts. Mini-wolves were created to lessen the bite of larger wolves. This gradually developed a popularity for what we now call Well Temperament.

Finally, so many little wolves were created that it was decided to just go all the way. After all, so many other good intervals had already been compromised; equal temperament seemed to be the next logical step. Equal temperament was found to be more of a struggle than at first expected. Not every musician had the patience to learn the techniques and skills to be able to tune equal temperament. This helped to more fully develop the professional piano technician. Here were people who were willing to devote their lives to practice and learn the art of equal temperament. After about 75 years the art was well developed and standards of acceptable tempering were established.

Yet, there remains even to this date some disagreement as to what constitutes an even balance of octaves. Since the advent of higher-tensioned scaling in comparison to the lower-tensioned scaling of the early fortepianos and harpsichords, it was discovered that octaves could not be tuned perfectly, either. This seemed not to be a problem with the earlier instruments. But now, in order to make a piano have good balance in the octaves, some tempering is necessary. The main question today is: how wide can the octaves be and still not be an irritant? Also, is there an ideal trade-off between the width of the 4ths or 5ths and the width of the octaves?

Originally, the standard approach to setting equal temperament was to first establish the octave and then, by using a circle of 4ths and 5ths, one could divide up the octave evenly by contracting the 5ths each by 1/12 of the 24-cent comma. The early attempts involved tuning two 5ths upward and then dropping down one pure octave and repeating the procedure until the circle of 5ths was completed. Later it was decided that steps could be saved if one tuned up one 5th, then down a 4th, up a 5th, etc., until the circle of 4ths and 5ths was completed. There have been many schemes used to balance out a one-octave scale.

One special scheme was to divide the octave into three contiguous Major 3rds, then tuning down a 5th from the second one and then building two more Major 3rds, then dropping down a 5th, etc. The earliest bearing plan of this system was popularized by Oliver Faust and later made more popular by John Travis.

Eventually, a scientific system was developed where one could tune the circle by 4ths and 5ths and check with 3rds and 6ths. This was made very popular by William Braid White. Later a system called "Both Ways From the Middle" was developed by Bill Stonaker where early on one had some checks and balances for the 3rds and 4ths. Several variations of this then have been used and made popular by such people as George Defebaugh, Don Morton, Bill Stegeman, and others.

Back in the early 70s, while working for the Baldwin Piano Company I tuned many Acrosonics. I discovered it was quite easy to set a temperament from A3 to A4 by using three contiguous 3rds as a basis from which to tune 4ths and 5ths to complete the scale and avoid the break area of the Tenor section. Later, Dr. Al Sanderson and Rick Baldassin extended that idea to covering two octaves and utilizing some bulletproof procedures to assure excellent results regardless of the difficult scaling challenges of some pianos.

In all of the later developments, it was discovered that the 4ths would beat slightly faster than the theoretical rates. The 5ths would beat a little slower than the textbook values. As these later systems became more popular, the desire to stretch the octaves a little more to accommodate the effects of inharmonicity became more popular. At the present time it is common to find the octaves of the better tuners stretched by from 1/4 to 1/2 beats per second at the second coincident partials of an octave, i.e., when one listens to an octave at the partial one

Continued on Next Page

"The main question today is: how wide can the octaves be and still not be an irritant? Also, is there an ideal trade-off between the width of the 4ths or 5ths and the width of the octaves?"

Equal Temperament by Pure 5ths

Continued from Previous Page

octave above the upper note of the octave there will be up to a 1/2 beat per second widening. Another way of checking would be to compare F3-A3 and F3-A4 where the beat of the latter would be faster than the former by up to a half beat per second.

The result of this causes the 5ths to beat even slower. But, of course, this is at the expense of the 4ths beating a little faster. There are always trade-offs when one attempts to favor one interval above others in stretching equal temperament.

Many have held tenaciously to the idea that octaves should be perfect. Can we talk about this? Is there a law of nature that says that octaves must be pure? What about double octaves, must they also be pure? What about triple octaves, or quadruple octaves? Must they also be pure? Who is to say?

Contrary to what my good friend Virgil Smith says about always tuning pure octaves, we have been able to show that when comparing coincident partials, it is impossible to have all pure single, double and triple octaves. If one starts in the center of the piano and tunes a pure 2:1 type octave, and then another contiguous pure 2:1 type octave, and then another contiguous 2:1 type octave, the resultant triple octave will be terribly flat on any typical modern piano. As a result of this the modern tendency is to stretch octaves judiciously in order to minimize this discrepancy. In spite of Virgil's explanation of his method of tuning, his results are very good and he actually is able to tune to greatly minimize the discrepancy created by inharmonicity. After studying Virgil's tuning style, I believe I have a clue as to what he is really doing. He is not the only one. Brent Fischer of Arizona State University is an excellent tuner who has also been able to realize this ideal type of stretch. Recent study of the aural tunings of Tom Kenny of La Crosse, Wisconsin, has convinced me that for a long time we have ignored a very helpful interval in controlling our stretch tunings. This interval, as you may have guessed, is the perfect 5th.

As we have noted above, each effort to stretch octaves a little more has resulted in the 5ths being slower and the 4ths becoming faster than the theoretical values we all started with. Brent Fischer is the first one to bring to my attention the idea that the octaves should be stretched to the very edge of the limit. That is, as far as you can stretch without the octave beginning to sound bad. Perhaps others have tried to suggest this to me and at that time it just went over my head.

The next logical question becomes: "What is the limit to the stretch of an octave?" Can single octaves be stretched to the point where triple octaves will sound good? I believe Virgil Smith does this. I also believe that this is why his tunings sound so good.

Can octaves be stretched as much as three beats in five seconds? We've been listening to 5ths which are compressed that much for a long time and it has been tolerable. Worse yet, we have been listening to 4ths which theoretically beat four beats in five seconds.

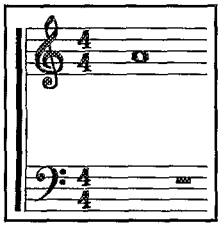
Now, when you realize that we have been listening to 4ths that are more than one beat per second due to the recent trend to stretch octaves a little, just how far can we go in that direction? If we stretch our octaves just a little more, can we still tolerate even faster beating 4ths? I believe the answer to this is, "*yes.*" After all, since the advent of equal temperament we have been conditioned to listening to 3rds which beat more than seven beats per second. What is the practical limit of beats which we can tolerate in the sound of the single octaves and the 4ths? Could they be balanced out equally? Should they be balanced out equally?

I believe the answer to that question can be found in the 5ths.

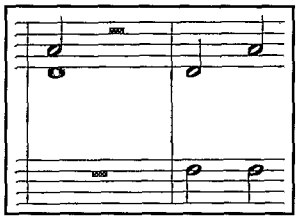
If one sets a temperament using pure 5ths, the 4ths will be faster and the octaves will be wider. In the early experiments thus far, the results of this type of tuning have by the strangest coincidence provided just the right kind of octaves to produce tolerable triple octaves, and the quadruple octaves are not bad. The overall sound of the piano is quite exciting.

Aural Scheme for Equal Temperament by Pure 5ths

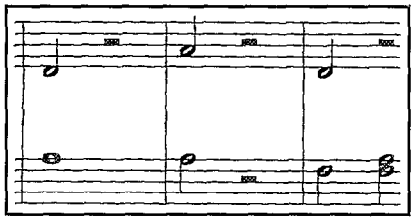
A whole note indicates the note being tuned; half notes indicate reference notes or tests; quarter notes indicate progression checks:



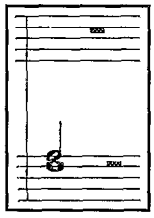
Step 1 — Tune A4 to fork.



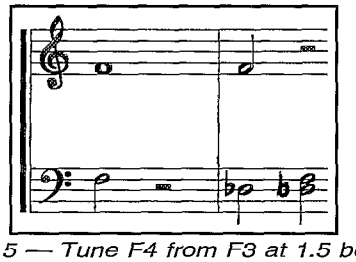
Step 2 — Tune D4 pure to A4. Test F3-D4 6th equals F3-A4 10th.



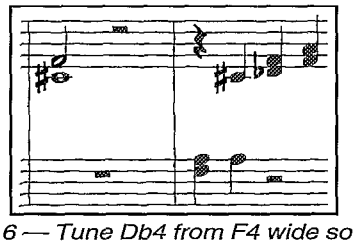
Step 3 — Tune A3 to D4 at 1.5 beats wide. Check that A3 - A4 octave is also 1.5 beats wide. Check that F3-D4 6th is 1.5 beats faster that F3-A3 3rd.



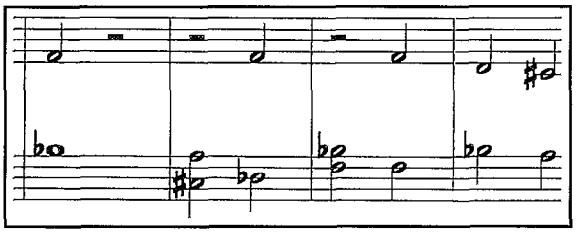
Step 4 — Tune F3 from A3 at 7 beats wide temporarily.



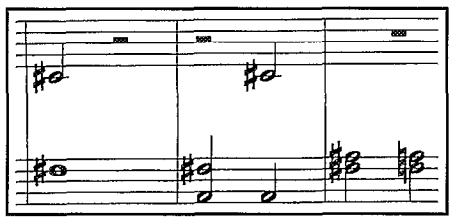
Step 5 — Tune F4 from F3 at 1.5 beats wide. Check that Db3-F4 10th is 1.5 beats faster than Db3-F3 3rd.



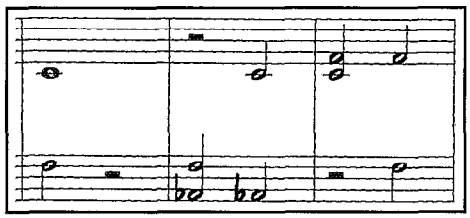
Step 6 — Tune Db4 from F4 wide so that the A-C#4 3rd is half way between the F-A 3rd and the Db4-F4 3rd. If the Db4-F4 3rd is not halfway between the A3-C#4 3rd and the F4-A4 3rd, then the two Fs must both be adjusted, but they must maintain their 1.5 beat octave spread.



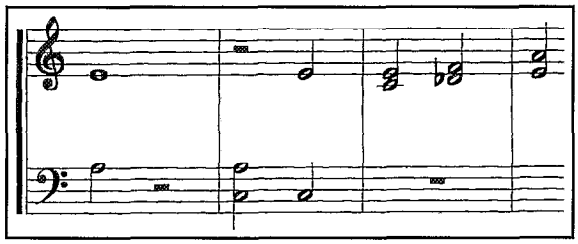
Step 7 — Tune Bb3 from F4 as a pure 5th. Test C#3-A# 6th equals Db3-F4 10th. Check that F3 4th is same speed as F3-F4 octave. Check that Bb3-D4 3rd fits with A3-C#4 3rd.



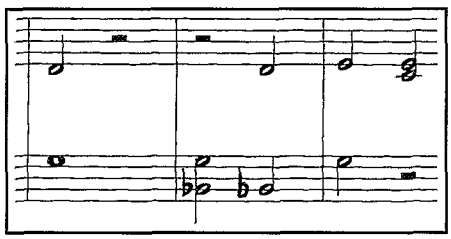
Step 8 — Tune F#3 from C#4 as a pure 5th. Test A2-F#3 6th equals A2-C#4 10th. Check that F#3 3rd fits with F3 3rd. If it doesn't, then the speed of the 4ths and octaves needs to be changed or else the C#4 was not balanced properly between A3 and F4.



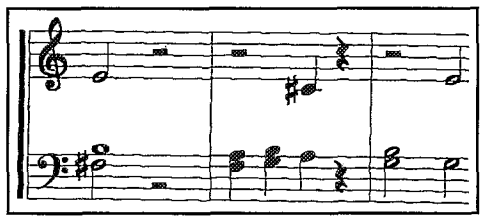
Step 9 — Tune C4 as a pure 5th from F3. Test Ab2-F3 6th equals Ab2-C4 10th. Check that C4-F4 4th is not much faster than F3-F4 octave.



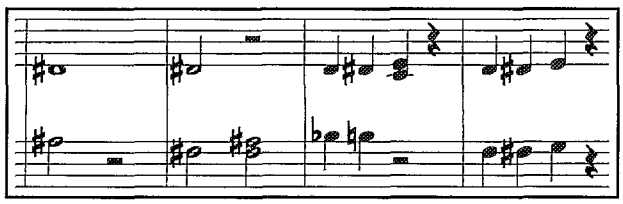
Step 10 — Tune E4 as a pure 5th from A3. Test C3-A3 6th equals C3-E4 10th. Check that C4-E4 3rd fits with Db4-F4 3rd. Check that E4-A4 4th is not much over 1.5 beats per second.



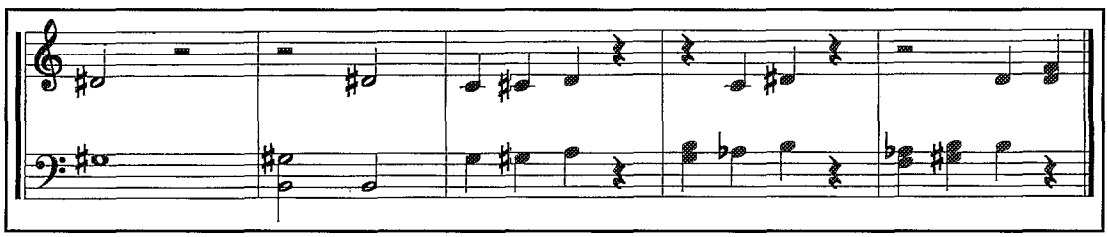
Step 11 — Tune G3 as perfect 5th from D4. Test Bb2-G3 6th equals Bb2-D4 10th. Check that G3-E4 6th is slightly slower than C4-E4 3rd.



Step 12 — Tune B3 between F#3 and E4 as balanced 4ths, each being 1.5 beats. Check that G3-B3 3rd fits between F3-A3 and A3-C#4. Check that G3-B3 is slower than G3-E4 6th by about 1.5 beats.



Step 13 — Tune D#4 to A#3 as a 4th that is as wide as its tuned neighbors. Test F#3-D#4 6th to be 1.5 beats faster than F#3-A#3. Check that B3-D#4 3rd fits with its neighbor 3rds A#3 and C4. Check that F#3 6th fits with its neighbors F3 and G3 6ths.



Step 14 — Tune G#3 as a perfect 5th from D#4. Test B2-G#3 6th equals B2-D#4 10th. Check that the G#-C# 4th fits with its neighbors. Check that Ab-C 3rd fits with its neighbors. Check evenness of 4 minor 3rds, on F3, G#3, B3, D4.

Continued on Next Page

Equal Temperament by Pure 5ths

Continued from Previous Page

This completes the F-F temperament, but it should be filled out in both directions, tuning F#4 as a pure 5th to B3 and checking to see that the octaves are stretched as much as the near 4ths. Continue with G4, G# in similar fashion.

Tune down from B3 to E3 as a pure 5th maintaining equal 6ths and 10ths as above, and balancing with descending 3rds and 10ths. Another test for pure 5ths which works is the complementary Minor and Major 3rds like E3-G3 equals G3-B3. This works better when tuning pure 5ths. Continue downward in similar fashion to the bass break.

