PIANO TECHNICIANS
Journal
JANUARY 1991

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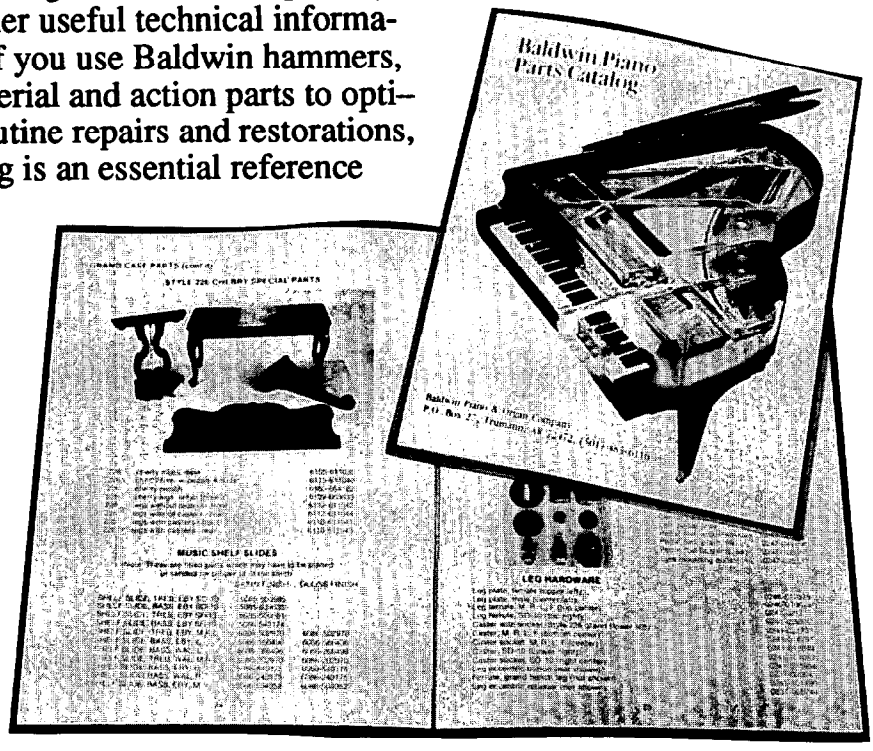

I'm Linda Gann, and I'm the person you usually talk to when you call Baldwin Tech Service for parts. For five years I've been coordinating parts orders and shipments for Baldwin grand and vertical pianos. During that time I've become very knowledgeable about Baldwin parts and your technical needs. I enjoy using my expertise to help you make the right choice of Baldwin materials for your application.

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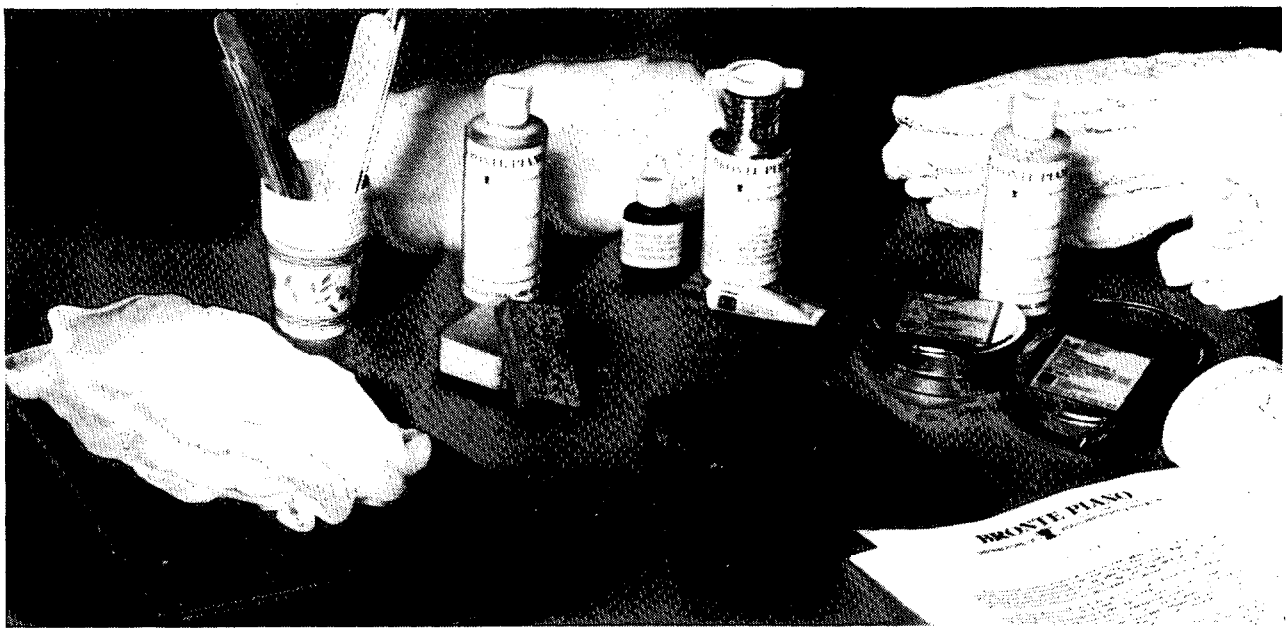

The König Company of West Germany is the European leader in the development and manufacture of "State of the Art" refinishing and touch-up materials. Over 40 years ago, German piano makers started using polyester finishes — just in the past few years, German chemists have found a fool-proof way to fix them.

In the past, polyester repair was complicated by long curing times, unpredictable chemical reactions and a short shelf life for the polyester. Nowadays, a 9 month shelf life is guaranteed, but realistically, you can expect the polyester to last 18 months. Also, the hardening process only takes twenty minutes so you can see same day results.

For the past few years, Schaff has been the exclusive U.S.A. piano industry distributor of König polyester repair products. Just recently, a two hour instructional video was made that coordinates with the 22 page polyester repair manual, to show all of the aspects of polyester touch-up. With the Polyking Repair Kit, everything except a chisel and some tape is included to make fast, "factory perfect" repairs.

Polyester repair is the perfect partner to piano tuning and repair. For the young technician, polyester repair opens doors to new piano dealers and their customers. For the veteran technician, polyester repair provides a break for the ears. Alternating your appointments between tuning and polyester repairs means fewer tunings with more profit, since the going rate for a one visit repair is about 75% greater than for a piano tuning. You cannot make a better investment, as the cost of a Polyking Repair Kit is about the same as a couple of piano tunings.

König has a full range of products for the lacquer and polyester industry. Schaff maintains a stock of polyester based wood fillers, stains, high gloss touch-up pens, rubbing compounds, polishing liquids and Lack 20 polyester. Call or write for a complete product listing and prices.

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PIANO TECHNICIANS
Journal

JANUARY 1991 — VOLUME 34, NUMBER 1 OFFICIAL PUBLICATION OF THE PIANO TECHNICIANS GUILD, INC.

4
PRESIDENT'S MESSAGE
A new year's resolution: participation
By Nolan P. Zeringue, RTT

6
HOME OFFICE
New Year's wishes,
By Larry Goldsmith

8
CONVENTION
The Philadelphia story,
By Ernie Juhn, RTT
1991 Convention site,
By Ruth Brown, RTT

10
ECONOMIC AFFAIRS
Klunkers and failed appointments,
By Carl Root, RTT

13
TECHNICAL FORUM
Torquing, touring, and more,
By Susan Graham, RTT

18
TUNING UP
Negative inharmonicity,
By Rick Baldassin, RTT

22
PRACTICALLY SPEAKING
Grand action touchweight part II,
By Bill Spurlock, RTT

26
GOOD VIBRATIONS
Laying out the bridge, and drilling pin holes,
By Nick Gravagne, RTT

PLUS
Membership 29
Auxiliary Exchange 30
Coming Events 32
Classified Advertising 33
Display Ad Index 35

ABOUT THE COVER:
Photo by Bill Spurlock. See his article beginning on page 22.

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

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

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PRESIDENT'S MESSAGE

A New Year's Resolution: Participation

Nolan P. Zeringue, RTT
President

January is always the month that we re-evaluate ourselves, make predictions or projections for ourselves for the coming new year, and look at the past year to see how much we did or did not find success in our reflections of January past. We plan for the year to come in our personal lives and in our business lives, all the time with great expectation that this year will be bigger and better. We have to act on this expectation or else nothing will happen. Just sitting and waiting for the world to give us bountiful rewards, for the most part, just doesn't happen. We must work and contribute to share in the rewards.

Thus is it with the Piano Technicians Guild, our organization. We hope that each year it will grow and become better to benefit us in our profession. The Piano Technicians Guild will grow and prosper in proportion to what is put into it in time, talent, and expertise. The Guild depends on all of its members and potential members for growth both in technical expertise and in being a viable cornerstone in the piano industry.

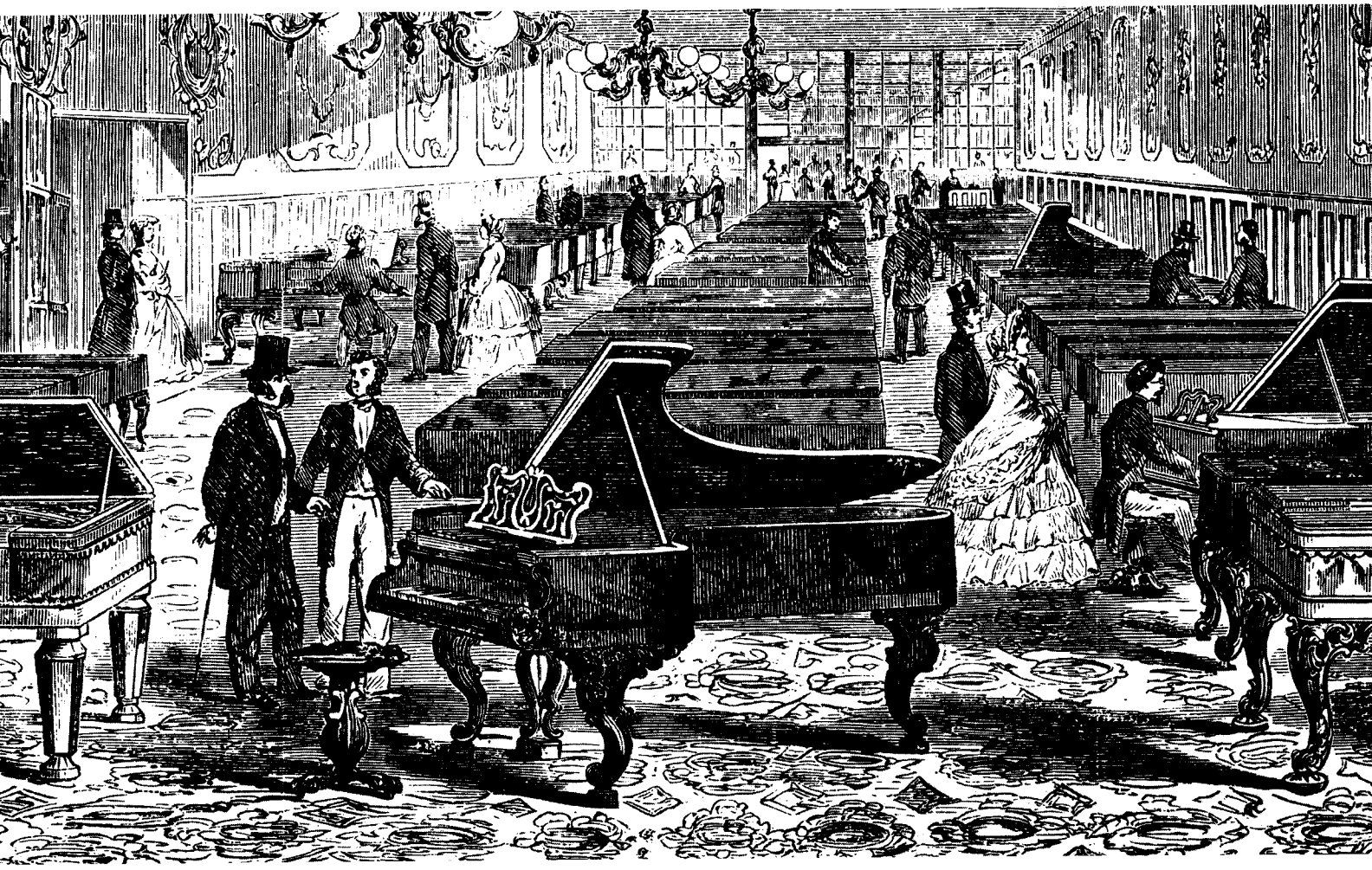
Bringing it down to a bare fact, we need you! Whatever you can do, whatever you can contribute, whether it's at the chapter level, in committees, or on the national level as an instructor or otherwise, the Piano Technicians Guild will grow and be better because of your participation.

This is what we're all about, giving and sharing in our profession so we might all be better technicians — the genius and the beginning technician sharing and working together so the public, our customers, will continue to get better and more professional service, and the manufacturers will be assured that because of the Piano Technicians Guild, their customers' piano will be kept in optimum playing condition.

If all the membership would only take from the Guild and put back nothing in return, we soon would have no organization. Many thanks to those who have given so much to the Guild at great cost. They have been our lifeblood. If you have participated in any capacity, have you ever learned anything through the Guild? Have you ever learned anything from a chapter meeting, a seminar, a Guild convention, the *Journal*, a manufacturer's technical service representative, having a beer and shop talk with a fellow technician? Yes, all of this is at the tip of your fingers for only $114 per year. How about giving a little more? Not money! Give of yourself and your time. It might be just a chapter technical or help with the chapter newsletter, but I can assure you of one thing: your efforts are appreciated and PTG will be better because you were there.

I hope the new year 1991, the start of a new decade, brings all of you good health and a prosperous year in business. May God allow us all to be here again next January to start another new year. Have a happy and safe New Year.

Some manufacturers ask your customers to invest in their past.



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Some of the most "prestigious" instruments in the world are also the most expensive. At Young Chang, we don't believe a piano's value is limited to the number on its price tag or its place in history.

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We believe the instrument that's most appreciated is the instrument that's most played. And as one of the most popular imported pianos, the value of Young Chang pianos appreciates like few other instruments.

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From The Home Office

New Year's Wishes

Larry Goldsmith
Executive Director

As I write this words, it occurs to me that this is the seventh January message I've written for the pages of the *Journal*. Like the years they introduced, some have been better than others.

For a writer, New Years' messages are at once the easiest and most difficult to produce. You have a ready-made subject, and a never-ending supply of cliches to plagiarize. At the same time, it's difficult to say anything meaningful because it's all been said many times in many ways (see what I mean?). And I don't even want to *think* about my New Year's Resolutions. We don't have enough paper or ink here for that.

So let's call the message tried-and-true, rather than trite. Holiday wishes are no less sincere for having been repeated annually.

There's no doubt that things are tough for many people. Recession looms. War threatens. Every time we turn around, greed carries someone past the bounds of good sense and human decency. The truly unfortunate become lost in the shuffle. It's often a gloomy picture that's painted for us. Sometimes reading the morning paper makes you want to find a hole and pull it in after you.

But somehow, despite all its bad press, life goes on. Each life brings a measure of misery, it's true, and some people receive more than their share. But there are good things as well, and at no other time of year do they show themselves more clearly. In November, Thanksgiving gave us a chance to look at our lives and count our blessings. In December, we had an opportunity to express our appreciation for those blessings that matter most, our families and friends. And now, in January, we're given a new calendar, 12 blank pages on which to write a better story.

May you fill those pages with happiness and success.

***

Speaking of things that we've talked about in previous issues, I'd like to remind you that we're coming down to the wire on the music industry's petition drive. For better or worse, this part of the project will come to an end on February 28. This is no time to let down on our efforts.

It's pretty hard to quarrel with the idea of improving the quality and accessibility of music education in our public schools. Nobody can appreciate the benefits of a music education better than those who make a living in the music industry. Even if we look at it selfishly, even if we don't have children ourselves, every one of us gains when a child learns to appreciate music at an early age.