As one continues above A4 eventually balance the 5ths and octave-5ths checking all along to keep the 10ths moving up evenly. The octaves will be as wide as you can tolerate them and eventually utilizing double-octave-5ths balancing them with the single octave 5ths. By the time you arrive at C6, you should have perfect triple octaves. 17ths will be faster than 10ths and 3rds giving you wide double-octaves and wider single top octaves. In the top octave, the double-octave-5ths are easier to gauge than the fast speed of the 17ths to maintain evenness.

Achieving Equal Temperament by Pure Fifths With a Sanderson Accu-Tuner

It was while playing around with altering the A4 stretch numbers that I discovered the possibility of having equal temperament with perfect 5ths. For some time it had been noticed that when the temperament octave was stretched a little more than before that the 5ths would be slightly slower and the 4ths would be a little faster in beat rate.

The original experiments were done on my Steinway L, which had FAC stretch numbers of 7.0, 8.5, 8.6. By adding 1.0 cents to the A4 stretch number, the center octave was stretched enough to make the 5ths come out pure in almost every case. Now this was at the expense of making the 4ths faster as well as the single octaves. The smooth curve ability of the SAT kept the 3rds and 6ths well in line, so when the 10ths were a little faster the progression was smooth.

At first one may object to the wider octaves, but after tuning the piano this way, and playing music, I found it was not objectionable and the wider octaves prepared the way for slightly wider double octaves than the normal readings would provide. While playing two-handed block chords up and down the piano, there was a solidity noted which far outweighed the slightly stretched single octaves in the center of the piano (up to 1.5 beats).

By the time I reached the 5th octave, and making the 1.0 cent reset necessary as explained in previous articles on "Altering the Stretch," the test for 3rds, 10th and 17ths showed a very decided increase in the 17ths over the 10ths. But the payoff was in the fact that the 5ths and 12ths continued to be pure. By the time I reached octave six, the 5ths were actually stretched, but the 12ths continued to be pure and the triple octaves were also pure. Eventually the 12ths (octave-5ths) gave way to the pure 19ths (double-octave-5ths). The top half of octave seven may have been a little too much as single octaves, but the triple octave sounded so good that it was tolerable. The octave-5ths began to be on the wide side too.

There is a difference between our melodic sense of hearing and our harmonic sense of hearing. One can prove this to himself by playing middle C with a short staccato blow and while remembering the pitch, playing the C7. Most of us would rather tune the C7 a good bit higher in satisfying the melodic sense than we would tune it as a triple octave sounded together. This test has been done in many of my tuning classes over the years. Most classes preferred to hear the C7 somewhere around 17 to 23 cents sharp when C4 and C7 are played melodically (one note after the other). This gives a stretch on most pianos which would make even a triple octave beat on the wide side (i.e., too sharp). By progressively sharpening the single and double octaves as proposed by this article, there is less difference in beats between the single, double and triple octaves as viewed from octave seven. At this point, I am beginning to think that this is what Virgil Smith is doing or at least approaching when he says he can get pure single, double, triple, and sometimes quad octaves. He definitely does make the 5th and 6th octaves sharper than most of us have been doing.

Another interesting discovery during bass tuning was that in going down below the break, I was able to maintain pure 5ths. Most of you have noticed that the normal bass stretch using the FAC numbers provided bass octaves which are usually stretch to make the 6:3 octave relationship a little wide. During this greater stretch, it was noticed that the 5th above the note being tuned was almost always pure. This should not have been surprising to me when I consider that, for example, when tuning C2, the machine is listening to the 6th partial which is also the 4th partial of G2.

I already knew that the normal curve of FAC tunings attempts to keep the double octaves fairly clean, so since the partial which the machine listens to is two octaves above a note a 5th higher than the note being tuned, the match is very good. Of course, one should expect some slight variation in all bass tuning tests, because the inharmonicity of bass strings usually jumps around quite a bit (i.e., you can't have everything coming up like roses) during the tuning process. There is almost always a jump as you cross the break between the two-string unisons and the single-bass strings. Usually the 17ths and double-octave-7ths slow down or else one is widening the 5th, the octave and the double octave.

Editor's Roundtable
By Steve Brady, RPT
Journal Editor

First Responses to Jim Coleman's Article

Equal Temperament by Pure 5ths

A few months ago, shortly after writing his article which appears in this issue of the *Journal* on Page 17, Jim Coleman posted it on the Internet listserv, "pianotech," for some peer review. The article spawned a fair amount of discussion at the time, some of which appears here in edited form.

Horace Greeley, RPT: I have looked for years to find ways to describe how I tune. I should have known to ask you.

The method you describe for tuning pretty concisely covers what I do. I would go so far as to state that I will instantly sacrifice a "perfect" octave, if it makes musical sense to do so. Also, I do think that managing the 5ths is a crucial key to understanding how the 3rds and 6ths are "supposed" to sound under differing circumstances.

Do I correctly remember that Broadwood was the first maker to "standardize" on "equal temperament" (in 1853)? If so, then it would seem altogether likely that varying methods of establishing the temperament would have sorted themselves out by the time Braid White was first writing (roughly 50 years later). That kind of time line is not unusual in transitions from theory to practice, especially in the 19th century.

A few comments are interspersed:

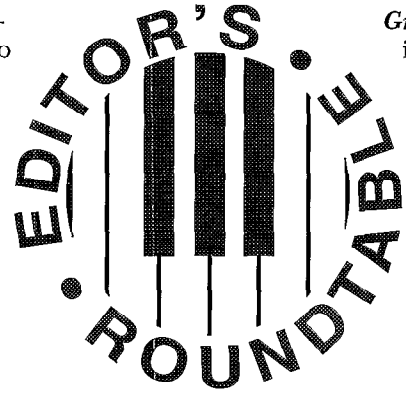
Coleman (from the article): "Eventually a scientific system was developed where one could tune the circle by 4ths and 5ths and check with 3rds and 6ths."

Greeley: It was hard to decide where to "snip" what was here, each of the writers/teachers you mention have made significant contributions to the instruction and practice of tuning. My more modest contribution is that in each of these cases, the scope of the area in which the temperament is set is expanded. That is, Braid White wanted everything to be "doable" within the major 7th (yes, with checks outside, but that was his basic range for temperament tuning). By the time we get to Rick Baldassin and Al Sanderson, we are using two octaves. An observation that comes to mind is that we are, in actuality, tempering the entire instrument.

Coleman: "Many have held tenaciously to the idea that octaves should be pure. Can we talk about this? Is there a law of nature that says that octaves must be pure? What about double octaves, must they also be pure? What about triple octaves, or quadruple octaves? Must they also be pure? Who is to say?"

Greeley: This is where I seem to be constantly getting myself into trouble. I think the clue is, as you suggest, the "judicious" stretching of the octaves, using the (essentially) pure 5th as the delimiting factor. From an application standpoint this means that I will (virtually) never (knowingly) turn the 5ths inside out. I will, however, work to make them squeaky-clean, as I feel the musical situation warrants. It is good to know that, while our descriptive vocabulary may differ, there are others who are carrying the octave to the "very edge of the limit."

Coleman: "The next logical question becomes: what is the limit to the stretch of an octave? Can single octaves be stretched to the point where triple octaves will sound good? Can octaves be stretched as much as three beats in five seconds? What is the practical limit of beats which we can tolerate in the sound of the single octaves and the 4ths? Could they be balanced out equally? Should they be balanced out equally? I believe the answer to that question can be found in the 5ths."



Greeley: I completely concur that the answer is in the 5ths. Most of the other questions in this paragraph depend, for me, on many other variables — most of them subjective. What is the literature? What is the piano? Who is playing? Where is it played? etc.

Coleman: "The overall sound of the piano is quite exciting."

Greeley: The combination of ingredients

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can have very exciting results indeed—rather like a good snare drum, in which the tension of the heads is so well-balanced with the tension of the snares that the slightest movement creates an explosion of sound.

Jim, this is great. Thank you very much!

Michel LaChance, RPT: The idea is not new. The French technician Serge Cordier has already made some research on the subject. There is also an article by Mieczyslaw Kolinski in the *Journal of the American Musicological Society* in 1959 about the tuning by pure 5ths. I also have a book called *The New Tuning* by Lucas Mason which is promoting this quite unusual way of tuning.

The principle is the following: since we have to stretch octaves, why not do it in a way to provide pure 5ths. This results in fairly wide octaves in the midrange, but the extremes get very much in the same proportion as a normal stretch tuning. I tried the tuning "by the book" on my Yamaha M1 by just transferring the theoretical frequency figures into my SAT. It does indeed provide 5ths that are very punchy. The slightly wavy octaves do not seem to be a problem for me, but the harsh major 3rds made me somewhat ambivalent toward the result.

Another problem, in my opinion, is that the inharmonicity on the piano would call for an even more spread 5th, in terms of frequency differences, in order to get them pure — which may make (I guess) the 3rds beat even faster.

Don't get me wrong, I don't mean it is a bad concept. Some may like the strong chordal effects it provides in some repertoire. It is certainly worth trying it. Thanks, Jim, for your healthy contributions.

Robert Scott: When we talk about pure octaves we have the distinction between 2:1 octaves (where the 2nd partial of the lower note zero beats with the fundamental of the higher note) and 4:2 octaves (where the 4th partial of the lower note zero-beats with the 2nd partial of the higher note. Due to the variability of inharmonicity these two tunings are not necessarily the same.

Doesn't the same consideration hold true for pure 5ths? There can be a 3:2 pure 5th (where the 3rd partial of the lower note zero-beats with the 2nd partial of the higher note) or a 6:4 pure 5th (where the 6th partial of the lower note zero-beats with the 4th partial of the higher note). I suppose you could even talk about 9:6 and 12:8 pure 5ths too, but by the time the partials get that high they are probably too weak to need special attention. How does this impact the discussion of tuning by pure 5ths?

Dennis Johnson, RPT: Jim, if I understand your temperament correctly, you are setting something very close to a 1/5 ditonic comma meantone, with the comma divided regularly between four 5ths and the octave. Your language does not necessarily imply regularly tempered divisions, but if your 3rds are of equal size, then these divisions of the ditonic comma would need to be equal as well. This is something different from anything I have tried, but I have come to respect your interests. Actually, it would not be so far removed from the Marpurg I temperament, which is a 1/6 comma ditonic division, all of them being 5ths. In your temperament, the telling triads would be D Maj, B Maj, E Maj, and Eb Maj, but there can be no argument that all other keys are improved over both the standard ET and the traditional Pythagorean triads for two reasons. First, the 5ths are pure which implies the triads to be proportionally beating (actually, 6:4 5ths are strictly proportional but that is not worth picking over) and second, the 3rds within these triads would beat identical to, or very similar to, beat speeds of standard ET 3rds. It then becomes an aesthetic question as to whether one prefers this color, or something else.

I eventually tired of the Marpurg I temperament because I felt that the color of a 1/6 ditonic 5th matched with an ET 3rd did not appeal to me. That is why I must wonder about these keys mentioned because a 1/5 ditonic 5th would beat slightly faster than a 1/6 5th. This is not to say that a 5th beating 1.5 bps is too fast. To the contrary, 1/4 syntonic 5ths beat even faster, and they can be glorious. The aesthetic issue, in my opinion, is one of balancing beat speeds in a complimentary way between 5ths and 3rds. Generally, the more noticeable a 5th is beating, the slower I like the 3rds to be, with the clever exception of an occasional proportionally beating triad that can hide a faster beating 5th. In my experience, when a noticeably beating 5th beats in no rhythmic relationship to the 3rds, and the 3rds are beating as fast as standard ET, you get a color much less satisfying than a traditional Pythagorean triad with much faster 3rds and a pure 5th.

Coleman: Dennis, thanks for your well reasoned response. I have not yet dealt with the difference between the 3/2 5ths and the 6/4 5ths. This is still quite new to me. However, I do not relate this temperament to any of the historical temperaments at this time. You will notice that I refer to this as an equal temperament which includes tempering the octaves as well. When you actually try this temperament on a piano, you will find that all the 5ths stay pure, all the 4ths stay in even progression, all the 3rds stay in even progression, all the 6ths stay in even progression. Therefore, this is not anywhere near an historical temperament except that equal temperament was also developed historically.

I have a great respect for your depth of understanding of the historical temperaments. For years I used an aural temperament which I thought was equal temperament, but which was closer to Marpurg I. I liked the idea of balancing the three 3rds of an octave first and then I could tune all but three notes in the octave as either a 4th or a 5th from those balanced 3rds. I called those my primary 4ths and 5ths. Then I could tune the last three notes from some of the primary 4ths or 5ths. Steve Brady was the first to suggest to me that I was tuning strangely close to the Marpurg.

In this current tuning, I stress that this is

more equal temperament than that which we normally call equal temperament, because it also tempers the octaves so that they match better throughout the whole piano. Let me know what you find after you have had a chance to try it. I may have to alter my estimate of the 1.5-beat 4ths and octaves a little after I have more experience in tuning different pianos. At the time of the writing, I had only tuned my Steinway L and one Yamaha console with this system. Now I have tuned a few more pianos including a Yamaha CFIII. The results still make the piano sound bigger.

Doug Hershberger, RPT: When I was at the Steinway factory for a voicing seminar in April we did some tuning there and it was my impression that the Steinway concert tuners start stretching the octaves right away, such that the 5ths end up being pretty much pure and a fairly active 4th with a common top note. This technique really seems to push the envelope as far as the octaves are concerned and within reason sounds very musical. It sounds like what you're talking about is another step further in that direction. Interestingly, when I was back at the factory I was told the kind of aggressive tuning techniques used by the concert tuners for Steinway would probably not pass the Guild's tuning exam at the RPT level. I like your expression that the piano sounds more exciting. Thanks again.

Richard Moody: It seems that if an interval were pure, all of the "eligible" partials would also be beatless. But you raise an interesting point by noting that there are more than one series of partials affecting the interval being tuned — on paper, anyhow. The 5th for instance, (how did I think of that?) the 3rd partial of the lower note beats with the second partial of the upper note. Take 5th F to middle C. The theoretical rate is .590 bps. That is the 3:2 series. Now look at the 6:4, (double) and the rate is 1.180 ... exactly double. These rates can be seen in Reblitz's tables 4-12 and 4-14 (first edition). However he doesn't comment on these "extra rates" and no one else has mentioned them to my knowledge.

Surely these rates must be audible because we can hear the beats of minor 3rds which are caused by the 6:5 series. However, no one must hear them separately, else they would be dealt with in tuning instructions. It would seem that they would reinforce the .590 beats.

There is much to be done with theory on paper. Of course in practice things are not always as predicted. Some pianos are easy to get triple octaves, while others are impossible. Also, even with meter-type electronic tuners, one can observe the A octave stretched automatically when set by ear (1/2 cps +/- , again this varies from piano to piano). Since all of this happens because of inharmoanicity (sic) the stretching is accomplished automatically when tuning aurally. And since it is better to error on the sharp side, and since the strings tend to pull flat and we have to be sharp anyway to set the pins, octaves get even more stretching just from considerations of accurate and stable tuning.

Another reality of tuning, especially in temperament: if you can hear 5ths beating, they are too narrow; on the other hand they can be too pure. The sound they make is not like a beating, rather a tonality. That is to say 5ths sound purer than they look on paper. Maybe because the double beats from the upper partials smoothes them out?

Jerry Anderson, RPT: Dr. Albert Sanderson published some fascinating data in the June 1978 issue of the *Piano Technicians Journal.* Page 16 shows two charts which compare theoretical beat rates to actual measured beat rates in a well-tuned piano. There are separate columns quantifying the 2:3 5th and the 4:6 5th beat rates. These beat rates, and their rates of change are significantly different.