This is a grass-roots campaign, and it must be carried out on a local level. You can photocopy a petition form that appeared in the *Journal*, or, for a complete campaign kit, contact the National Association of Music Merchants, 5140 Avenida Encinas, Carlsbad, CA 92008; or call (619) 438-8001.

And don't forget to sign it yourself.

KEYSTONE...

The Philadelphia Story

Ernie Juhn, RTT
1991 Institute Director

Here is a sneak preview of the 1991 Technical Institute in Philadelphia. As most of you know, Philadelphia is located in an area of music and culture. The Philadelphia Orchestra and Curtis Institute are right in town, and only a couple of hours away are giants of music like the Metropolitan Opera, New York Philharmonic, Boston Symphony, Steinway, Juliard, Tanglewood, and many more.

I can hardly think of a part of the country where more music is concentrated into one area. In the 1991 Technical Institute we will try to do our best to fit into the picture. I am planning on a program which will offer just about everything for everyone. From the most basic tuning and regulating classes to sophisticated concert preparation and voicing. Business classes for beginners as well as for old timers who feel that one can always learn something new. Manufacturers from all over the world will be represented and show how to service their product.

Also — "Private Tutoring" is back. For those who have not attended a PTG Convention before, private tutoring consists of one-on-one sessions. You have to register in advance. Subjects: any — as long as it is related to piano technology. You register and we supply a competent instructor. More on this later.

> **Tutoring — You Name It, We Got It!**
> *First Class Instructors For Any Subject You Like.*
>
> You can have 1 1/2 hours of private instruction in any area of piano technology. This will be the best investment you can make in yourself and your future. Just let us know what you want.
> *Gary Neie, 1991 Tutoring Coordinator*

I have good news for those who missed the "Mini technicals." They too will be back and as good as ever. Mini technicals (an original idea of Wally Brooks of the Connecticut Chapter) are half-hour classes covering a wealth of subjects. The nice part about these short sessions is that some of the finest instructors cover their subject by "getting right into it" and thereby convey the most information in the shortest time. It has been said that technicians could just attend all these "Mini techs" and feel that they had attended a convention in itself.

Want to know more? Keep reading "The Philadelphia Story" in coming issues and you will know exactly what to expect at the 1991 Technical Institute.

...Of Better Piano Service

Philadelphia: Our 1991 Convention Site

Ruth Brown
Southeastern Pennsylvania Chapter

Southeastern Pennsylvania (SEPA), PTG's newest (and most motivated) chapter, is looking forward to welcoming you to our area and to the "Keystone of Better Piano Service" convention, July 13-17, 1991!

I had the opportunity to stay at the convention hotel recently, the wonderful Adam's Mark in Philadelphia. From my vantage point I was struck by the beauty of the region I know and love so well — the lush greenery of the world's largest, most beautiful municipal park system, the granite and limestone buildings sparkling in the sun, the expanses of brick buildings from the 1700s and before.

This is a unique area — as cosmopolitan as Toronto, situated only an hour's travel from New York, or mountains, or the Atlantic Ocean, or the Smithsonian — with a fabled historic background. We are unique in having such a rich historic past and in having maintained this treasure while continuing to grow as a major, vital urban area. Visitors who have not seen the area in five years or so will not even recognize the skyline, vastly developed, which is benefiting existing landmarks with the infusion of interest (and capital). Highways have been completely rebuilt and are ready for your use, making the trip from the Adam's Mark into the heart of town a smooth, 10-minute venture — only five minutes from the hotel, the fabulous Philadelphia Art Institute or adjacent Rodin Museum. Traveling the opposite direction on the same road will take you, in 15 minutes, to Valley Forge Historical Park, acres and acres of rolling hills where General Washington headquartered his troops preparing for the Battle of Trenton. This same area is now center of the east coast's burgeoning high-tech answer to Silicon Valley — The Corridor.

PTG members express a variety of opinions in matters of taste and budget, so we offer the following: Saks Fifth Avenue is right across the street from the hotel, and so is Denny's, a 24-hour family restaurant, and TGI Friday's. Philadelphia has become internationally known as a restaurant renaissance city, and every possible cuisine, for every taste bud and budget, is waiting for you. The members of the SEPA chapter are preparing to serve you at their booth as a concierge would, to make your visit as full as you care to make it. We also have a few surprises for you!

And the hotel! Our Home Office staff has done its usual extraordinary job of selecting the finest location, and then negotiating truly nominal rates for us. With its prime location and easy access to and from the airport, all major highways and public transportation, the Adam's Mark is the perfect venue from which to begin your local touring, and also as a stay-put convention facility. The amenities will remind you of Caesar's Palace, the class and exhibit rooms are roomy and well-equipped, the many dining rooms will greet you with excellent food and impeccable service, whether in the large all-day restaurant or the elegant dining room — even the lounge offers something a little different — rows of backgammon tables, and a big band night. There is also a sports bar, for those of you who want to check out the Philly Phanatic. Did I mention the quiet jazz bar? And, yes, the TV in your room will have a remote control. Parking is free, and there's plenty of it, indoors and out.

With Ernie Juhn and his team of pros planning the Institute, you know you can depend on an outstanding educational experience. So please join us in the Keystone State, for the remarkable annual event of PTG's International Convention and Institute. With this year's theme of "Keystone of Better Piano Service," you are bound to return home with new skills and new energy. You will also be intrigued by your visit to the nation's first capital, and home of SEPA — it just doesn't get any better than this!

ECONOMIC AFFAIRS

Klunkers And Failed Appointments

Carl Root, RTT
Economic Affairs Committee

How much do you charge to condemn a klunker? It may be tempting to do a quick tuning, collect a fee which is probably higher than the charge to condemn it, and get out of the house. This is a disservice to the customer and is highly unprofessional. The service you should offer instead emphasizes educating the customer rather than hands-on work.

Before an appointment is scheduled, ask about the piano's symptoms and service history, but for the most part, you shouldn't use this information to diagnose the piano's condition. It is usually a waste of time and can mislead the customer. This doesn't mean that you shouldn't discuss a possible service scenario when the description of the piano is clear enough. If it has been 10 years since the piano was serviced, you should not allow them to assume that your basic tuning fee will give them a fine tuning. If they report that several keys aren't working properly, let them know that if the solution takes a few minutes, there will be no charge, but if the repair or adjustments are more involved, you will discuss what can be done, how much it will cost, and when to do the work once you've seen the piano.

If you spend a few minutes getting basic information, you will often be able to anticipate whether or not condemning the piano is at least a possibility. At this point, you should discuss what the charges will be, emphasizing that you hope and expect that the piano will be serviceable.

Your job would be easier if pianos were able to be categorized as either viable musical instruments or basket cases. There are many marginal pianos which require extensive inspection and thoughtful analysis before a recommendation is made to repair or condemn. In theory, almost any piano can be serviced regardless of the extent of disrepair. A soundboard can be replaced, a plate can be welded, an entire action can be replaced, or case parts repaired or replaced. To make a decision about what work is warranted on any piano, the following questions must be addressed:

1. What are the design limitations on performance potential?
2. Is sentimental attachment a factor?
3. What are the piano owner's furniture requirements?
4. What level of musical performance is required?
5. How often will the instrument be played?
6. How long will the instrument remain in active use?

Other questions that must be addressed are:

7. If the piano can be repaired such that all the questions above have been addressed, are you able to do the work?
8. Are you willing to do the work?
9. Are they willing to have the work done?
10. Is a new piano an option?

It is important to propose solutions for all the piano's problems even if you expect that the limited use of the piano is unlikely to support the cost of the proposed work. Talk to the customer to determine if some of the work can be considered nonessential. There is always a risk that you will be held responsible for the piano's total performance if you do only part of the work you have recommended. For that reason, some technicians will walk away from a job if the customer does not accept their proposal in its entirety. This raises two issues. 1. Will you then charge them for the inspection and estimate? 2. Will the customer be able to get what he wants out of the piano by finding another technician who is willing to do part of the job?