The tuning this data was drawn from appears to be based on a system where all octaves were tuned 0.5 bps sharp. This could, of course, have been done with any other temperament system including a zero beating 2:3 5th. The data seem to suggest two problems that may arise from a zero-beating 5th system. First of all, both the 2:3 and 4:6 5ths will not be zero-beating at the same time. This might be a problem in the middle, and certainly would be a difficulty in the lower bass of smaller pianos where the first and second partials are dominated by higher partials.

Secondly, the inharmonicity does not progress linearly as we progress up the scale from the temperament, but clearly is increasing in more like an exponential manner. Regrettably, Dr. Sanderson only gives data for two octaves, but his data suggests what we all know intuitively, that the top octaves of a piano are extremely inharmonic, and that inharmonicity increases from note to note by progressively larger steps as we go up the scale.

It seems to me — please correct me if I'm wrong — that this non-linearity would make it impossible to apply a uniform pure 5th at all points in the scale without making excessive compromises with other intervals. A pure 5th temperament might well be desirable on a low inharmonicity instrument in a large hall, but I have trouble imagining this system as something universally applicable to all pianos, or even to all 88 notes of any single piano.

I'd love to be wrong, and I'm very interested in your research. If anyone can convince me otherwise it is certainly you! Best of luck with your project.

Walter Sikora, RPT: A couple of weeks ago I was called on to do a voicing overhaul on an Acrosonic that had just been tuned by the most popular, well established tuner in town. I was keen to hear what one of his fresh tunings sounded like. Sure enough, the double octave-5ths and triple octaves were very smooth. I'm very conscious of the sound of double octave-5ths as I use this interval as part of my final aural checks on every tuning.

I liked this highly stretched tuning style, but didn't known how to duplicate it with the SAT. Yesterday I tried your method on a customer's Steinway M and Bechstein grand. It worked beautifully. I got smooth double octave-5ths and triple octaves with a nice progression of 17ths up and down the

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scale. I thought single octaves actually sounded better, although I could hear some roll. Both pianos sounded very musical and the customer was delighted.

Thanks for providing this great new tool. The only situation I can think of where I might hesitate to use the pure-5ths method is in churches where the accompaniments to hymns have so many major 3rds and their relatives. Even so, it's probably worth experimenting. Maybe our ears are becoming ever more accustomed to dissonance in the major 3rds. And a little added dissonance there is tolerable musically when the consequence is a more musical sounding stretch.

Coleman: The perception may have something to do with the close unison idea, but I think it has more to do with the better matching octaves, especially the wider multiple octaves. The beats in the octaves are still more than what one would tolerate in a unison that was not quite perfect. My personal belief is that this is closer to what a lot of good aural tuners have been doing accidentally for a long time. I have noticed that I tend to tune sharper when tuning strictly aurally than when I tune with a machine. I think that is because of the perceived need not to tune on the flat side, so I overdo it a little on the sharp side. Many years ago I used to hear people say that they liked my aural tuning better than my machine tuning. I don't hear this anymore.

It may be because my machine tuning style is much better now. However, now that I can tune the wider octaves more consistently than I did back then, it may become more popular to tune with the wider octaves again.

I have a couple of very keen customers who will give me feedback soon on this particular idea.

Jim Bryant, RPT: Dr. Coleman, you replied: "The perception may have something to do with the close unison idea, but I think it has more to do with the better matching octaves, especially the wider multiple octaves."

Okay, I'll buy that. The question came up during a tuning yesterday. A long-time customer, who is a recording engineer, performing artist, symphony player and one half of a very neat couple, had asked me to tune his wife's Steinway 'L'. This particular 'L' is about 12 years old, has had adequate maintenance, and is a joy to play, tune, and listen to.

Due to the fact that I had plenty of time to work on this tuning I decided to try some of the alternatives we have discussed these past few weeks. The clarity of scale on this instrument lent itself to my experimentation.

Starting with a very, very slightly stretched octave in the temperament I strove to get the smoothest progressions I could as concerns single, double and triple octaves, pure sided 5ths, slightly faster 4ths, etc.. I was concentrating on my technique and not paying attention to anything else. Starting at the temperament octave and working out in both directions (not my normal procedure). I had worked through the middle five octaves when the customer, sitting in a chair across the room behind me said "Jim, I don't know exactly what you are doing but I like the richness that is coming out." (I had not realized he was there until he spoke.) Of course this led to a discussion of theory, and where this tuning varied from what I normally do. Customer's comment: " I really like the clarity of your regular tuning but I like this sound as well" (slightly purer 5ths, slightly expanded 4ths, etc.)

I am glad that this happened, as my customer is very conversant with what he likes and doesn't like and is comfortable with discussing aural perceptions versus interval realities (and he does not tune).

I had intended to go back and retune the piano to my "normal" tuning but the customer asked me not to, in order that he could play on this one for a long period of time and decide what he liked/disliked about it. The results were very close to what you describe and although some single intervals do beat at what I consider to be an objectionable rate, they fit in well with the overall scale. No, I did not have my SAT so I could not take measurements.

I thought that due to this customer's unique set of abilities, perceptions and knowledge his comments would be of interest.

Ralph Martin, RPT: Have to relate an experience to you that your subject of stretched octaves pertains to.

Two years ago I had the unfortunate experience of tuning for a pianist/bandleader now fronting one of the big bands we all knew in past years. The local dealer delivered a 7' Yamaha to an outdoor bandstand immediately adjacent to a bus terminal. Auto horns were blaring, some of the musicians were warming up their instruments and Greyhound buses were pulling in next to the stand. Obviously, the ambient noise was overpowering. To make things worse, I had a little less than one hour to get some kind of respectable tuning installed.

The only way possible was to use an SAT FAC tuning and tune with the magnetic pick-up. I finished with a few minutes to spare and the pianist walked over to check everything out.

As you know, it's extremely rare to have a musician fault an FAC tuning performed with the SAT....but this guy had to be my first. These were his comments: "Hey, it's a good tuning, especially under these circumstances. But, you know, these factory-type stretches are never really enough. I play a lot of raised 11ths in the lead...and with this little stretch they all sound flat."

I told him the next time to allow me a little more time and a little less noise and I would accommodate him ... but I have to admit that, for the type of playing he was doing, they ***did*** sound flat. When I got back to the shop I began to think about this and wondered if Cavallero's style, what with the triple octaves high on the keyboard, would have sounded flat as well.

In any event, this sure supports what you have been working on. Further,

when I was learning how to tune many years ago, a ***lot*** of tuners seemed to tune in this fashion. Maybe this is another cyclic thing coming around again. What do you think?

Ed Foote: It is interesting to see who will accept what. I can state for a fact that the additional stretch (beating octaves for the sake of pure 5ths) will not work in a country music recording environment — the bass players go nuts! I tried this and it cost me another tuning on the spot. Ensemble playing also just doesn't seem to gel, intonation-wise, with this much stretch. As opposed to additional "richness," I hear it as a loss of foundation when the 6:3 octave is still beating, for the sake of 5ths.

Perhaps the solo piano will benefit from this, but then, I think it may depend on what kind of music that is being played. Jazz? I suppose so; I have been asked in the past by jazz musicians to make the top end "hot" and it seemed that there was no limit to how far I could sharpen the upper two octaves. My personal feeling is that the additional stretch is of limited use. I have not tried this on anything smaller than a Steinway L, so I cannot address the utility of the pure 5ths on small pianos.

However, we have to consider the primacy of the 5th in determining the value of making them pure. The 3rds operate in acoustical opposition to 5ths, so if the music is heavily dependent on the 3rds, this pure 5th approach will place the harmonic cost in a very sensitive area. Examination of the use of various sizes of 3rds and 5ths can be done with the well-temperaments and the music that was composed on them. Some musical architecture is predicated on the pure 3rd, hence, the destruction of the octave for the sake of the 5th is, in my opinion, counter-productive. As always, we tend to compare much of what we evaluate on the example of our mentors and teachers, so, for what it is worth, I will quote Bill Garlick, circa 1976.

"As you go up from the temperament octave, the 4ths will begin to show increasing amounts of beating, but the 5ths should not exhibit any more beating than they do in the middle of the piano. As you tune the last octave, which needs no compromise for notes above it, there should be a feeling of "lift," a sense that the pitch is "going somewhere."

My own personal feeling is that the double octave should stay as clean as possible, the loss of pure triple octaves seems to be of small importance, the straight program from the SAT seems to do this well on the larger pianos.

The optimum stretch for the bass? I think that this depends on the piano itself. A brassy set of hammers might sound better if the fundamentals are spread a little in favor of the higher partials, but on a more "mellow" or softer voiced instrument, which is producing a lot of fundamental, the strength of the 4:2 relationship is more important. Okay, that is more than two cents worth, but that is what my ears and customers are telling me.

Greeley: It may be more than two cents, but I think it's worth thinking about. Your story could be told many times over. In the years when I was doing studio work, certainly this kind of tuning would have been a very quick ticket out of town — it still would be, in some areas.

While I am quite excited about getting this method more carefully dissected, perhaps it is well to keep in mind that, like pianos, no two clients are alike. Paraphrasing myself from another context, what works for me and for my clientele might be problematic for someone else. I no longer do any studios, so do not have to worry about either the electronic instruments, or the specific needs found in that environment. The point might be that I can "get away with" a stretch that might not work for many others.

Still, my primary concern and goal is for each instrument I service to be the best that it can reasonably be. This equation, if you will, certainly tries to take a client's preferences into account. Without regard to "slow times" none of us can really afford to lose clients for the wrong reasons.

Martin: This morning I had to tune a 40-year-old Baldwin spinet. Using the FAC numbers but adding 1cent to the A4. At the risk of being a cold blanket, I found the bass really too wide for my taste. The rest of the piano, though, boasted almost pure 5ths all the way up with good triple octaves and single octaves that were certainly not objectionable. Probably I could have programmed the F for a better bass. My candid opinion, though, was that I know I could have been a whole lot happier with an aural tuning had I left myself more time. Couldn't ask the Missus opinion since she had just started taking lessons and wasn't really able to hear the difference from the previous tuning which was probably performed aurally with the old 4ths and 5ths method and really expanded octaves.

I am not giving up just yet, however, I'm going to try again with a larger piano. Maybe tomorrow.

Richard Raskob, RPT: Thanks to Jim for his post on this subject. I have for some time been experimenting with using the SAT to tune more like my aural tuning. My method is very similar to Jim's. I choose my A4 number by multiplying the measured A4 number by 1.16 . This normally gives me a difference between .9 and 1.5 cents. I reset the SAT at C6 as Jim stated in his post but find that pianos with a high C6 measurement start to get octaves just a little too wide for my liking around C7 and so I remove the reset at that point. The bass end of many pianos seems a little wide as some have mentioned on the list. I have found that, if one resets the SAT sharp by the amount added to the A4 number, a very acceptable bass can be had from the AccuTuner. I have had good results on many different brands and sizes of pianos. I only use a straight FAC tuning when I must pitch raise a piano. This method gives a very musical piano which, when I go over it by ear at the end of the tuning, needs very few changes.

Brent Fischer, RPT: I certainly appreciate and am humbled by your reference to me in your article. Of course I am one of those who has been advocating this (stretch

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First Responses to Jim Coleman's Article

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to the limit) tuning style since a few years ago and truly the acknowledgment goes to Franz Mohr and the techs at Steinway Hall for coaching me on this at that time. There is a limit on how fast a 4th should be allowed to beat and on concert grands I have generally found it to all work out within reason; however, the tuning I just completed this morning re-confirmed a critical area on the Steinway "D" exists between notes #67 and #76. In my opinion, the speed of the 17ths through this range will make or break the difference between an exciting and brilliant top end or a sound that becomes edgy and brittle. Just being a hair too fast is worse to me than slightly slower than ideal. Can you really dial this in now with the SAT? I know we have had this discussion in the past and being the diehard you know I am it may be time to "show me the money" again.

As accurate as the machine is you will have to just set me down and prove that it can not only measure frequency but also perceive and anticipate beat relationships which is the level of tuning I think goes beyond the SAT. If for no other reason, I think the art of tuning cannot be completely measured — absolutely very closely measured — just not completely. I guess I will never understand why technicians are not driven to exercise their minds with the challenges that tuning by ear requires. But wait, you also know that I am buying an SAT for the department as soon as possible. The three advantages I do not aurally possess are accurate pitch corrections, the ability to tune two instruments together, and confidence with pitch perception on notes #86, 87, and 88.

Moody: Oh boy, how to talk about aural tuning? But trading experiences seems valuable.

One time when subbing for the regular tuner he warned me that the performer was critical of the upper octaves, that he had checked the piano and it should only need a touch-up, but don't go overboard, tune like I usually do, that sooner or later it comes down to the tuner's judgment, not the player's. Or words to that effect.

As soon as I got there I checked the octaves — good; double octaves — okay; triple octaves — wow, sounds good; quadruple octaves — nothing blatant. In walks the pianist, "The upper octaves sounded flat in practice." "I just checked them and heard nothing horrendous, but I would like to check them against single strings. Say, how did you hear them?" He proceeded to play them not together but melodically (arpeggio). "See, they sound flat!"

Trying not to seem like I was squirming between a rock and a hard place, I blurted out, "Oh I haven't gotten to those checks yet, let me get set up and we will see what we can do." "Okay, I'll leave you to your work," he said, and walked out.

I started with a double octave and raised the left string two beats just to be blatant and then checked it against the single string in the temp. No beats ... Oops! Hmm, how far can I go and what about the 12ths? It turned out I could boost those octaves by one to two beats (the left string against the middle string) and still have beatless double and triple intervals. Well maybe one beat in three seconds sharp, but I can't count that slow, and the 17ths didn't speed up that much. So I jacked up the treble, but the pianist never came back to check, and I never found out if he noticed the difference. I didn't hear from the tuner that I really stretched his octaves too much, and he had me sub on other occasions. Oh well, another day, another tuning. By the way, this was on an American Steinway D at least once restrung.

You wrote: "There is a limit on how fast a 4th should be allowed to beat."

Of course, within the octave the 4th will beat according to how the 5th is set. I have recently noticed an interesting relation of these intervals according to beat rate tables. Using the first edition Reblitz illus. 4-11, F3 - F4. The 4th F3-Bb is .790 bps. The Bb-F4 is .790, exactly the same rate. However the F3-C4 5th is .590 while the 4th C4-F4 is 1.180 or exactly ***twice*** the rate. Having never known this it doesn't affect the way I tune, but perhaps it explains why I never listened much to 4ths. They (for me) result after the 5ths and 3rds are set. Besides I don't hear a distinct beat, rather a change of tonality when the intervals of 5ths and 4ths are tuned.

Bryant: As in any occupation, tuners have certain totems that we ascribe to and you have touched on some of those in this first article. The "pure" yet "stretched" octave is one. Yes it probably is possible to go across the range of the keyboard and have (mostly) pure octaves, but I'm not sure you would want to do it. The reason of course is that for every "pure" note or interval you have, a compromise has to be made somewhere and as you know that compromise is geometrically progressive. An acceptable interval in the mid range can become quite unacceptable in the second octave up or down very easily, and focusing on a pure octave, or 5th, or any other combo leads us into something other than "equal temperament" ... doesn't it? (honest question, not rhetorical).

I vary from Horace in that I will not hesitate to turn a 5th "inside out" if it makes melodic or musical sense in a given instance; probably because I don't know enough about theory to understand why it should not be done. Of course we are speaking in generalities and some methods will work better on some instruments than others due to the many factors ... size, type, materials, musical score, solo ... etc.

I learned to tune by doing it because it sounded right and "because that's the way it should be done, son." So I tend to focus more on 4ths and 5ths than perhaps I should, checking, occasionally, with 3rds and 6ths and probably can't tell you where to find a 7th. As a consequence, I depend on my 5ths as an anchor in my tuning and I find that I prefer them on the "pure" side and have never been able to get away from that (don't know that I want to). Horace's comments, and your postulations on 5ths, tend to lead me to believe that we are essentially in agreement there.

A 30-Ton Pneumatic Soundboard Press

By Clair Davies
Bluegrass, Kentucky Chapter

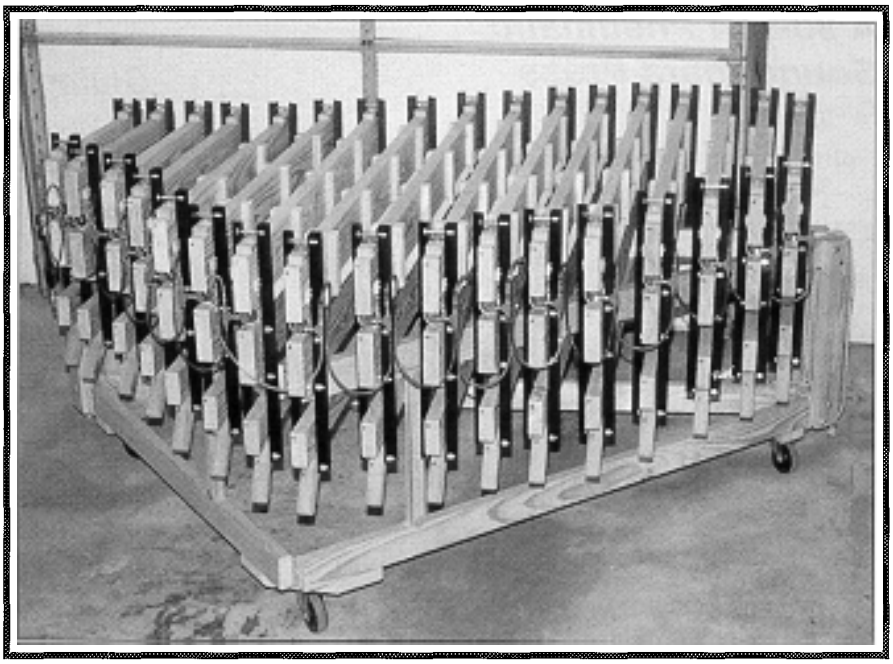

Photo 1 — The 30-ton Soundboard Press, weight 500 pounds.

The press you see here is a much-improved version of the one I introduced in the September 1987 issue of the *Journal*. The 1987 press worked well for me for several years, despite operations that were annoyingly slow or awkward.

For instance, to reposition the rib clamps I had to go to both ends to loosen their locking rails, then go back to both ends again to tighten them. The top beams would sometimes get jammed on the threaded rods when being taken off or put back on. As many as 34 hex nuts and washers had to go on the threaded rods to load a soundboard in the press, then later come off again to unload. I had always wanted to rethink these functions, and a dozen others, but never seemed to have the time or motivation.

When Webb Phillips asked me to teach a soundboard class last year at the Pennsylvania State Convention I thought I'd better finally give the old press a good going over and fix some of its problems. I didn't want to spend all my time in Philadelphia apologizing for it. I ended up designing and building an entirely new press. It turned out really well and is infinitely more fun to use. Having dealt for so long with the deficiencies of the old model, I knew better this time what was needed.

Improvements in New Press

The most important new feature, angle-iron braces to hold and align the beams, instead of threaded rods, solved the problem of the inherent instability of beams (see Photo 2). At full pressure, half the beams in the old press actually needed an additional yoke on one or both ends (unfortunately, not shown in the 1987 article) to keep them from suddenly leaning over and squirting hoses and gluey ribs out the side. The angle iron prevents that from happening.

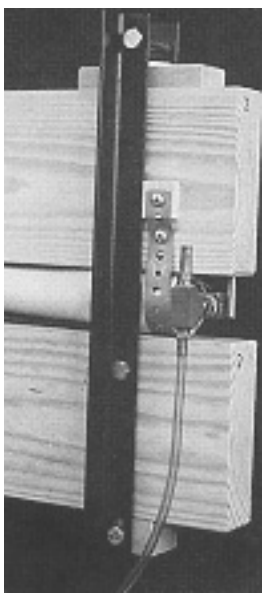

Photo 2 — The important features of the rib clamp assembly.

In the new press, thick pins (bolts with the threads cut off) are simply popped into place to capture the top beams without need for nuts and washers. The beams also slide in and out between the angle irons without jamming.

Listed below are some of the other improvements:

1. More suitable beam lengths, to be ready for any kind of piano.
2. Rib clamps that position from one end just by loosening a dog.
3. Carriage posts that move if necessary when positioning the clamps.
4. A simpler way to attach the hose to the beam.
5. Larger diameter hose to insure ap-

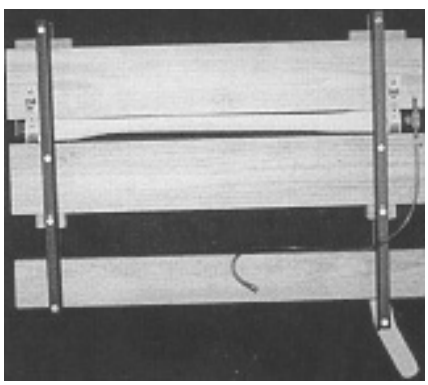

Photo 3 — A complete rib clamp assembly.

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A 30-Ton Pneumatic Soundboard Press

Continued from Previous Page

plication of full pressure.

Safety rods that prevent the fittings from blowing out of the hoses.

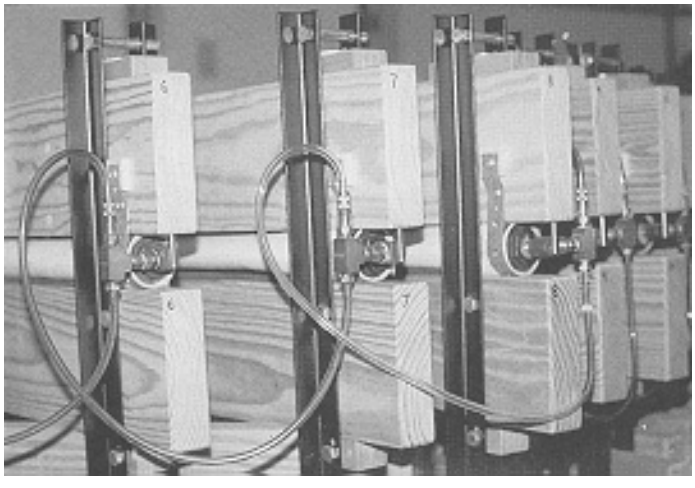


Photo 4 — Rib clamp assemblies hooked up.

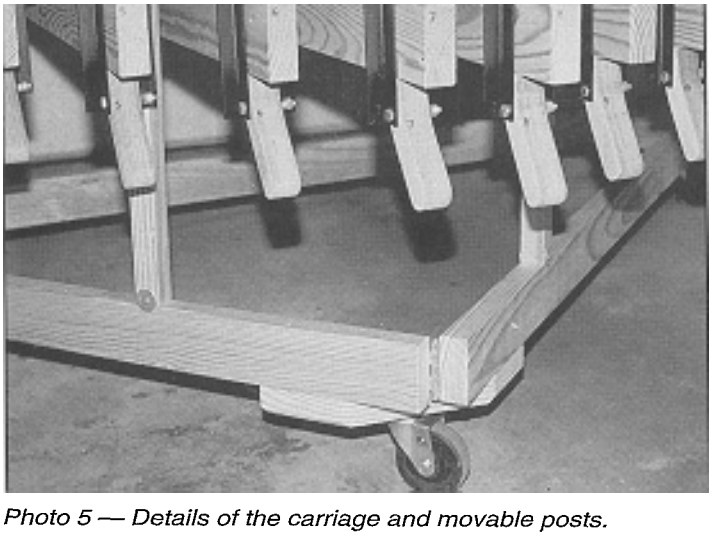


Photo 5 — Details of the carriage and movable posts.

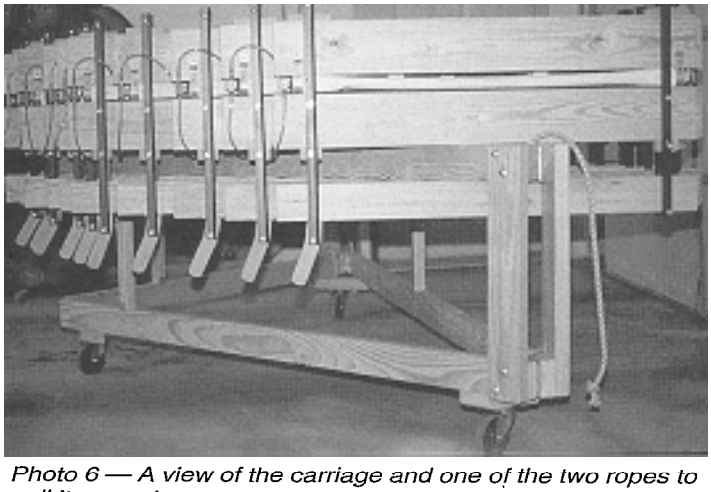


Photo 6 — A view of the carriage and one of the two ropes to pull it around.

Gluing Pressure

The best reason for using a pneumatic soundboard press is that it can deliver a perfectly uniform pressure of 100 pounds per square inch. The pressure is always known exactly, by means of the compressor's gauges.

I first decided to use 100 psi when I found out it was the pressure used by Steinway in their presses. But since rebuilders had never used such high pressure and I wanted to be sure I wasn't going too far, I called Bruce Hoadley to see what he thought. He surprised me by saying that 100 pounds per square inch was actually considered a minimum in woodworking industries for gluing softwood, and that twice or three times as much was used with hardwood. When I finally bought Hoadley's book, *Understanding Wood*, I found all this laid out in detail in his chapter on joining wood.

A lot of pressure is needed for a superior joint when the wood has been surfaced with rotary planers or drum sanders. The wood looks perfectly flat and smooth but really isn't. The scalloping action of machining leaves a miniature topography of hills, valleys and ridges on a piece of wood, as will always be revealed by the first coat of finish. Only substantial force can bring two such pieces into intimate contact. In light of this reasoning, and with Bruce Hoadley's assurance that I wouldn't be squeezing out all the glue, I built the press I wanted.

Obtaining Crown

For the one-person shop, a pneumatic soundboard press is ideal, particularly when made of yellow pine. Yellow pine beams are light enough for one person to lift, and yet they're extraordinarily strong. According to Hoadley's book, the bending strength of this commonplace wood equals many species of oak. Used everywhere in home construction for floor joists and roof trusses, yellow pine is relatively inexpensive. Grades one or two, which are both strictly flatsawn for maximum strength, should be used for the pneumatic press. Construction grade isn't really strong enough. The beams that clamp

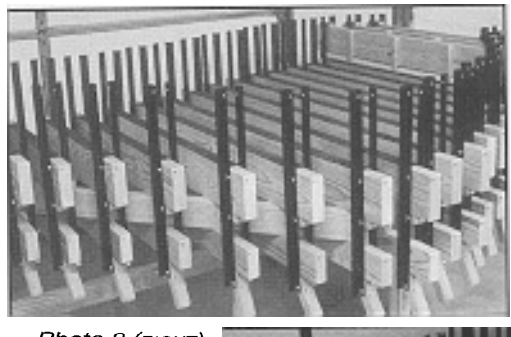
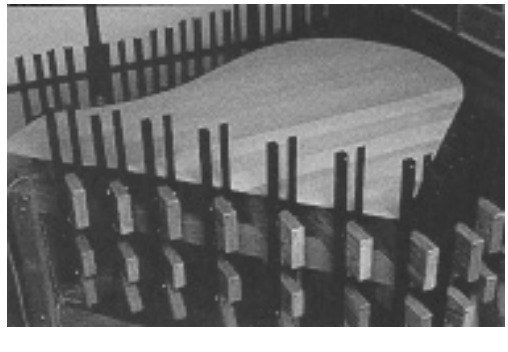


Photo 7 (LEFT) — Soundboard press ready to accept soundboard panel.

Photo 8 (RIGHT) — Soundboard press with soundboard panel loaded.



down a concert grand's longest ribs must each bear more than 5000 pounds of force.

A unique and unorthodox feature of my press is the absence of a built-in dish to force the crown. The beams are perfectly flat before the pressure goes on. A modest reverse crown is taken on as the press inflates, the longer of the bottom beams bowing downwards about 3/8 inch, the top ones upwards the same amount.

Some technicians may be tempted to cut a curve into the bottom beams, but I don't recommend it. Klaus Fenner, the well-known scale designer, has observed that the ends of the ribs seize first in a pneumatic press with a deep dish. The fibers of the panel then tend to be stretched apart as it is forced down into the curve of the press. This actually works against the ultimate crown of the soundboard.

If more reverse crown is desired in the press, it works better to take a little off the height of the bottom beams. Since the strength of a beam varies as the cube of its height, removing only one inch from a five-inch beam weakens it enough to bow nearly twice as much. The beam must not be weakened excessively, as too much bow allows the hose to round out and not completely cover the rib. To deliver full pressure, the hose must contact the rib's whole width.

If I were to contour any of the beams, I would do only the top ones. A convex top beam would put pressure on the middle of the rib first, then spread it out toward the ends. It wouldn't necessarily give the press more of a dish, but I don't think this issue of reverse crown in the press warrants all the attention it gets. Soundboard crown does often mysteriously vanish when the strings go on, but it's never a problem of insufficient dish in the press.

A soundboard panel that is dried correctly before ribbing will bow up at least 5/8" when it takes back its normal moisture content from the air, which gives plenty of extra crown for compression. It's open to question whether a reverse-crowned press really contributes measurably to this. It's impossible to prove or disprove an effect.

In terms of ultimate crown, however, the effect of the inner rim is absolutely certain. The required 1 1/2 degree angle on the inner rim (2 degrees in the Mason and Hamlin) is probably the biggest factor in setting the crown of the soundboard and in keeping it. When this criterion is not met the crown will be spoiled, no matter how deep the dish in the press. Disappointment can result even with a good inner rim if the soundboard isn't made to conform to it perfectly. Crown can disappear altogether if some part of the inner rim is flat.

This press, as described, always gives me a 3/16" crown before stringing and more than 1/8" with the strings on. This is a good result, but I could never depend on it happening until I got serious about the inner rim.

Of the fifty people who attended my class in Philadelphia, several have already built the press and many others have it in their plans. This demonstration of interest in the power, versatility and convenience of the pneumatic system made me want to continue helping people learn about it.

Only rudimentary skills are needed to build my press, mainly just careful measuring, cutting and drilling. In the next two issues I'll give the details.

An Essay on the History of Tuning - Part VI

By Skip Becker, RPT
Northeast Florida Chapter

Modern Tuning Theory

The Baroque era (1600-1750) is notable for the population increase of European cities, and the corresponding rise of new "middle classes." These were successful merchants, manufacturers, and even tradespeople who had time and money on their hands. The leisure time enjoyed by their families was a measure of their success. Men began smoking tobacco, and women were cultivating the ritual of tea with sugar. Everyone learned to wear wigs. They flocked to the new sophisticated Italian operas (often just to be seen wearing their wigs). They could afford the new "harpsicons" ("harpsichord" was in general use much later in the Baroque), and, affecting the manner of aristocrats, they had the inclination to put them in their parlors—but not necessarily to play them.