If you visit a doctor's office, you will be charged for essentially the same services — inspection and advice. Whether or not you decide to take his advice is your decision and has no influence on his fee. The second question gets a bit more involved. You have to believe in yourself to the extent that no other technician can provide a better diagnosis than you can. If you believe that the customer is unable or unwilling to cover the cost of all the recommended work, shouldn't you be the one to decide whether or not doing part of the job is a viable option? At the most basic level, if a piano needs a tuning and pitch raise, can we at least do the pitch raise and rough it in? If the action needs a regulation, can you make a modest improvement in the touch by adjusting the capstans or leveling the keys and setting dip? Can you do basic repairs and leave some adjustment for the next tuning? Can you do things that will not have to be redone in the future? If the piano is in good enough condition to permit this approach, and if I think the customer is able to understand that I should not be held responsible for work not yet done, then I would rather do some of the work than deprive us both.

This approach is admittedly risky. Whether it's appropriate or not depends on your communication skills, the kinds of pianos you service, and who you service them for. If you do a fair amount of regulation work on pianos in fair to good condition for piano players whose musical skills are modest at best, you should have few problems. This kind of work will often be done as a result of your recommendation, not because they are complaining about poor performance. This approach is rarely appropriate with a good player and a piano in poor but restorable condition. Often, the best approach with a seriously deterio-

rated piano is to present a written appraisal or estimate detailing the work required. Then keep your foot in the door by agreeing to continue to tune the piano on a regular schedule if the piano's condition permits. Some proposals are accepted only after months or even years of ongoing discussion.

What do you do if the piano has deteriorated to the point where the necessary work to restore it is not cost effective? Have you ever had an appliance repairman come to your home and condemn the appliance you asked him to fix and then hand you a bill. It's not his fault your dishwasher can't be fixed. He spent his time on your behalf, even if it wasn't what you would have wished. Of course you pay him. He is not obligated to spend more than a few minutes explaining his reasons for not fixing it.

Keep in mind that you may be of service to this customer in the future even though you have just condemned their piano. Hopefully, they will buy a new piano and will recall the honest and straightforward evaluation you gave them. However, if you walked out the door without getting paid, there may be some confusion in the customer's mind about when you do and don't charge for your time. When I condemn a piano, the charge reflects the time and expense of servicing the customer, not the piano. In cases like these, I find that customers not only need to know why their piano should be discarded, they also need to make a decision about a replacement. Are you qualified to give them advice? The time required to discuss these issued can add up to more than the time normally allowed to a minimum service call. Rather than telling them everything you know about pianos, you can save yourself a lot of time by supplementing your evaluation with several publications. "The Piano Book," by Larry Fine, RTT, is in its second printing and should be stocked by every piano technician. "Consumer's Guide To Buying A Piano" is a pamphlet that is distributed by the National Piano Foundation and was revised this past fall.

The best way to achieve objectivity in your recommendations is to acquire the knowledge, experience, time, tools, and financial security so that your judgement is not adversely affected by any of these factors. The customer's and piano's needs should not be compromised by the choices of services the technician is prepared to offer or withhold. Ideally, the customer should select a technician whose areas of expertise are best suited to their needs. Unfortunately, piano owners are rarely in a position to evaluate either their piano's needs or the suitability of the technician.

Failed Appointments

Why devote an article to failed appointments? They happen so rarely, and the ones that occur seem unavoidable. We could just learn to live with them.

Or we could take steps to reduce the number, however infrequent they may be, and the negative effects they produce. We can give some thought to how to notify customers, when to charge them, or whether or not to keep them in the active customer file.

Most people who fail to show up can be placed in a larger group of marginal customers. They live too far away, have lousy pianos, are impossible to contact by phone, constantly put you off for an appointment, forget to leave the check, or just give you the impression that they're doing you a favor to let you service their pianos. Any of these might be reason enough to expunge someone from your active file. If you have more than enough work, you may be tempted not to give it a second thought. You simply refuse to tune their piano. On the other hand, if you're trying to service a lot of pianos and maintain a fairly high net hourly income, you will want to continue to service some of these marginal customers in order to achieve your business goals. The best way to deal with most marginal customers is to give each a priority rating rather than to categorically refuse to offer them service.

Most failed appointments happen because the customer forgets. You could remind everyone, but it's probably more trouble than it's worth. It's also not that simple. You can call the night before and hope they will be home or have an answering machine. You can call just as you are about to leave from your office or from the previous appointment, but the phone may be in use, they may be outside or otherwise indisposed, (or they may be planning on arriving on time but no earlier.)

Don't call them all; call just the ones that are likely to forget. Whenever you service a piano, make a note on their permanent service record. If someone meets you at the door and says something like, "Oh, I forgot you were coming!" they get confirmation calls the night before from now on. Drop a hint when the appointment is scheduled and tell them that you're writing down the date and time in your appointment book. I've even come right out and asked them to please not forget the appointment.

Don't make tentative appointments. I've been asked to call that morning to see if someone's schedule will allow for service. Even if you have an open time slot, this is a bad precedent. Avoid making appointments where someone is promising that someone else will be there. Husbands frequently make appointments for wives and vice versa. Apartment managers and maids are risky, but generally reliable. Institutions are notorious for occupying a room where the piano is located. Talk to the person who will be there and who is responsible for scheduling, if at all possible.

Let's suppose you've rung the doorbell and there's no answer. You can: 1. Knock on the door. 2. Walk around to the back and try another door. 3. Recheck the time and location of the appointment. 4. Go next door and call the home and/or office number. 5. Go to the next appointment and call a few times while you're there.

Each of the above has salvaged appointments for me more than once. Calling from next door will often get you a new customer. Calling from the next appointment is one reason for scheduling tunings close together geographically. If a customer is late and if you've given the next customer a time range rather than a specific time, you can go to the next appointment and return later in the day. It beats sitting in your car and listening to the radio, rearranging your back-up tool box, and hoping someone will show up. In my experience, only a small percentage of customers show up late. For that reason, waiting for 15 minutes or more is usually a waste of time. The exception is when they have told you in advance that they will not be home until the time you

expect to arrive.

Some churches, schools, and other institutions can be serviced with no notice at all. These clients can be put to good use when someone in the area fails to show up. Most allow you to fill holes in your schedule on short notice and may be worth tuning at a discount for that reason alone.

If you decide to go on to your next appointment, or to a church or school, leave a card, but do not leave a bill... yet. If a genuine emergency prevented someone from being at home, it is unlikely to happen again. The bill may offend them and you may never know whether they had a reasonable excuse or not. When considering whether or not to bill a customer, we want to know if we are dealing with a repeat offender or is this a fluke? You won't know until you hear from them. Let them initiate the next contact, which is why you should leave a card. This procedure avoids a confrontation which is embarrassing for them and awkward for you.

If they call back in response to the card I've left in the door, they deserve recognition for that effort. Some even offer to pay before knowing my policy. Sometimes I accept payment from them, but usually, it just doesn't seem justified because I know they understand and appreciate my concerns. But what if they merely apologize for forgetting? Most people who forget appointments do so habitually in my experience. Now what? Do you threaten to bill them if they do it again? You have to place a value on the customer that now includes a risk factor. Over the years, how much time will you have to spend to service this account?

A piano technician owes it to his profession to let the piano-owning public know that their behavior has resulted in a loss of income and is not just a matter of minor inconvenience as is so often assumed. Their usual line of defense, that the appointment can be rescheduled, shows that they fail to realize that the time slot is lost forever. The time allocated is greater than other home service professionals. We often work a larger geographic area which requires more driving time. We don't like to overbook or ask people to stay home half the day hoping we'll show up.

Someone actually told me that if she had known I was going to charge her, she would have made it a point to be there! This odd bit of logic, from a law student, no less, reminds us that our time is worth something only if others can be persuaded that this is so.

I've often wanted to ask people who fail appointments what they would do if their boss told them to go home and take time off without pay or benefits and with no notice.

Even worse than a failed appointment is an attempted late cancellation. Granted, they at least have the courtesy to call, and you don't have to waste time driving to the appointment, but you should already be in the area anyway. It's worse because you have to deal directly with the customer on the phone when they are trying to cancel late the night before or early that morning. I point out my anticipated loss of income since it's too late to schedule someone else on such short notice. I suggest as many options as I can think of to salvage the appointment — a key under the flower pot or with the neighbor, a different time slot on the same day if I can accommodate it, or simply asking them in a diplomatic way to consider rescheduling their other activity. I succeed in salvaging the appointment about half the time.