Because of their increasing popularity, both as musical instruments and as a status symbol, keyboards increasingly fell into the hands of novices. The tuner and the player were less frequently the same person. The thinking of keyboard players about tuning underwent the transformation from medieval to modern as well: let somebody who knows what they're doing do it! At the beginning of the Baroque, anyone who played a keyboard knew how to tune the common temperament. By the end of the Baroque, with the complexities of key color, and circulating 5ths, tuning had become a specialized art; in the early part of the next century, it became a separate vocation. Musicians with the aptitude for it became known as "tuning masters." They were the first professionals, usually found working in the instrument shops of the rapidly growing urban centers. There weren't many of them. The best were instrument makers, but it is unlikely one could have prevailed upon Mr. Silbermann or Mr. Stein to "put a clavier in tune." Master craftsmen usually employed five or six apprentices, who might be dispatched to maintain an instrument of their manufacture, for a small maintenance fee. The arrangement of one master to five or six apprentices produced around 20 instruments annually, so the whole affair was more or less manageable. This was the standard production rate for all Europe during the Baroque era. It seems to be the greatest number of hand-made instruments which could be produced with the proper quality assurance required to bear the master's name.

Outside city limits, the task of tuning fell to music teachers, or schoolmasters, even musical tinkers, in a pinch. In the preface to his tuning instructions, Barthold Fritz writes in 1756: "For there are persons who live in the country who cannot always get hold of a tuning master. There are music lovers in cities who would like to undertake this exercise partly in order to save expense, and partly for their own satisfaction and for confirmation of the science of music they have themselves acquired. Yes, there are a lot of teachers in cities who are no real organists, and have never had instruction in proper tuning, but who ought to be able to tune their pupils' instruments before, during, and after their lessons." Keyboards during these times generally required tuning every couple of months. It should not be a surprise to learn that they usually didn't get it. Wolfgang Goethe, in his memoirs, recalls a trip in his youth to visit an Alsatian clergyman, whose daughter "waited upon him with music." "She played...upon a clavier which the schoolmaster ought to have tuned long before if he had had the time."

Grand New Opry

The Baroque period is usually defined by the development of national trends in art, literature, and music. Athanasius Kircher, who coined the phrase "doctrine of affections" in his own encyclopedic version of "universal harmony," attributed the different styles to the differences in national humors. Naturally enough, different countries were reacting to the advent of modern times in their own ways. In music, the new and innovative styles came from the Italians, who led the way with their operas (the first bonafide opera was from Monteverdi in 1610). Italian composers were legion, their music was all the rage. Italian traveling opera companies greatly affected local provincial music everywhere they played. Italy was also the home of instruments. Italian Masters, such as Stadivarius, dominated the making of the new violins, violas, and cellos. It was also the birthplace and home of the harpsichord. The Muse seemed to be living in Italy. The highest status symbol a German or French potentate could flaunt was a personal opera establishment. This involved the construction of an opera house[1], incredibly complex stage machinery, an orchestra, and a troupe of Italians who composed and performed works of grandeur based on the vanity of their princes. This was fabulously expensive, and most rulers of the many smaller principalities had to be content with small chamber orchestras.

Around 1700[2], Italy was also the birthplace of the piano. The honor of "inventor" falls to Bartolomeo Cristofori (1655-1731), Court Instrument Maker to the Medici family. He called it the "gravicembalo col piano e forte," or "harpsichord that plays soft and loud." Little is known of Cristofori's life. He moved from Padua to Florence around 1690 at the request of merchant Prince Ferdinando de Medici, an accomplished harpsichordist. He remained there until he died. The opportunity to work in Florence for the Medicis was an incredible honor, and suggests that Cristofori had established a reputation in Padua as a skilled instrument builder. After Prince Ferdinando's death in 1713, Cristofori was appointed curator of instruments to the Grand Duke Cosimo III, where he assumed the responsibility for maintaining a collection of 84 instruments, half of which were keyboards.

Cristofori's bills to the Treasurer of Tuscany have been preserved. Although drawings of his piano design appeared in print by 1711, his instrument was not well known in his lifetime. The first sonata dedicated specifically to the new instrument was composed the year after he died (composer's rarely designated which instruments to use

until the late Baroque). There are, of course, competing claims for priority, but Cristofori's pianos reveal a remarkable technical genius. He realized early on that piano strings required higher tension than those used for traditional harpsichords. He alone constructed sturdier cases for his instruments. His action design is also the best of any early claimants. It included the sophisticated concept of escapement, and utilized individual dampers (the first wedge-shaped for unison strings), backchecks, and a repetition string[3].

Baroque England

The new scientific way of thinking, which was sweeping all of Europe, took hold in England first. England was the most affluent country, and offered economic opportunity to anyone who could get there; including musicians, and especially instrument makers. Music became so popular that paradoxically, it lost its glamour. In Renaissance times, Queen Mary had led a national trend in playing the new claviers. Any decent courtier was expected to be a musician. By Baroque times, England was lousy with musicians. It was not possible to make a trip to the market, or dine in a tavern without being "fiddled or piped to death, for a penny." English aristocrats still owned and purchased the finest instruments available, and hired musicians for entertainment; but they were "mortified to contemplate their sons putting a viol under their chins, or raising a pipe to their lips." For them, what was the sense of devoting a lifetime of practice just to be able to perform as well as a hired musician? Music was not considered to be a proper vocation for a son, unless preceded by matriculation in the church. But the ability to play a keyboard just well enough to tinkle out the melody from the latest air or aria became an essential "feminine" characteristic. Playing the keyboard became one of the female "accomplishments." Together with such skills as speaking a few words of French, and some needle point, these accomplishments were the requisite display of good breeding so necessary to succeed in any class of Baroque English society. Because the keyboards were played primarily by "middle class" daughters awaiting marriage (and no decent home could be without one), the instruments became known as "virginals."

According to the remarkable historian Charles Burney, the description was accurate. Any keyboard facility displayed in the courtship process was neglected immediately after marriage. There seemed to be a finite amount of musical talent apportioned to England; the more who participated, the smaller was each share. Indeed, by the middle of the 18th-century, it seems the shares were so small that they had to import their musical talent from Italy and Germany.

In the new modern England, the Muse had been stripped of any notions of "higher calling," or nobility. Some of the new religious sects which were springing up during the "Reformation" (like the Quakers) even banned music from their worship services. It took their Germans to remind the English that there was a "higher purpose" to music. For example, even the jaded English found Handel's *Messiah* to be a profoundly moving experience. When Lord Kinnoul offered Handel some compliments on his "noble entertainment," Handel replied: "Milord, I should be sorry if I only entertained them. I wished to make them better."

Baroque Germany

In Baroque Germany, times were tough. Years of civil warfare and frequent invasions had ravaged the country (marauding armies were encouraged to "live off the land"), decimating the population by 40 percent, and creating a plethora of tiny independent states. Social class structure solidified to a greater extent than in other countries. Upper classes were educated to the point that Latin was encouraged, even in schoolyard games (German aristocrats learned early to change their verb endings when speaking to menials). Latin was the language of medieval thought. In 1660, books printed in Latin (by the very busy German printing presses) outnumbered books in German by four to one. 100 years later, the ratio was the same, but reversed (this signaled Germany's belated entrance to modern times).

However, in Germany, music had not lost its sheen. A musician was still regarded in the same manner as a prophet, or a soothsayer, or a mathematician: someone with a special window into the nature of the universe. Musicians tended to be true *musici* (educated musicians of the old school). Tuning and temperament theory were active topics. The Germans also tended to be the least influenced by the innovative music coming from Italy. They continued to compose in the contrapuntal style of the Renaissance.

Werckmeister was among the first to base his musical theory on the modern concept of harmony. Germany was also lagging behind the other countries in terms of economic development. The best job a musician could get was in a court chamber orchestra. These opportunities were rare, despite the large number of courts. When Handel's friends visited him in England, they were astounded that he could make a living independent of any royal patronage. Music was just not as omnipresent in Germany as it was in the rest of Europe. Few people got to hear the court chamber concerts, as the audience was restricted to aristocrats and courtiers. Most Germans got their music Sunday mornings, in church, where they listened to what may be the best sacred music in the world. The Germans were proud of this heritage. Competition for a job as a church organist could be very intense (just like today). Historians tend to neglect the fact that Telemann aced out J.S. Bach for the organist post in Leipzig. Telemann didn't take the job because he got a higher paying gig in Hamburg.

> "At the beginning of the Baroque, anyone who played a keyboard knew how to tune the common temperament. By the end of the Baroque, with the complexities of key color, and circulating 5ths, tuning had become a specialized art; in the early part of the next century, it became a separate vocation."

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An Essay on the History of Tuning - Part 6

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The next best job for musicians in Germany was teaching. The daughters of the German middle class were not to be outdone in any social graces or accomplishments, but unlike their counterparts in England, German men received music instructions as well. Music was an acceptable vocation, and a desirable avocation. Wolfgang Goethe recalls, in his memoirs, his instructions on the forte-piano. His father did not encourage advanced lessons for him, but he did for Wolfgang's sister. Germans loved to musicalize. Non-professionals formed societies known as "kenner und liebhafen" (connoisseurs and amateurs), who had influence far beyond their numbers. Many compositions in the later part of the century were dedicated to and directed towards these permanent societies. Any program produced by the Kenner und Liebhafen was considered to be of a higher quality than the concerts performed by traveling virtuosi.

But if they had the money, even connoisseurs didn't tune their own instruments. Herr Johann Caspar Goethe, a learned doctor from the University of Giessen (and father of the famous Wolfgang), recorded his tuning expenses in Latin: January 28, 1755, pro cimbalo accommodando, 24 kreuzer; and again on April 11, 1764, Pro cimbalo temperando, 30 kreuzer (we may assume that the higher price included a pitch raise). We trust Herr Goethe was *musici* enough to maintain his keyboard between professional tunings.

Music a la Mode

The French had trouble defining just what French music was, mostly because they loved Italian music so much. French musicians were dreadfully intimidated by their Italian counterparts. Even Francois Couperin (le Grande, 1668-1733), who came from an aristocratic French family famous for its musical prodigality, used an anagram of his name when he presented his early works. Any sonata by the new Italian composer "Pernucio" was devoured eagerly by the French public. The unique "French style" was probably first defined by Jean-Baptiste Lully (1632-1687), who was himself an Italian (but to the French, he was their Italian). Lully was the most popular composer of his time, and a favorite of Louis XIV, the Sun King. The two became acquainted as adolescents when they both danced in the same ballet (in Paris, 1652). Lully was able to parlay this on-again off-again friendship into a series of musical patents, which gave him virtual domination of French theater music. Most of Lully's operas and innovative ballets were very popular. However, when his *Arimide* received a cold reception from the public, he shut it down — except for a final performance during which he was the entire audience (Lully was his own biggest fan). When the Sun King heard of this development, he reasoned that if Lully liked it, it couldn't be so bad; so he ordered a private performance of his own. Louis was charmed by the opera; his court and the public hastened to change their opinions.

Another great French composer who helped define the "French style" was our old friend J. P. Rameau. Rameau entered the opera arena rather late; he was 50 before he wrote his first, but he is celebrated for rejuvenating the French theater with 25 operas over the next 30 years (this includes the first Masonic opera *Zoroaster*, anticipating Mozart's *Magic Flute* by 40 years). Even so, his early efforts were criticized because he didn't compose like Lully. But, however fashionable, the French public was notoriously fickle. Rameau lived long enough to see Rousseau's operas (his enemy from the "War of the Buffoons") criticized because they didn't sound like Rameau.

France also has a legitimate claim to the invention of the piano. Jean Marius presented detailed drawings to the University in Paris in 1714. He had the temerity to claim that Cristofori stole the idea from him. But his pianos lacked the sturdy case construction of Cristofori's, and his actions lacked any sort of escapement. His work, while interesting, has won no priority status in history books.

The First Home of the Piano

Although born in Florence, the piano would never call Italy home. Cristofori only made a few such instruments. His work was continued by his student Giovanni Ferrini, whom he designated in his will to complete a piano under construction. That particular piano went to Queen Maria Barbara of Spain, an early devotee, who managed to collect a total of five of the new Florentine pianos.[4] It's quite possible the others were made by Cristofori himself. But Italians rarely saw the "piano e fortes" outside Florence or Rome. The Germans were the first to manufacture pianos in any quantity, beginning in the 1730s. A German claim of priority comes from Christoph Schroeter, who submitted hammer action plans to the King of Saxony in 1721.

The attention of Gottfried Silbermann, the distinguished organ and clavichord builder, was drawn to Schroeter's "invention." He "test marketed" his early efforts (based on Schroeter's design) on J.S. Bach, who found little use for the clumsy keyboards, save to strengthen the fingers of his students. Thus piqued, Silbermann redoubled his efforts, and redesigned his instruments to be exact copies of Cristofori's. The new models were quite successful. His dedication to producing a "better piano" inspired the next generation of builders, most of whom were trained as apprentices in his shop.

By the mid 18th century, Germany became the first home of the new instrument. For the first time, demand for keyboards made it possible for an instrument maker to specialize in harpsichords, clavichords, and pianos. By the end of that century, so many German piano makers had moved to England that they took the distinction of "the home of the piano" with them.

Bach Piano Concert In Potsdam 1747

A favorite figure in history is Frederick the Great (1712-1786), King of Prussia, who came to power in 1740. Because he survived the Baroque era so successfully, he is often regarded as the first great personage of modern times. Although he is remembered in history books mostly for his military astuteness (he did bring the gift of Prussian militarism to both Germany and the world), he was also devoted to the life of the mind and the spirit. His court in Potsdam was one of the great centers of intellectual activity in Europe in the 18th century. Many mathematicians, scientists, and

> "Although some music histories report to the contrary, Bach not only used pianos, he sold them."

philosophers visited, and wrote some of their most influential works while there. But music was Frederick's real love. He was an avid flautist and composer. Some of his works are still performed today. And Frederick was one of the first patrons of the arts to recognize the virtues of the newly developed "piano-forte," which he saw as the great new wave of the future.

Although often on the battlefield, defending or enlarging his borders (he had commissioned a portable harpsichord to accompany him), he found time to increase Prussia's cultural activities as well. Upon completion of a new opera house in 1742, Frederick enlarged his musical staff, hiring outstanding instrumentalists at enormous salaries. C.P.E. Bach, J.S. Bach's son, was appointed first cemballist (an appointment which lasted for 20 years). C.P.E., then 26-years-old, had had seven years of university education in law and liberal arts in addition to the intensive training in music he received from his father from a very early age. In Frederick's court, however, these credentials were quite meager. He was one of the lowest-paid musicians. In fact, he may have only gotten the job because Frederick was an admirer of his father. For years after, the King made it known, through gentle hints, how pleased he would be to have the elder Bach come and pay a visit; but this wish had never been realized.

It was Frederick's custom to have evening concerts of chamber music in his court. Often he himself would be the soloist in a concerto for flute. His efforts must have been well received because the King's flute teacher, Joachim Quantz, was by law the only person allowed to find fault with the King's playing.