TECHNICAL FORUM

Torque, Touring, And More

Susan Graham, RTT
Technical Editor

Due to the untimely absence of my computer, the second part of the article on grand dampers will not be appearing this month. Instead, the Forum will feature work from a variety of sources. We begin with a short piece by Don Galt, reprinted from the May 1972 *Journal*. Thanks to Wally Brooks, who very kindly sent me a large collection of back issues which had been his father's, I will be reprinting "*Journal* Classics" from time to time.

Torque

When you *torque* the tuning pin, you induce a *torque* in it. If the pin is extremely tight in the block, part of the *torque* remains after the *torque* has been removed, so that the pin is left with a *torque*.

Catch on?

Or do you think I have flipped?

Well, although this is a made-up paragraph, I have seen the word used in every one of these senses, of which there are four that are different. Most of the senses are wrong, or at least questionable, and their indiscriminate use can lead to confusion.

Let's see what they are intended to mean in this paragraph.

When you (apply a torque, a torsional or twisting force to) the tuning pin, you induce a (torsional, twisting strain, deformation, change of force) in it. If the pin is extremely tight in the block, part of this (torsional strain) remains after the (torque) is removed, so that the pin is left with a (torsional internal restoring force tending to untwist the torsional strain).

Only the next to the last usage of the word is really valid, although the first is nearly so. The qualifying "nearly" comes from the fact that *torque* is really a noun, though it is gaining currency as a verb in the automotive field where it has a specialized usage.

Torque, according to Webster, is a noun, and means "something that produces or tends to produce rotation or torsion and whose effectiveness is measured by the product of the force and the perpendicular distance from the line of action of the force to the center of rotation; broadly: a turning or twisting force."

Now comes the auto service industry with its service manuals and their torque tables. Every important bolt or threaded fitting is to be tightened down with the specified torque as measured by a torque wrench. So when the mechanics speak of "torquing" the cylinder head, they mean to tighten the cylinder head bolts to the specified torque.

The author of a recently published book about pianos has borrowed the automotive language when he speaks of torquing down the plate. Of course he is talking about tightening the plate bolts and screws, even though there is not, and hardly can be, any specified torque to be used for this purpose.

I have heard people speak of "torquing" tuning pins, which is a usage that leaves the hearer guessing as to the intended meaning.

Words are codes, which convey meaning only when a speaker and hearer both understand and agree on the code. Which is why the dictionaries are such useful things when people want to communicate.

For myself, I believe I will stick to Webster's meaning for torque, as quoted above, and simply twist, turn or tighten things as the occasion demands, sometimes leaving them with torsional stresses and strains in the process, but not with torques.

The Forum continues with a reprint from *The 7/0 Pin*, newsletter of the Baltimore Chapter, by its editor, Greg Hudak.

I'm always amazed at how I am always confronted with new problems in working on pianos — and new solutions. Buzzes, squeaks, clicks, whooshes, etc. have always been some of the most frustrating to deal with — just when you thought you have worked your way through every possible source of these unwanted sounds, some new ones challenge you to locate them, or else tear your temperament strip into little pieces and go into something calm and relaxing, like brokering at the New York Stock Exchange. In concert work, these noises are particularly challenging, as they not only cannot be ignored, but must be dealt with swiftly and efficiently, often with an impatient artist pacing the floor around you as the clock ticks inexorably towards curtain time. Wouldn't it be great if everyone would cull all these problems and (hopefully) solutions into some sort of compendium that a technician could carry in his tool case and whip out whenever needed. If every time we vanquished one of these little buggers, we would feed the experience into some massive international database, that could be updated every year, like Leonard Maltin's "Guide To Movies On TV." (Ever wonder what the size of that thing will be in the year 2020?) Anyway, here are some humble contributions from my experiences of the past week...

1. *squeaking shift pedal on grand.* These will drive you crazy because it is very difficult to isolate certain parts of the keyframe (unless you start taking it apart) like you can with the key/wippen/shank and flange train — it's either in or it's not. What I usually do is lubricate every friction point I know of. If it wasn't squeaking the lube won't hurt it. However, in this case the squeak

merely jeered at me even louder than before (as they always do). Then I found that the glide bolt all the way to the right was up too high, so the keyframe in that area was not sliding on it, but on the wood of the keyframe itself, causing a squeak. Yes, Virginia, I should have checked it first, but that was before I read this article...

2. *buzz on one note in treble.* Yes, we know it was some sort of sympathetic vibration, but finding exactly whence was the tricky part. In a case like this I always try to locate the sound as much as I can with my ear — moving it around the underside of the lid while playing the note repeatedly and with the other hand touching various suspected sources (a good trick in itself!). Sometimes you can be fooled, but usually "where you hear it is where it is." So even though I didn't want to admit it, I finally accepted the fact that it was coming from down in the action. Pulling the action and tightening the screws that hold the sostenuto rail assembly in place (just a hunch) corrected it immediately (they were not really loose, but just needed an extra nudge).

3. *clicking sound when damper returns (grand).* My first instincts told me underlever hitting sostenuto rod, or backcheck hitting same. But testing with the action out in the case of the former, or with it slightly pulled out in the case of the latter did nothing. Removing a damper to see if there was a hard piece of material on the damper felt yielded the culprit — the wire was loose in its slot in the damper block, which upon a forceful wiggle made a nasty click (new, high-quality grand!). Tapping it in with a punch corrected the problem immediately; however, since the damper block was now closer to the wire and thus the damper guide hole, the damper needed some adjusting to lift nicely.

An amusing historical note is added by a piece on the composer Louis Moreau Gottschalk, written by Jack Greenfield (this piece also appeared in the Chicago chapter newsletter *The Wippenpost.*)

A Concert Tour Hardship

Louis Moreau Gottschalk (1829-1869) was the first American-born pianist to achieve international recognition as a first-rank concert artist. Performing in Europe during 1845-1853, he was classed on a level with Chopin and Liszt. For the rest of his life he performed in North, Central and South America. While he had the training and perhaps ability to compose more "serious" music, he preferred to write light "salon" program pieces that appealed to popular tastes. He was the first composer to make extensive use of Creole and Caribbean themes and musical styles.

As Gottschalk continued his career in America after his return in 1854, he raised the standards of concert performance. His recitals combined with the publication of his piano pieces were strong influences, promoting the growth of the piano industry. Gottschalk did not limit his appearances to major cities where he could be comfortable in good hotels and enjoy good food, but undertook arduous tours traveling from town to town on the slow-moving, mid-19th century railroads. He averaged over one performance per day.

His book "Notes of a Pianist" gives an account of his travels during his last 12 years including the period 1862-1865 in the United States and Canada. He had to endure many discomforts and unpleasantness on his strenuous, arduous itinerary. His account of an experience in several below-zero snowstorm days in Northern Illinois brings chills to the reader.

In December 1863, Gottschalk assembled a group that included a prima donna, tenor, violinist, accompanist, and three personal assistants. Also in the group was Gottschalk's business agent and a piano tuner named Ashfort. Ashfort took care of the two Chickering pianos that Gottschalk brought with him. These were huge grands, 10 feet long and three feet across at the tails.

After two concerts in Chicago, on December 28, the group divided, Gottschalk and the agent departing for Rockford for a solo recital, the others departing for Racine for a concert they would present. The scheduled train travel time then was five hours to Rockford, four hours to Racine. The group was scheduled to reassemble for a program in Milwaukee several days later.

In Rockford, Gottschalk found a foot and a half of snow accumulated after two day's snowing and a temperature of about 18 degrees below zero. He gave his concert that night and the next day he and his agent departed on the local railroad line that made connections for Milwaukee. But the weather had turned more ominous. The temperature had dropped to 25 degrees below zero; heavy snow had started again and a fierce wind was blowing huge drifts across the tracks, threatening to halt the train and bury it. The train barely reached the station at Harvard, IL, before it was stopped completely.

There was a comfortable small hotel near the station, but it did not have enough room to accommodate all of the 50 to 60 passengers on the train. These places were given to the women and children; the only space for the men was on the floor. Gottschalk's agent however, was able to obtain lodging for the two of them at the postmaster's home nearby the station. The unfortunate train crew had to spend the night maintaining fire in the train engine's boiler to keep it from freezing up.

Gottschalk spent the night with all clothes on, wearing a fur cap, under a mountain of bedclothes. The thermometer bottomed at 32 degrees below zero. On New Year's Day, 1864, Gottschalk was snowbound in Harvard, IL — he could neither go out to Milwaukee nor return to Chicago until several days later after the tracks were cleared of snowdrifts. On January 8, he was able to resume his tour with a performance in Michigan.

A Concert Performance With An Actionless Piano

In one of his first concerts in San Francisco, after arriving in April 1865, Louis Moreau Gottschalk planned a spectacular program with 14 pianos playing his special arrangement of the March from Tannhauser. The concert was so successful that he decided to repeat it. On the day of the performance, one of the pianists became ill and a replacement was needed. When Gottschalk was unable to find another professional pianist, the proprietor of the concert hall offered the assistance of his son. He claimed his son was a talented amateur who could play pieces by Liszt or Thalberg at first sight.

Gottschalk accepted the offer and suggested the son rehearse with the other pianists. The son did not think it necessary since his part was much easier than the Liszt fantasies he played. There was rehearsal, however, which Gottschalk

ended quickly after he heard how poorly the son played, especially with the pedal held down continuously.

Gottschalk could not dismiss the son because his father was influential in San Francisco society, and had already invited many friends to come to the concert to hear the son play. While Gottschalk was considering whether or not to postpone the concert, his tuner offered a solution to the difficulty. He removed the action of the vertical piano designated for the son.

Before the performance, Gottschalk spoke to the entire group of pianists and asked that no-one play any notes before the piece was started so the audience would get the full effect of 14 pianos striking the opening chords simultaneously. His instructions were obeyed and all went well. The young man at his piano in a prominent position went through the motions of playing and performing difficult passages with ease while turning his head to smile at friends in the audience. The applause was vigorous and some in the audience began to call Encore! Encore!

But before Gottschalk could start the group to repeat the March, the son decided to play a short chromatic scale. "The stupor that was printed on his countenance was inexpressible. He began his scale again. Nothing. The piano was mute." Believing the piano was just out-of-order, he started to signal wildly to Gottschalk . Gottschalk avoided the signals and quickly gave a downbeat for the start. Again, the young man went through the motions of playing to save appearances before the audience, but now his face was filled with discouragement and dismay.

Gottschalk complimented the players later in the artists' room but he said the second playing was not as effective as the first. "The mischief," said the young amateur to Gottschalk, "my piano broke down all at once."

Gottschalk and his tuner kept the removal of the action secret for a long time, but it leaked out as evident by the furious glance Gottschalk received later one day when he greeted the son on the street.

Next, we hear from Allan Day, RTT, with a detailed procedure used to repair a cracked pressure bar in an old upright which the customer particularly wanted saved.

Dear Susan,

I thought I would share with you my experience repairing a broken pressure bar. I don't recall ever reading about this in the *Journal* and none of the technicians I questioned had any experience with such a problem... so I was on my own.

About eight years ago I began servicing a turn-of-the-century Bauer upright. This is a family heirloom and my customer was quite willing to have me rebuild the action and eventually restring her treasure. After the action was rebuilt and the case was refinished, customer was happy — technician was not. I dreaded tuning this recalcitrant antique but hesitated to tell the customer since she just paid me to make it all better.

I finally broke my silence during a recent tuning and told her that I was having extreme difficulty setting the pin and stabilizing the strings. I told her about a similar experience with another Bauer that I had given up on but I felt I would like to try restringing this one, feeling secure that this final link in the rebuilding chain would fix the problem. She finally agreed and we started the job.

After we lowered the tension, removed the strings, and measured the height of the pressure bar we noticed a problem which at the time seemed to be incidental. As the screws were removed from the pressure bar we noticed hair line fractures at the screw holes. When we tried to lift it some of it stayed in our hands but most of it stayed where it was. Ten pieces in all.

We numbered each piece so we could reconstruct it easily and noticed that the bar was made from cast iron. Now I knew I was out of my league trying to solve this problem.

The first thing I did was to show the broken bar to the customer explaining that the fractures had apparently been there for quite some time. She, however, was more concerned with the cost of fixing it than when it broke. I presumptuously tossed a figure out and that it would take the talents of a metal worker to mend it. I put the pieces in a bag and left for lunch after reassuring her that I would have more words of encouragement in a couple of days.

Within the next two days I coincidentally ran into two colleagues namely Dan Wade and Tom Hughes both equipped with a great deal of engineering background. I presented the problem, eliminating brazing or welding and concentrating on making a new bar using steel rather than cast iron. I listened, debated and discussed and finally accepted Tom Hughes' plan to reuse the old bar with a reinforcement bar added.

His reasoning to reuse the old bar was that since it was cast iron it had the best natural lubricity (cast iron contains graphite) and it could be pieced perfectly back together again without distortion.

Now it dawned on me that the breaks in the bar were causing it to move as the strings were tuned, thus causing my frustration in stabilizing anything. Since the problem didn't appear in the bass, it substantiated the cracked bar as the culprit.

How We Did It

I pieced the bar together using A C glue and splinted the entire length with heavy cardboard. I took it to a welding shop and asked them to supply and bend a piece of hot rolled steel bar 1/4" by one inch to the contour of the pattern. My plan was to use the old bar to spot and drill slightly larger screw holes in the new bar (to allow for any discrepancy in transferring the holes) then replacing the original flat head screws with 1/4" longer round head screws to fasten the new bar in place over the old bar in the piano.

While the bar was being made the new strings were installed. When I picked up the new bar at the welding shop I was distressed in finding that the over-enthusiastic metal worker drilled some diameter holes in the new bar and countersunk them as well. When I explained the reason for my distress he said try, it just might turn out perfect... in spite of Murphy's Law, he was right!

With both bars in place I drilled holes through the new bar and into the old bar halfway between each screw hole. In these new holes I drove in #9 bridge pins to join the bars to prevent any shearing motion of the old bar in case the friction between the bars wasn't enough.

Did it work? *Drum roll needed here...* Do you think I would have written this if it hadn't?

In keeping with our policy of reporting on piano catastrophes, the Forum includes an article from member Ray La Motta of the Virgin Islands.

Dear Susan,

I would like to share with you and my fellow piano technicians a situation I experienced with a keybed of an upright piano which was made of particle or press board.

The piano, made in England, has always been the choice of many residents of the U.S. Virgin Islands who moved here either from England or one of the British Islands in the West Indies.

I found the piano to be well-made of good wood, center pins coated with a special coating to prevent rust, plastic bushings in the key buttons, oxide strings and key tops and fronts tacked with brass tacks to secure them. I must say it is a well-constructed piano.

I received a call from a wonderful family, whose home was damaged by the hurricane, to see if the piano should be disposed of as it really got wet. The exterior of the piano seemed to be okay because of the type of material used to finish it; a few pieces of veneer came up. When I opened the piano to check the inside, I found the keys separated from the glued centers, hammer felts loosened from their cases and dampers falling all over. This I expected. I took the action off, and this is where I was surprisingly disappointed to see the keybed, which was 1 1/8" thick, all swollen to about three and one-half inches. I learned this after I called the factory in England, for specifications.

They told me I could not fix it as that was a factory job, but they would send me a new keybed if I wanted. I did not care to replace it with another press board. I took more measurements — the location the keyframe was on the keybed, etc. I then removed the keyframe and inspected some more. The keybed was glued to the sides of the piano, screwed to the bottom part of the cheek blocks, plus mortised and screwed to two points of the plate. I sawed the board at its center and forced it out.

I had an old Wurlitzer 45" keybed (wood) which I decided to use. I took more measurements from the inside of the piano, cut and shaped the new board and got it to fit in, and replaced all other parts as measured. The piano is working fine again and was donated to a private school that needed one.