One evening in May,1747, an unexpected guest showed up. Johann Forkel, one of Bach's earliest biographers, tells the story as follows:

> One evening, just as he was getting his flute ready, and his musicians were assembled, an officer brought him a list of the strangers who had arrived. With his flute in hand he ran over the list, but immediately turned to the assembled musicians, and said, with a kind of agitation, "Gentlemen, old Bach is come." The flute was now laid aside, and old Bach, who had alighted at his son's lodgings, was immediately summoned to the Palace. Wilhelm Friedemann, who accompanied his father, told me the story, and I must say that I still think with pleasure on the manner in which he related it. At that time it was the fashion to make rather prolix compliments. The first appearance of J.S. Bach before so great a King, who did not even give him time to change his traveling dress for a black chanter's gown, must necessarily be attended with many apologies. I will not here dwell on these apologies, but merely observe, that in Wilhelm Friedemann's mouth they made a formal dialogue between the King and the Apologist.
>
> But what is more important than this is that the King gave up his Concert for the evening, and invited Bach, then already called the Old Bach, to try his fortepianos, made by Silbermann, which stood in several rooms of the palace. [Forkel here inserts this footnote: "The pianofortes manufactured by Silbermann, of Freiberg, pleased the King so much, that he resolved to buy them all up. He collected fifteen. I hear they all now stand unfit for use in various corners of the Royal Palace.] The musicians went with him from room to room, and Bach was invited everywhere to try them and to play unpremeditated compositions. After he had gone on for some time, he asked the King to give him the subject for a Fugue, in order to execute it immediately without any preparation. The King admired the learned manner in which his subject was thus executed extempore; and, probably to see how far such art could be carried, expressed a wish to hear a Fugue with six Obligato parts. But as it is not every subject that is fit for such full harmony, Bach chose one himself, and immediately executed it to the astonishment of all present in the same magnificent and learned manner as he had done that of the King. His Majesty desired also to hear his performance on the organ.
>
> The next day, therefore, Bach was taken to all the organs in Potsdam, as he had been before to Silbermann's forte pianos. After his return to Leipzig, he composed the subject, which he had received from the King, in three and six parts, added several artificial passages in strict cannon to it, and had it engraved, under the title of "*Musical Offering*," and dedicated it to the inventor.

After seeing Silbermann's "new models" in Potsdam, Bach was happy to act as his local Leipzig agent (see Jack Greenfield's *PTJ* series: "Sound Background"). Although some music histories report to the contrary, Bach not only used pianos, he sold them.

Notes

1. Although the notions of Pythagoras had been driven from the realm of "natural science," Baroque theaters were constructed (by Freemason architects) according to strict Pythagorean concepts of proportion.
2. The date 1700 for the invention of the piano is accurate to within 300 years or so. Various scholars argue about the invention of the "soft and loud," and depending upon their premises, they may all be correct. See Steve Brady, "Roll Over, Cristofori," in *PTJ*, March, 1997, p.2.
3. "String" is not a misspelling. Cristofori laid a silk cord over the hammer shanks to aid in repetition.
4. Spanish technicians apparently balked at the new technology. Two of Maria Barbara's pianos were converted into harpsichords.

Bridle Strap Replacement

By Rob Kiddell, RPT
Calgary, Alberta Chapter

This is a job so simple, it's automatic. As in all automatic processes, however, there is a sequence to follow and parameters to keep in mind.

Background

The primary function of bridle straps is to keep the jacks from dropping below the hammer butt felt when the action is removed from the piano. That's it. Simple. I have, however, encountered bridle straps that have been installed that were too short. These straps pull back on the hammer butt, and some think that this aids in repetition. If your repetition is sluggish, look elsewhere for your problem, as bending the bridle straps to pull on the hammer butts is not a solution. The two problems I find with short straps are: *1)* keys drop when the hammer rail is raised, due to the tension on the strap allowing the wippen to be raised, and *2)* bridle wires bend back to touch the backcheck wire, causing annoying clicks when the piano is played. Correctly installed straps should have some slack, and the bridle wire should be in front of the backcheck wire. Conversely, if straps are installed that are too long, they can bunch up during playing and interfere with a solid check between the catcher and the backcheck. If the straps have too much slack, they will allow the jacks to fall below the hammer butt felt when the action is removed, defeating their original purpose.

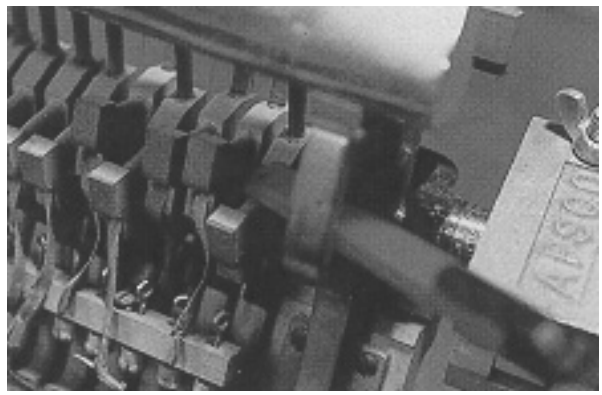


Photo 3

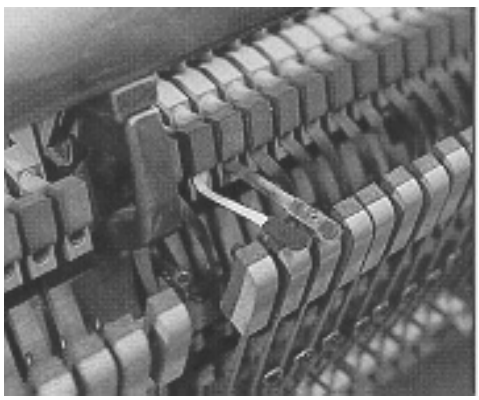


Photo 1

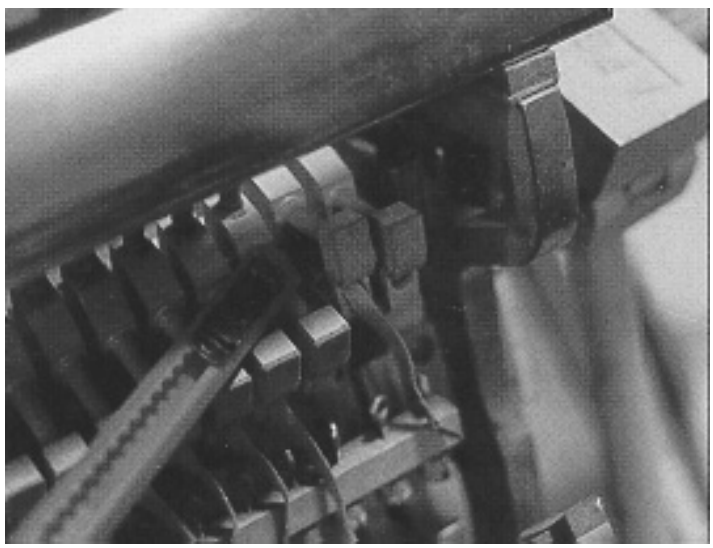


Photo 2

Procedure

Keeping the new straps to the correct length is the primary concern in replacement. Remove an old bridle strap, and compare new straps to the existing ones in the action, taking care to select a new strap that matches the old ones in length (Photo 1). You have a decision to make regarding new straps, either the cork-type, clip-type, or plain straps. If there is a hole below the catcher, cork-type straps will usually suffice. They come in different sizes of cork, and I often trim the cork, so that it doesn't dislodge the felt square attached to the back of the catcher. Both the spring-clip and the plain straps attach to the catcher shank, and the strap either feeds through the hole below the catcher, or simply connects straight

Photo 4

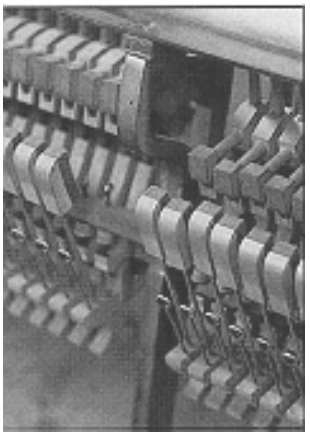


Photo 5

to the bridle wire.

This might seem like a lot of work just to select bridle straps, but incorrect strap replacement results in tedious, often permanent regulation problems. Save yourself the future hassle and get the initial dimensions correct.

Removing the old bridle straps is as simple as disengaging (or crumbling) the old leather from the bridle wire and cutting the strap from the catcher shank. Again, this is a simple process that requires a bit of thought before heedlessly hacking the old straps off. Too often when I've been servicing vertical actions, I have seen a set of replaced bridle straps with bits of the old straps hanging from the catcher shank, sometimes a full inch. The jacks brush against the old strap segment, which interferes with smooth jack escapement. Cutting the old straps as close to the point where they were glued into the hammer butt is the ideal removal technique.

One method is removing the hammer butt, trimming the strap flush to the catcher shank, and replacing the hammer butt in the action. You can do this if you are repairing each hammer butt for any reason, or have eons of time to replace the straps. More practically, I use a technique that involves scoring the strap from both sides of the catcher shank, while the butt is in the action. Using a 1/2 inch Olfa breakaway blade knife, I extend the (new) blade considerably, and keeping tension on the old strap, cut the strap on either side of the catcher shank flush from underneath (Photos 2 and 3).

This results in a clean, close cut of the old strap, and any bits of the strap that remain are easily removed with needle-nose pliers or strong tweezers. The narrow knife can slip between the action rails (see Photo 3) to get at both sides of the end section hammer butts. The results of clean bridle strap removal are evident in Photos 4 and 5. Gluing on the new straps is again a simple, automatic task. As you have already sized and trimmed the new straps to the old dimensions, gluing them in should present no problems (Photo 6).

Some bridle wires need to be enlarged to accept the new leather/vinyl head, as new straps tend to be thicker in this dimension than the old ones. Simply wedge a thin, flat screwdriver blade between the point of the bridle wire and where the wire loops, and pry the point away from the loop. I use the old standby, aliphatic resin glue (also known as yellow carpenter's glue) to attach the new straps, but in this case, almost any good adhesive will work. When installing the clip-type straps to the catcher shank, I pinch the clip a little, to give a good, solid grip on the catcher shank. I also dab a bit of glue inside the brass clip, just as an added precaution. If using cyanoacrylate (Krazy) glue, be careful not to let it get on the catcher leather or jack stop felt, as it will harden and cause odd clicks and sticks.

Bridle strap replacement is a simple task, and with a few precautions, you can complete a quick, neat, and proper replacement job (see Photo 7).

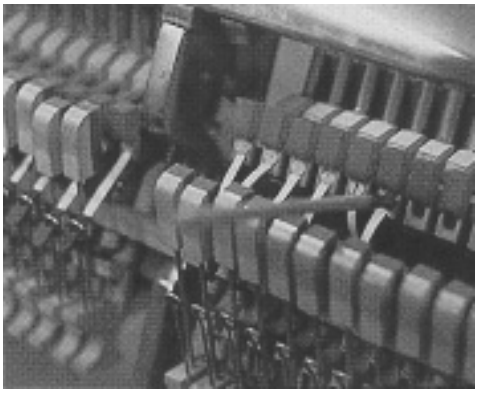


Photo 6

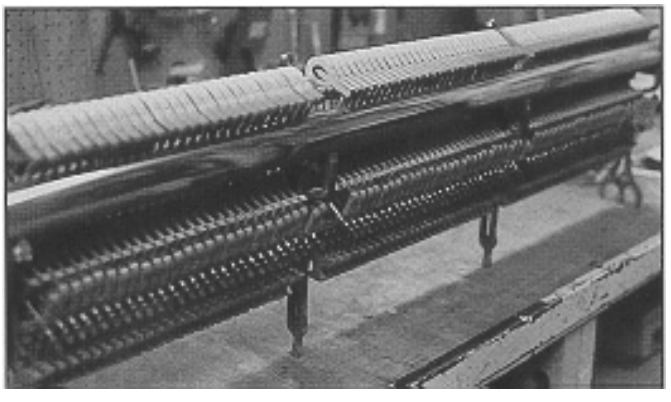


Photo 7

To Step In It

By Carol Beigel, RPT
Washington, DC Chapter

Last week I had one of those service calls where I did everything wrong! Even after 19 years tuning pianos, I still amaze myself sometimes that I make such mistakes when I know better. I am sharing this embarrassing story with you because I learned something very valuable, and I have a question.

A store I do work for recommended me to a music school. I quoted my best price over the phone because the director came from an immigrant culture that feels insulted if they are not made to feel like they are getting a discount. Mistake #1 — no discounts! I also assumed that because they seemed like a classy music school, the pianos had been reasonably serviced in the past. Mistake #2 — never assume anything but the worst conditions in a music school.

I arrived to find one very busy, over-worked (seven days a week, twelve hours a day) director giving a music lesson. There were four pianos, and I was to "tune" two of them. The first piano was a Belarus studio upright. Mistake #3 — never assume a music school has nice pianos! It was 38 cents flat, had loose hammer heads, noisy pedals, and bass strings that were not matched pairs.

Since the teacher was busy with her student, I decided not to interrupt, and just go ahead and service the piano. Stupid mistake #4 — the piano required a lot more than "tuning," and all the extra free work I was about to do would have no value to her because I had not pointed out the extra problems. The piano took twice as long to service as I had originally estimated, but I was pleased because it played and sounded so much better. All she heard when I was finished was the inharmonicity of the mis-paired bass strings, and that the repetition was not even across the keyboard!

The next piano was a 4'10" baby grand manufactured by a Korean company. After listening to the previous lesson, I knew this piano was badly in need of tuning. Again, the piano was at least 38 cents flat, and the last five damper heads in the treble were sticking. The piano was also covered with so much dust when I raised the lid that I choked; not to mention the eight pencils I pulled from the action! Again, I did not interrupt the teacher to point out that this piano needed much more than "tuning." Mistake #5 — I was thinking what a lucrative deal this could be tuning for all these students. Stupid, stupid, stupid! I cleaned the piano, pitch-raised it, and tuned it twice. Again, my effort took twice the time I had planned on, but I figured I gave this lady more than her money's worth, and that I had done a really good job — especially considering the circumstances! Wrong!

That evening, the teacher called to tell me that her baby grand sounded terrible, far worse than it ever had before; that it was "ringing" and totally unusable for teaching piano lessons! I was surprised (stupid!), but rather than make excuses or try to explain anything away over the telephone, I offered to go back the next morning. What I found was a piano slightly out of tune, still at reasonable pitch, and to my ears, still a whole lot better sounding than when I first met the thing. So I asked her what the problem was, and she started playing single keys very hard and complaining about the "ringing."

I assumed she meant overtones she was now able to hear, and that is my question. Apparently, she had not had the piano tuned since she had purchased it new four years before. Since it is a very high tension, inharmonic, bright-sounding piano at pitch, could the amount of flatness (38cents) have masked the inharmonicity and brightness? I must admit, the piano did overall sound better, except for the tuning, before I touched it!

I then sugar-coated the hammers so no more high harmonics could be heard, and retuned the piano. It sounded very mellow. I left without charging her more money.

Again, that evening, she called, very angry, to say that now she could not get any "forte" out of her piano; no loudness. And that she had expected more professional service and that her piano should have sounded better after I "tuned" it, not worse! She did say the Belarus piano was fine. Again, I figured that she was not trying to get a lot of free work out of me — she truly was not happy with her piano! And why should it be any different? After all, I had not pointed out that anything was wrong except to say that these pianos needed servicing more often if she wanted them to sound better. So I offered to go back the next day, make the piano louder, but she had to communicate more with me when I was there — another free call! It has also occurred to me that anyone who listened to pianos playing 12 hours a

The Tuner's Life

day, seven days a week for four years, could be having problems with their hearing!

So I went back for a third time. I tried to explain about voicing being different from tuning, and she kept saying that she needed her piano at concert pitch! After all, she, with her European Doctorate degree and her brilliant students with perfect pitch deserved better! She also thought I should return her money because she did not get the professional service. She was really very angry, and made a big display in front of her students.

For some unexplainable reason, I took this situation quite calmly — maybe because I am getting older! Even if she did think I was dog meat, not only was I not going to return her money, I was determined to get this piano sounding acceptable to her. First, I took one octave and lowered the pitch about 30 cents, and asked her if these keys sounded better. Yes, they didn't "ring" but they weren't loud enough! So much for her perfect pitch! I figured another piano tuner would come behind me, so there was ***no way*** I was going to leave the piano 30 cents flat! Even with perfect 20-20 hindsight, I could never have just tuned the piano at the pitch I found it! I used a drop of Supertone on each hammer, and that enraged her because it now sounded like a dulcimer! So, I started over, doing what I should have done to begin with. I checked the plate screws, seated the strings, and filed the hammers. Still too bright, but after another hour of needling the piano now sounded more melodic. A bit on the bright side, but within spec. I determined that after six hours working this for free, I had finally done enough!

So I packed up my tools, and on my way out, I smiled at her. I simply said that I was sorry the whole experience had been so trying for her, that I had done my best. If the piano was still not acceptable, I would send her a letter explaining (all the things I should have explained at the beginning!) the situation, but for now, I was finished and leaving. I clenched my hand tightly so the fingers couldn't move, and gave her the thumbs up signal! I still can't believe that through all of this I was so calm and upbeat, but in the end, that is what saved me!

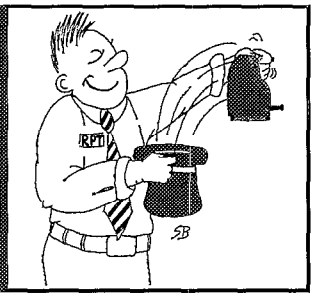
On my way home, I stopped off at the store that had referred me, and apologized for all the mess. Apparently, the teacher had called the store earlier that day, knowing that I was coming in the afternoon, to complain about me. The store owner was irate that the teacher had not had those pianos serviced in the four years since she sold them to her, and furthermore, what a crook she was for taking money from her students for piano lessons, and never having the pianos tuned! Now, I really felt badly that a fight had ensued on my behalf. Finally, I get home, and there is a message on my answering machine from the music school: "Mrs. Beigel, thank you for coming back! The piano sounds much better now!" Go figure!

So, this long story should show how not to set yourself up for misunderstanding. Always confront and point out problems before you start work, and don't be distracted by the goings-on around you. After all, how many times have you taken your car in for a tune-up and the mechanic calls you to tell you that you need more work than you thought? And if you do "step in it," try to keep a professional demeanor, do your best and smile when you call it quits!

And don't forget my question. Could the piano have sounded much sweeter at 38 cents flat without all those high overtones? PT

Grand Illusions . . .

The Page for Serious Cases



The Puzzler

By Dan Levitan, RPT
Puzzle Editor

Puzzler #3

An Unfortunate String Break

He looked out into the empty hall and sighed happily. He'd been working a long time to get here. The boss had started him as a stringer; had taught him to chip, and then to tune; and now he was trusting him with a concert. A fussy artist, too; the boss had spent a whole day with the old B before sending it out. He'd sweated the shift position and voicing especially, and had said not to touch anything, just to make sure the tuning was solid.

He opened his tool kit and set to work. He was determined to make this one solid as a rock. Things were going fine until, pounding on note B4, he heard a Bang! and saw that the middle string had broken at the agraffe. With a sinking feeling, he realized that the only good string remaining was the left-hand string. He engaged the shift pedal, and sure enough, the hammer now missed the string entirely, jamming above the string plane and making the key go dead. He pushed the hammer back down, released the shift, and moaned.

This was rough — rough as the tail of a badly checkered hammer. He had all his stringing tools, but they were no good without wire, and the shop was too far away to get some in time. There wasn't enough wire on the coil of the right-hand string to let him back the string around to the middle pin. And even if he were to cannibalize a bit of wire from the middle coil and top string, the boss had never taught him to splice. It was hopeless.

But an hour and a half later, just as the artist was arriving, the stage manager saw the tuner going out for a break, and noticed that he seemed in a particularly good mood. The concert went smoothly, just some touching up of the tuning at intermission. And the next day the boss got a call from the artist, praising the tuning and preparation, especially the shift pedal.

What did he do?

Solution to Puzzler #2 —

A Curiously Recurring Click

What did she do? She noticed that the center pin of the clicking hammer was touching the center pin of the neighboring flange, so she loosened the flange screw and spaced the hammer.

Sometimes the tip of a flange pin will click if it touches the pin of a neighboring hammer. The click disappeared when the technician reinserted the hammer after removing it for inspection because she unknowingly returned the flange to a spacing further away from its neighbor; then the click came back when, while touching up the hammer spacing, she moved it to a position in which the pins again touched. The permanent fix, which she made a note to herself to do at her next visit, is to cut the center pin flush with the side of the flange, and then make sure the flange is properly spaced side-to-side between its neighboring flanges.

Unfortunately, the *Journal's* long lead time precludes publishing reader mail at the same time as a puzzle's solution. However, interesting mail regarding puzzles will be printed when possible, even at the expense of the puzzle editor's dignity. Ideas and suggestions for future puzzles are always welcome, subject, of course, to whatever modification the whim of the editor may deem necessary. Puzzle mail (snail mail only) may be sent to Daniel Levitan, Puzzle Editor, 530 First Street #6, Brooklyn, NY 11215.

That's Disgusting

By Doug McKay

Nothing impresses a customer more than when you show them the dirty, disgusting, worn-out part that you just replaced. That's why I always carry a few dirty, disgusting, worn-out parts with me at all times. I get them from the oldest pianos I can find, let my dog chew on them, then smear on some used motor oil

If you don't have a dog, you can order the Valley Hi Bag o' Disgusting, Worn-Out Parts. We do the work, you take the credit!

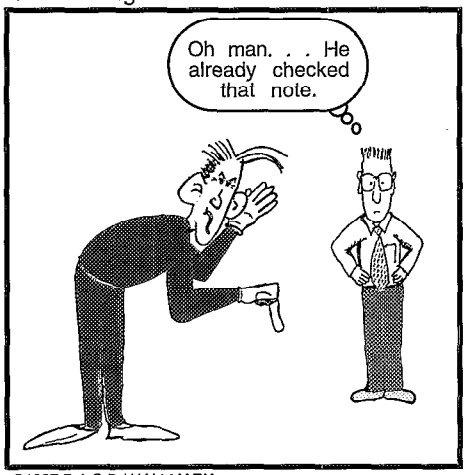
Bag o' Disgusting, Worn Out Parts
Order #63452A — $12.50 ppd

Doug McKay can be contacted c/o Mark Stivers, RPT, Sacramento Valley, CA Chapter

PIANOMAN Adventures

by Alan Hallmark

Tuning for the mime. . . Although tuning time was a breeze, critical analysis was excruciating.



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

"Farming Out" to Build Business

Economic News & Views

There are many methods of increasing your livelihood as piano tuner/technicians. Even if you do not have facilities to repair, rebuild, or refinish a piano you can "farm out" part of the work.

In days past many of the pianos that were sold were not manufactured by the seller, some were not even assembled by the seller. When Aeolian was building pianos, you could order as few as 13 pianos and get your name or any other name put on it. Werlein Music Company of New Orleans for many years sold Werlein pianos that were built by Aeolian.

Other manufacturers were also in the Co-op business, Baldwin was building a lot of Kimball's pianos. Wurlitzer was making keyboards and case parts for other manufacturers.

I remember a promotion film that Yamaha showed some years ago of their manufacturing plant in Japan and on the dock that particular day they were shipping out Hammond organs.

It is possible to get into the complete rebuilding business without a manufacturing facility or the loads of expensive equipment that it takes. Let me cite a few examples to let you know what is out there to help you. The C.A. Geers Piano Co., Inc. has facilities to completely restore a piano for you. They also have been building soundboards for as long as I can remember. Forty years ago Cliff Geers designed and developed the 27-ply, multi-laminated Falconwood pinblock. I consider this to be the finest pinblock on the market. There are thousands of pianos all over the country with this pinblock installed, all with satisfactory results. Cliff and Tony Geers also have a service to pick-up and return pianos to your location that have been completely rebuilt, or to any stage of completion that you specify. They have recently had a machine made to duplicate pinblocks from your sample and the last one I received took very little fitting to mate it to the plate.

There are others in the business. Ralph Onesti also does complete restoration of pianos for your customers. Another is PianoBuilders NW, the Fandrich brothers do a great job of complete rebuilding. There are many listed in our "Guide to Resources in Piano Technology 1997."

Then if you wanted to just send out your keys to be recovered, there are quite a few facilities that will help you. Sue Speir, Leon's wife, is the person we look to in our area for fine keyboard recovering. You can find many advertising in our *Journal* that may be closer to your area. Closeness is not the most important concern. There are days you can get quick overnight delivery from United Parcel Services (UPS), Federal Express, or sometimes the US Postal Service.

The things that are frightening are things that we have never tried before. I had never even thought about installing pinblocks until I went to a 2-day seminar many years ago where they actually drilled and installed a pinblock in a grand. I came away from that seminar saying, "I can do that" and have been installing pinblocks ever since. I will not rebuilt a grand unless I install a new pinblock. I was privileged to return to one of my first rebuilding jobs where I had not installed a pinblock and was ashamed to say that I had done that work, it was bad.

Many are advertising Soundboard replacement in our "Guide" but the one that I know personally is Nick Gravagne. I remember the class that he had at our National Convention in Dallas. He shipped in a soundboard from his facilities in New Mexico, in a moisture controlled box, removed the old soundboard (now that was a sight to remember) and installed the new soundboard during the convention. Again I said, "I can do that."

Our own committee member, Bob Beck, repairs broken piano plates. I have seen broken plates that have been repaired by another person in Jack Wyatt's shop that was excellent. I remember going to an inspiring plate repair class, at one of our National Convention sights given by Bud Cory when he was with Wurlitzer many years ago. It was there that I learned that broken plates were not the disaster that I had always thought they were.

The point I am trying to make is that you can get as much or as little bit of work done by others that you want. You can get into the repair business or complete restoration business without a lot of problems. You can earn more than you are now earning without a lot of expense.

I said last month, "The more you learn, the more you earn." Get to as many seminars as you can. Our Annual Convention and Institute is the finest learning opportunity to come along and it only comes once a year. If you miss it you just don't want to earn more money. There are also many other opportunities in your region. There is always an annual seminar in your region or a nearby region. Many of you have state seminars. Then there is always the learning opportunity at your local chapter, a lot of knowledge is dispensed at your local chapter meeting.

I need to add a disclaimer here. I am not trying to slight anyone that does rebuilding or furnishes material or supplies for piano rebuilding. I am just trying to get you to start thinking of better ways to earn a living and to expand your thinking so that you can have a better life.

— Gary A. Neie,
Chairman Economic Affairs Committee

PTG Publications Help You Educate Clients

Members of the Piano Technician's Guild enjoy having access to quality client relations materials at a discounted price. These products all have one unique and invaluable feature — they were developed by fellow piano technicians (PTG volunteers) for piano technicians.

The publications fill the client education needs you see every working day.

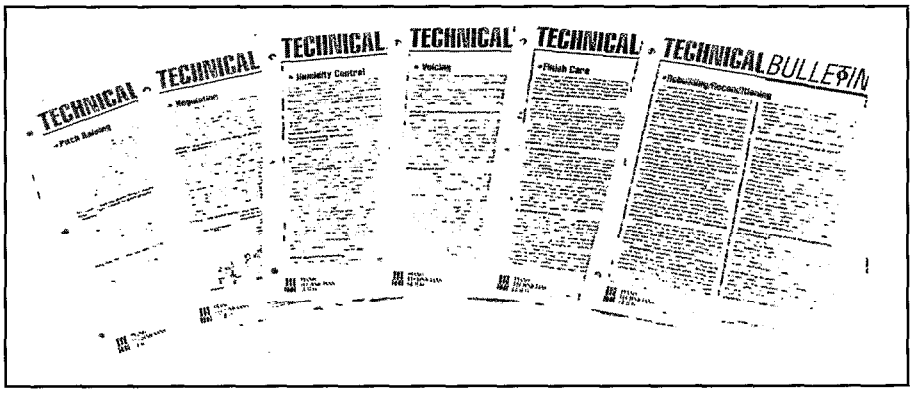
A beautifully produced series of three pamphlets includes basic information of interest to piano owners and music teachers. Titles include:

"How Often Should My Piano Be Serviced?"

"How Should I take Care of My Piano?"

"The Special Care and Maintenance of the Teaching Piano"

These glossy brochures have space to add your business name, address, phone number, etc., and can be distributed to your clients and potential clients with bids, appraisals and invoices, or displayed and distributed through music stores or piano teachers.



The 'Special Care' brochure is available to members in groups of 25 for $10. All three pamphlets are available to

members in groups of 50 for $20 (non-members $26); 100 for $35 (non-members $47); 500 for $150 (non-members $199).

The "Technical Bulletin" series is written for customers who are considering a particular maintenance option. The bulletins provide detailed information on specific topics in a question-and-answer format. The attractive, single-page documents are printed in two colors, on 8 1/2 x 11 heavy ivory stock, punched for a three-ring binder.

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The Bulletins are available to members in groups of 50 for $12 (non-members $16); 100 for $20 (non-members $26); and 500 for $90 (non-members $120).

For more information on these and many other products that are designed to promote and enhance your business, please refer to the PTG Business Aids and Merchandise Catalog or call the PTG Home Office at 816/753-7747, fax 816/531-0070, e-mail to ptghomeoffice@compuserve.com.

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JUNE • 1997

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EVENTS CALENDAR

October 11-12, 1997
TEXAS STATE
Ramada Hotel Downtown, Ft. Worth, TX
Contact: David Reed (817)735-4420
4004 Lovell, Ft. Worth, TX 76107

October 18-19, 1997
NYSCON
Ontario Province
Radisson Hotel, Corning, NY
Contact: Donald McKechnie
(607)277-7112
1660 Slaterville Rd, Ithaca, NY 14850

October 23-26, 1997
NORTH CAROLINA REGIONAL
Embassy Suites Convention Center, Greenville, SC
Contact: Don Valley
(864)574-6165 or (864)574-1201
P.O. Box 844, Fairforest, SC 29336

February 20-22, 1998
CALIFORNIA STATE CONVENTION
Pomona Valley, Riverside, CA
Contact: John Voss (909)794-1559
2616 Mill Creek Rd, Mentone, CA 92359

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

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

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

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

AUXILIARY EXCHANGE

Dedicated To Auxiliary News and Interests

Slip ... Slap ... Slop

No. That's not what happens when you step on a banana peel in a pigsty. It's the Australian government's advice for avoiding skin cancer; *slip* on a shirt . . . *slap* on a hat . . . and *slop* on sunscreen. This is good advice, as far as it goes. But there's more to it ...

Since I take about fifteen health newsletters, I decided that I might as well pass on some of this information to all of you members and since this happened to me this last winter, a word to the wise is sufficient. I was one of those teen-agers who just had to lay in the sun for hours and get that all mighty tan to look good before going back to school in the Fall. And being of fair skin, I many times burned before I tanned! If I can warn and help at least one person then I have done some good.