This experience reminds me of someone building a marvelous home of steel footings but erecting it on a sandy beach.

May I add that the U.S. Virgin Islands is the most southeasterly owned possession of the United States for the past 70 years. They are located approximately 70 miles east of the island of Puerto Rico, 1,100 miles east, southeast of Florida and 1,600 miles south, southeast of New York.

Finally, another reprint, courtesy of Brooks. The article originally appeared in the April 1929 issue of *The Tuners Journal*, but has a timeless quality which makes it rather interesting.

For some time I have been racking my brains to devise a workable plan that would be of real benefit not only to the tuners but to the whole piano trade. The following is an outline of my conclusions:

1. To get as many private individuals as we tuners possibly can to write or telephone to the big broadcasting stations and request them to feature more piano music in their programs.

2. After the stations have been convinced that there is a real demand for piano numbers to call a meeting of the dealers, the tuners and the music teachers in various communities, appoint a committee and formulate plans for inducing and aiding the stations to put on regular weekly piano recitals of good music, of say half an hour. With the weight of the influence of such a body behind it, this accomplishment should not be difficult. At each recital have a competent announcer give a little talk on the piano, its music, its care, tuning, and so forth.

3. To induce the stations to put on weekly half-hour recitals by students who are sufficiently accomplished and advanced to be acceptable to the musical director of the station. In every city there are plenty of such students who can play as acceptably as many of the professionals now employed, and who would feel flattered to be called on to play over the radio. It would be the duty of the local committee to guarantee to provide such students. At each recital the announcer would give the piano number to be played, the name of the performer and the name of the teacher. It can readily be seen that this would be a great stimulus to both students and teachers.

The basic idea is to revive an interest in the piano and piano music, believing that an increase in demand for tuning service will naturally follow.

The first step, namely, to get the broadcasting stations to believe that there is a real and genuine desire on the part of the public for more piano music is the most difficult, and a certain amount of diplomacy must be employed to this end. After the stations have been bombarded with enough phone calls and letters to wake them up, the rest will not be so hard.

All of the tuners of the San Francisco division have been instructed to suggest to their patrons, especially those interested in piano music and those having children who are piano students, the desirability of hearing more piano numbers over the radio and the benefit this would be to the students; also to ask them whenever a piano number is given to call up the station, compliment it on the excellent rendering of the number, emphasize the enjoyment derived from it and state how acceptable more of the same would be.

These calls from private individuals have great influence with the stations, and they put on the air the kind of music on which they receive the most compliments.

Keybed of an upright piano made with particle or press board.

Announcing the names of the teachers of the performers would be invaluable advertising for the teachers, and as they would be furnishing the talent free of cost to the stations, there could be no objection to doing this. It has been suggested that as there is considerable professional jealously among teachers this plan might foment trouble, but this could be avoided by making an alphabetical list of the teachers and giving them their opportunity in rotation.

I really believe the plan would show itself to be of enough importance to the whole piano trade to be considered worthy of financial aid by the manufacturers. As a matter of fact, financial aid would not be needed so much as energy and perseverance on the part of the tuners and piano lovers.

The plan could be amplified or qualified to suit the particular part of the country in which it is being used. But can one visualize what the result would be if every division of the National Association of Piano Tuners would put it into operation?

The initial step seems already to be bearing fruit here in California, and the broadcasting stations are showing a willingness and inclination to put on more piano numbers, so that we feel encouraged to believe that as we proceed with the other steps we shall get results.

Oh, yes, the computer... just your basic burglary, I'm afraid. The shop wasn't touched and the whole job was rather neatly and professionally done, but they did clean me out of all my electronic toys (right down to the answering machine) and *don't even ask* if I had my work backed up on a separate disk (some of us just have to learn the hard way). I realize that between this and the earthquake, the Forum must sometimes resemble "The Perils of Pauline" — but I promise, no articles on seismic retrofitting (how to bolt your house to its foundation) and superior deadbolt installation. Thanks for your patience! ≣

TUNING UP

Negative Inharmonicity

Rick Baldassin, RTT
Tuning Editor

This month we have a letter from Ken Churchill, RTT, of the Orange County Chapter. Ken writes:

Now that I have retired (almost), I am engaged in building my own piano. Thus I have followed the laws governing harmonics and inharmonicity with more than a passing interest. A recent experiment has puzzled me regarding those laws.

Wm. B. White in his book "Theory and Practice of Piano Forte Building," states that note C-88 with 13-gauge wire should be slightly over two inches in length. Note 28 with the same gauge wire would be 55.8" long.

I decided to experiment with C-28: one note which used 13-gauge wire and was 55.8" long, and another note adjacent using Dr. Sanderson's formulas which used a 20-gauge wire and was 45" long. The latter note would have an inharmonicity of 0.15, considered ideal on Sanderson's chart.

I tuned both notes to the same pitch according to my tuning device, set on C3. The note with 13-gauge wire sounded flat compared to the other note. Both notes sounded together produced about eight beats. I switched the tuning device to C4 (second partial) and the 20-gauge note read sharp, while no change occurred in the 13-gauge note. Switching to C5 (fourth partial) the 20-gauge note showed quite sharp, and the 13-gauge note actually read flat. This was hard to believe, but I did confirm it.

None of Dr. Sanderson's formulas show a negative inharmonicity. If a node occupies a non-vibrating space, it follows that the string is shortened by that space, and that the partials should always have a higher reading than their corresponding fundamentals.

Could there be an imbalance among partials that two or more were longer and more dominant, to give a reading lower than mathematically possible? As an afterthought, I located the second partial node on the 13-gauge string, and measuring from both termination points, found that node located 27" from one end, and 27.75" from the other end. What do you think?

I guess the real question here is if negative inharmonicity exists. I am afraid the answer is yes. The inharmonicity formulas we have account for the inharmonicity caused by the free vibrational nature and stiffness of the string. This component is predictable, and this is why we have formulas for it. The soundboard, bridges, and case, are also thought to be contributors, although it has never been proven how these components react predictably. It is thought that since these components have resonances, and resonances can either attract or repel each other, that a resonance from the soundboard could force a partial from a string downward. A couple of years age, Chris Robinson and I performed an experiment where an adjustable pressure bar was inserted between the the intersection of the case and one of the beams, and the belly rail underneath the piano. The object was to see if adjusting the tension made a difference in the sound, and it did. As an aside to this, we measured the inharmonicity of the note we were playing before and after adjusting the tension, and the inharmonicity did change.

Since the component caused by the stiffness of the wire is the largest component, in most cases the inharmonicity formula accurately predicts what we would actually measure, as the large stiffness component is not radically altered by the other small and unpredictable components. Those who have done much research have discovered that the first three partials are the most affected by these other components, and that sometimes the measured results for these partials do not match what the formula predicts. From the fourth partial and above, these other components have little effect, and the formula accurately predicts the measured results. Let's examine why Ken may have found negative inharmonicity on the fourth partial of his note.

One possible reason for obtaining a negative inharmonicity reading would be non-uniformity of the wire. In the paper from which the bass string inharmonicity formulas were derived ("A Proposed Loading of Piano Strings for Improved Tone," Franklin Miller, Jr., *Journal of the Acoustical Society of America*, July 1949, p. 318), Franklin Miller's theory was that by adding gold plating to the string at certain points along its length, the inharmonicity of given partials could be eliminated. If you think about it, if the weight was precisely at the nodal point, it would have no effect on that partial, but if it was at the anti-node, the additional weight would cause the partial to be flat, because of the additional mass. By figuring how much mass and where, Miller's theory would eliminate the inharmonicity of the first several partials by adding negative inharmonicity (via the weighting) to the positive inharmonicity caused by the stiffness. He assumed, of course, that this elimination was desirable. More on this aspect later.

In the case of a non-uniform string, the weighting is random (wherever the fat spot happens to be), and so the negative inharmonicity effects fall randomly on the partial(s) whose anti-node(s) the fat spot(s) occupy. In the above case, this would have to have been at an anti-node for the fourth partial. Dr. Sanderson mentioned to me that several sources have reported to him that the German piano wire is much more uniform than the American piano wire.