1. Pick a shirt of densely woven fabric. Sunlight penetrates some fabrics, especially when they're wet. Hold the shirt up to the sun. If you can see through it, wear another shirt.
2. Slip on sunglasses along with your shirt. The lenses should block ultraviolet A and B light. Both forms cause skin cancer. Goggles would be better, since they have panels that block light from the sides. If you'll be driving, "wraparound" sunglasses are less likely to interfere with peripheral vision.
3. Use sunscreen with a sun-protection factor (SPF) of at least 30. For years, doctors recommended SPF 15. But Dr. Allan C. Halpern, a University of Pennsylvania skin cancer expert, prefers an SPF of 30 or higher—for even more protection.
4. Keep watch over your moles. If you have more than 50, have a doctor give you a full-body skin exam at least once a year. Skin cancer can form even on areas not exposed to sunlight. Fortunately, even melanoma—the deadliest skin cancer—is usually curable if caught early. And this one was the kind I had. I went to a dermatologist early and caught it in time. Of course I have to have it watched every six months or so from now on, but that is the least of my worries. Do check *all* of your moles. Even the ones on your back side. After all, what are spouses for?

Phyllis Tremper
PTGA President

Donations

The PTG Auxiliary has recently donated $150 to the PTGA Scholarship Fund, and PTGA President Phyllis Tremper has donated $20 in memory of her sister, Irene C. Krahmer-Rice, and in honor of her brother Carl R. Krahmer.

Do you know what a definition of a weed is? Any plant growing where you do not want it to be growing! Even a rose can be a weed when in the wrong place.

Also, *did you know?* There are more than 300 species of hummingbirds, although only 16 are regularly seen in the US. Hummers can fly sideways, backwards, and can perform mid-air somersaults. In flight, their hearts beat 1,260 times a minute.

Now go and *Put A Little Music In Your Life* and pass on all the information that you read and learned today. You never know who you might help. Cancer is a terrible thing and we need to wipe it out of our lives. Have a good summer with what's left of it and *Be Careful In The Sun.*

Women's Page

ANNE SMITH, Editor **506 South Sixth Street, La Crosse, Wisconsin**

ANNE SMITH

Hello Everyone:

Hasn't it been warm? It seems that most ot the country is suffering from the extreme heat, and high humidity. There have been such severe storms too, and the State of Texas has undergone much flooding and heavy rain. Hurricane Audrey certainly took its toll of life and property. I do hope that all our friends in Texas escaped these severe storms.

As I write this it is the first of July, and when your copy of the Technician arrives at your home it will be August. The Convention will be a pleasant memory, and our summer will be two-thirds over. I wish I could say that I would be in Philadelphia, but I am afraid we will not make it. In our next issue I shall try to bring you some of the Convention doings, so that those of us who could not be with our ASPT friends can at least have a glimpse of what went on there.

First I have a letter from our Corresponding Secretary, (National) Mrs. Katherine Hughes. She has a report which will bring sadness to all of us. Here is Katherine.

"Dear Anne:

It has been so long since I have corresponded with you that perhaps I should introduce myself and I am sorry that this letter has to bring such sad news.

Mrs. Vera Wight, beloved wife of Gaylord Wight, 1309 15th St., Regina, Saskatchewan, passed away June 12th. I am sure that those of us who attend the Conventions will remember Vera, for she, her husband Gaylord and Eileen were always in attendance whenever possible and she was always a faithful and willing worker.

Vera was a sweet, gracious and charming lady, loved by everyone who knew her, and she will be greatly missed by all of us, especially when we all gather together at the Conventions.

I ask that we remember Gaylord in our prayers; there has been a serious disruption of his happy home and a great void left by Vera's passing.

Anne, will you please put this on the Women's Page of the Technician, the next issue if possible.

Will write you more a little later on.

Sincerely yours,

Mrs. Katherine Hughes,
National Corresponding Secretary,
410 Howard Street,
Houston, Texas."

We are deeply sorry for the sad news which Katherine had to report, the passing of Mrs. Vera Wight. I am sure we shall all be glad to comply with your request, Katherine, and remember Mr. Wight in our prayers. May we also extend to him our deepest sympathy.

I know that most of you will remember Mrs. Jay Millard, Bernice to all of her friends. I recently had a letter from her, and she is keeping quite busy. She had twenty-eight pupils this past year for piano lessons, and at the close of the year had a very successful recital. She plans a trip east in August to visit with her son and his family.

I also had a nice letter from Mrs. Maude Houdek and she too is busy. They plan to spend some time at Webb Lake in July, and she also spoke of a letter from the Governor of Iowa inviting her as President of the W. C. T. U. from her home city, to attend the Women's Traffic Safety Conference at the State House on July 9th. I am sure Maude will make a fine representative at this conference. We also hope to see Maude and Carl either on their way north to Webb Lake, or on their way home. It is always a pleasure.

Now, let's hear from another friend from Texas, Ruth Pollard. She always has something of interest for us. Hi, Ruth, what's going on in Houston?

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

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

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PLAYER PIANOS Rebuild bought & sold. Serving NY to GA. Will pick up system and re-install or send in mail. Nicholas Fiscina 1-800-862-2138.

STRAIGHT SIDES, SQUARE FRONTS and crisp notches are the benchmarks of our quality key recovering. Tops with fronts $135 plus return shipping and insurance. Call or write for price list of our key restoration services. Yvonne Ashmore, RPT and Associates, 12700 La Barr Meadows Road, Grass Valley, CA 95949, 916-273-8800. M/C & Visa accepted.

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

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CALIFORNIA SOUNDBOARDS BY DALE ERWIN, RPT. Too many cracks? Flat Board? Lifeless tone? Stop! Let our complete restoration facility perform a soundboard transplant and breath new life into your Steinways, Mason Hamlins, etc. All boards are Bolduc panels and hand selected rib stock. 50-60-70 ft. curves? Custom press allows for variable curvatures. All board thickness and rib dimensions reproduced. Quality control assures a superior tonal outcome. For prices on complete bellywork or restoration, call (209)577-8397. Rebuilt Steinways also available. 4721 Parker Rd., Modesto, CA 95357.

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

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NORTH CAROLINA REGIONAL CONFERENCE October 23-26, 1997 • Embassy Suites Resort Hotel Golf and Conference Center • Greenville, South Carolina. National and Regional Instructors along with Major Piano Manufactures and Preferred Suppliers will be on hand for 2-1/2 days of comprehensive classes offering a full range of piano service topics. In a supplemental all-day class Thursday, October 23 learn to design and build your own pneumatic soundboard and bridge presses. Bring your spouse and enjoy a get-a-way in the spacious surroundings of a luxury resort hotel. For more information contact Don Valley, RPT (864) 574-6165.

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

VIDEOS

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

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

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LOOKING FOR KEYFRAME with keyboard or if necessary, the whole action for an 88 key 6'1" Steinway A #121116. Call Leopold at N.Y. Piano Center at 1-800-642-5648.

LOOKING TO BUY OSLUND KEY MACHINES-ANY CONDITION. VINCENT IZZO'S PIANO GALLERY, 516-437-4386

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

Have you seen a MERRIFIELD PIANO? (Built by the Western Cottage Piano & Organ Co. in Ottawa, IL during the mid to late 1800's.) I am interested in buying a MERRIFIELD PIANO, any condition. Please fax, call or email if you have any information regarding a MERRIFIELD PIANO.
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WANTED: TINY PIANOS such as the Wurlitzer Student Butterfly or other small types. No more than 50 keys. Call toll-free: Doug Taylor, 1-888-895-6211. I'll pay shipping!

DISPLAY AD INDEX

Piano Discussions™

August 1997

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

Love an acoustic piano? Wish it was digital too? Well, now it can be — with MSR's *Piano Digital!*

Do you want it all? The beauty, touch and tone of an acoustic piano, with the technology of a digital piano? Esthetics and electronics? MSR has the answer: an amazing retrofit product that turns an acoustic piano into a digital piano, a MIDI controller, and a silent piano — ***Piano Digital with Quiet Time*** (also known as GT-360 QuietTime).

This amazing system makes the piano compatible with virtually all MIDI devices. Its MIDI In, MIDI Out and MIDI Thru ports let you send and receive MIDI data.

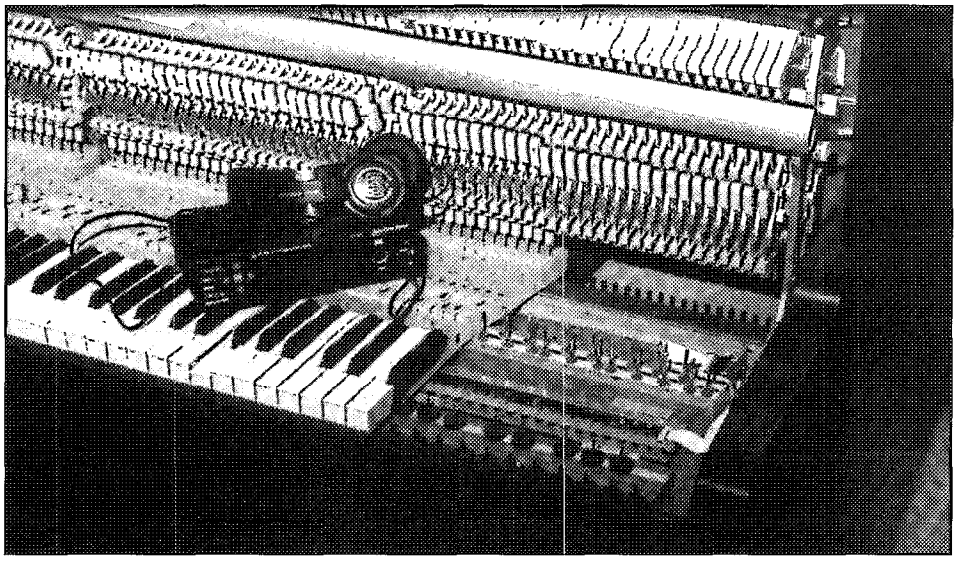
Its digital piano features include a General MIDI tone generator with 128 different instrument sounds. Layering allows you to layer up to 16 sounds of the 128 available, for a myriad of possible sound combinations. It also has 32 Note Polyphony, which allows you to play up to 32 notes simultaneously. With Multiple, Programmable Keyboard Zones, up to 16 zones can be individually and independently programmed. Fun features such as Pan and Reverb are also available. Audio Ins and Outs allow you to use all of the benefits of home stereo systems and professional sound systems in combination with the PianoDigital equipped piano.

The piano mute feature, QuietTime, is accessed by the simple pull of a lever, and allows the pianist to play in complete silence — the only sound heard is through the QuietTime headphones.

In addition to the ***Piano Digital with Quiet Time*** — Model GT-360, MSR offers an entry level version, the GT-90. In exchange for reduced versions of the GT-360's features, the GT-90 offers ease of operation (most features are accessed by pushing one or two buttons at most), and a reduced pricetag.

"Since ***Piano Digital with Quiet Time*** is a retrofit, it is a cost effective way for piano owners to upgrade and enhance their existing (and frequently beloved), pianos," commented MSR President, Gary Burgett.

For ***Piano Digital with Quiet Time*** sales and installation information, contact MSR.



This cross-section view shows a Piano Digital-equipped vertical piano's keyboard: the MIDI sensor trip is placed beneath the keybed and connected to the control unit.

"Hollywood's Favorite" is PianoDisc's too!

Paul Smith, the man known for years as "Hollywood's Favorite Pianist" is sure to be the same for PianoDisc owners when they added his brand new disk to their collections. ***Artist Series: Paul Smith*** **(PD 6008)**, is pure entertainment from the man who was staff pianist for Warner Bros. Studios, NBC Studios Hollywood and Burbank, music director/pianist for countless television programs, and conductor/accompanist for nearly every singer in the business. Included in that list are such greats as Bing Crosby, Sammy Davis, Jr., Mel Torme and Ella Fitzgerald, with whom he spent 12 years.

"Paul is just out of this world! He has unbelievable technique, flawless timing and a musical imagination second to none," commented PianoDisc Artist Director Jan Kiser. "Steve Allen told me that Paul was the one pianist we just **had** to record. I'm awfully glad we took his advice! His disk is so good, absolutely **everyone** will love it!

MSR/PianoDisc Factory

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Continuing Education

Aug. 26-28 Sep./Oct. 30-2 Oct. 28-30

Tuition is free, but a $50 refundable deposit is required for confirmation. The Continuing Education Seminars are restricted to PianoDisc certified technicians in good standing. For more information about either the Installation Seminars or Continuing Education,

CALL MSR AT
1-800-566-3472
4111 North Freeway Blvd.
Sacramento, CA 95834

916/567-9999 • FAX: 916/567-1941

Tech Gazette

Yamaha Service August 1997

Last month, we discussed the procedures for backframe construction utilized by Yamaha Music Manufacturing (YMM).

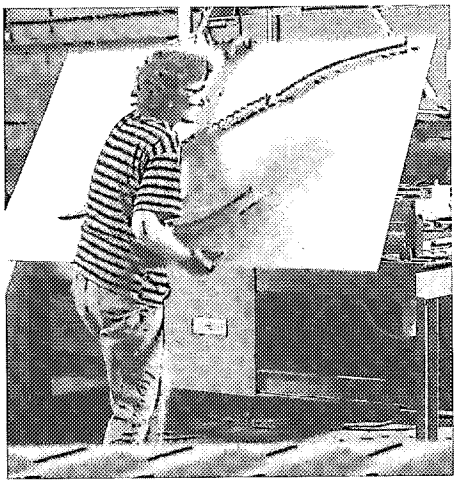
In this issue, we will discuss how the soundboards are constructed for all M450, M500, M1, P2 and P22 pianos.

As mentioned in last month's issue, all wood used in the manufacturing of Yamaha backframe components are cured to an Equalized Moisture Content (EMC) of 6% in a seasoning room.

EMC of 6% is necessary, so that the piano will survive in the extreme conditions of heating and air conditioning found in the typical homes of North America.

However, in the construction of the soundboard at YMM, an additional step is added. The soundboard, made of quarter sawn spruce, is placed in a second seasoning area called the "super drying room" where the EMC of the soundboard is reduced to 4.5%.

Also, the physical size of the soundboard is slightly reduced in the "super drying room" which enables Yamaha to construct what is called the "Permanent Crown Soundboard."



When the soundboard is removed from the super drying room, it is re-inspected for any defects and immediately placed in the high frequency gluing press where the ribs and the bridges are attached by a process using both heat and pressure.

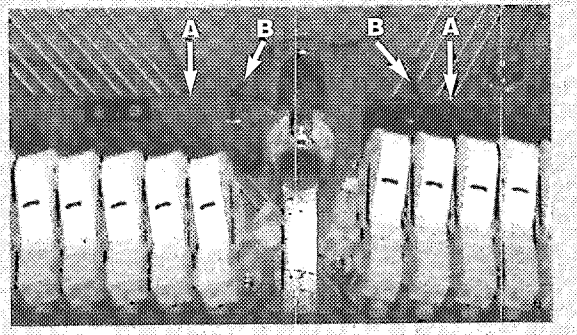
The fixtures inside the high frequency gluing press create a curvature or "crown" in the soundboard.

After the soundboard is removed, the ribs are tapered, the soundboard buttons are attached (which reinforces the bond between the bridges and the soundboard), and the entire assembly is finished with protective coats of sealer and lacquer.

In a holding area, the "Permanent Crown" of the soundboard continues to develop. Remember when the soundboard EMC was reduced to 4.5%, the soundboard was slightly reduced in size as well. Now that the components of the soundboard are all glued together the soundboard tries to expand back to its original physical size.

The YMM "Tip of the Month"

In order to adjust let-off quickly and more accurately, factory regulators use magnetic strips (A) applied to the strings. These strips are the thickness of the let-off dimension. The strips allow the regulator to "feel" let-off occur when the hammer touches the strip, instead of having to "see" it occur. Notice that electric cable ties (B) have been attached to both ends of the strips making them easier to insert and remove. Magnetic strip material is available in various thickness from hobby shops and sign shops.



Stay tuned for next month's information from Yamaha Music Manufacturing.