Another possible reason for obtaining a negative inharmonicity in this case is the problem of obtaining accurate, repeatable readings for the fundamental. Calculating the inharmonicity constant for the string 55.8" long with 13-gauge wire, the result is 0.031. Multiplying this out for the fourth partial (0.031 x 15) is less than half a cent. So the formula predicts less than half a cent of inharmonicity at the fourth partial. The question becomes whether or not the fundamental can be read accurately with repeatability at the fundamental within half a cent. It is difficult.

Speaking to Jim Coleman about this matter, he recounted that during his research days at Conn, he gave up trying to read the fundamental frequencies while striking the string with the hammer, as he could not get repeatable results. Instead, he plucked the strings, which gave repeatable results. Some of you may have attended a class which I taught in Las Vegas a few years back, where I measured the string while striking it with the hammer, bowing it, plucking it to the left, and plucking it to the right. An interesting fact was that the readings were different in each case, including plucking to the left, and plucking to the right. This is because when the string is struck by the hammer, it has a sort of elliptical vibration. Because of the nature of the termination at the bridge, it is as though the string thinks it has two lengths, one terminating at the bridge notch, and the other at the bridge pin. If these lengths differ too much, we have a "false beating" string. Plucking in different directions isolates the two different pitches involved, and the difference between these two pitches should account for the "false beat" present. It is important, therefore, when plucking strings to take measurements, to always pluck the strings in the same direction.

As I mentioned earlier, taking a reading at the fundamental can be difficult. This is due in part because the lights rotate more slowly for each cent of deviation as pitch becomes lower. For this reason, the readings obtained become less accurate the lower you go. In other words, a reading on the fundamental of a note read in octave three would be half as accurate as reading the second partial of the same note in octave four. This is why the more accurate tuning devices tune the notes of the third and fourth octaves while reading in the fifth and sixth octaves. It is four times as accurate.

When measuring inharmonicity, it is more accurate to measure the difference between two higher partials than, say, the first and second. This is because the cent difference measured is a greater amount, and this greater amount is then divided by a larger number to obtain the inharmonicity constant. Let us say, for example, we measured 1.8 cents difference between the second and fourth partials. To obtain the inharmonicity constant, we would divide this amount by the difference of the squares of the two partials. Since four squared (16) minus two squared (four) equals twelve, we would divide 1.8 by 12, and come up with 0.15 as the constant. To achieve the same using the first and second partials, we would have to somehow accurately measure a difference of 0.45 cents, and divide this amount by two squared (four) minus one squared (one), which is three The result is still 0.15, but let's see how being off by only a tenth of a cent affects each example. In the first case, 1.9 divided by 12 would equal 0.158, or an increase of 0.008. In the second case, if we read 0.6 (which is probably as accurately as we could read), and divided this by three, the result would be 0.2, or an increase of 0.05. As you can see, the same tenth of a cent error at the lower level had a much more dramatic effect on the end result.

One thing that can help you if you are trying to obtain good, clear readings on low pitches is to use two Accu-Tuners together. Hook the "Filter Output" of Accu-Tuner #1 to the "Audio Input" of Accu-Tuner #2. This system provides a double filtering of the note, and will improve the results. It also helps to disable the microphone of Accu-Tuner #2 by plugging in a grounded plug into the "Mag In" jack. With both tuners set to the same note and octave, the reading is taken from the second tuner.

Assuming that there were no problems in taking readings, the most logical explanation would be that diameter of the wire was not uniform, or that a resonance in the soundboard, bridges, or case forced the partial flat. With the formula predicting less than half a cent of inharmonicity at the fourth partial, it wouldn't take much to make the reading negative. Beside pianos, I have also measured negative inharmonicity on lightly-strung instruments, such as harpsichords and the harp.

Let us now turn our attention to Braid White's ideas on string length and wire size.

From statements made in his book "Piano Tuning and the Allied Arts," it is doubtful that Braid White knew of the concept of inharmonicity at the time the book was written. He attributed octave stretching to a property of the human ear. On page 109 he states, "Many measurements made by means of the Conn Chromatic Stroboscope confirm what had always been supposed; namely that there exists an apparently ineradicable tendency on the part of tuners to "stretch" the octaves in both the high treble and low bass." In July 1943, a paper by Shuck and Young titled "Observations on the Vibrations of Piano Strings" was published in the "Journal of the Acoustical Society of America." This paper dealt with the subject of inharmonicity. Three years later, in his fifth edition, published in 1946, White does make an insertion in the book which mentions the above article, stating that it appears the amount of stretching is roughly equal to the amount of inharmonicity.

Knowing that inharmonicity was not his guide, let us take a look at tension. Assuming that we were starting with a length of two inches for note 88, if the string lengths increased by a factor of 1.945 per octave, note 28 would be 55.7" long. (This was the approximate length which Ken Churchill mentioned in his letter). If all of these Cs were strung with 13 gauge wire, the tension for each note would be as follows: C88 = 155 lbs., C76 = 147 lbs., C64 = 139 lbs., C52 = 131 lbs., C40 = 124 lbs., and C28 = 117 lbs. The decreasing tension in each octave would mean that the tone would become weaker and weaker the lower we went. For this reason, a string 55.7" long with a 13-gauge wire makes no sense to me. To maintain the tension as near 155 lbs. as possible, we would have to increase one-half wire size per octave. The results would be as follows: C88 (13 ga.) = 155 lbs., C76 (13.5 ga.) = 156 lbs., C64 (14 ga.) = 157 lbs., C52 (14.5 ga.) = 158 lbs., C40 (15 ga.) = 158 lbs., and C28 (15.5 ga.) = 159 lbs.

Jim Coleman told me that while he

Chart 1

C28	(1) 0	(2) .054	(4) .270	(8) 1.134	(16) 4.590	(32) 18.40
C40		(1) .054	(2) .270	(4) 1.134	(8) 4.584	(16) 18.414
C52			(1) .270	(2) 1.134	(4) 4.590	(8) 18.41
C64				(1) 1.134	(2) 4.584	(4) 18.384
C76					(1) 4.590	(2) 18.390
C88						(1) 18.40

worked at Conn, Dr. Earl Kent came up with the idea that by doubling the string lengths every octave (as opposed to 1.945 in the previous example) the piano could be strung with the same gauge wire, the tension would be equal, and the inharmonicity would progress such that all of the partials would be in tune with each other. Just for fun, I computed the tension and inharmonicity for the above notes with string lengths doubling every octave, starting at two inches for note 88, and strung with 13-gauge wire. Sure enough, the tension in each case was 155 lbs. The inharmonicity progressed by a factor of four per octave. The constants for the six notes were as follows: C88 = 18.4, C76 = 4.6, C64 = 1.15, C52 = .288, C40 = .072, and C28 = .018. I then calculated the inharmonicity at the octave partials as follows:

Partials

	1	2	4	8	16	32
C28	0	.054	.27	1.134	4.59	18.4
C40	0	.216	1.08	4.53	18.3	
C52	0	.864	4.32	18.14		
C76	0		13.8			
C88	0					

The fundamentals could then be re-tuned, or the octaves stretched as in Chart 1. (The numbers represent deviation in cents, the partial numbers for each note are in parentheses).

The small discrepancies in the higher partials are due to rounding errors. As you can see, with this system, equal tension can be maintained, and the inharmonicity progresses such that all of the octave partials can be in tune at once. What more could we ask for? Too good to be true, you are asking? Why isn't anyone building this?

According to Jim Coleman, they tried this at Conn. Because the scale had to fit into an existing instrument, their approach was to start with the longest length for the lowest note possible, and half the string lengths every octave going up (as opposed to starting with the length of the top note and doubling the length every octave going down). The result was that the length of note C88 was about 1.625 inches, and though the piano could be tuned as expected, it didn't sound good. Dr. Kent went back to the drawing board and designed another instrument using 15-gauge wire with longer string lengths, but unfortunately, this instrument was never built.

A little over a year ago, Dr. Kent sent me a paper which he presented to the Acoustical Society of America. In the letter accompanying the paper he stated, "When I was directing piano research for C. G. Conn, Ltd., I thought that setting uniform diameters and tensions in plain strings served as a useful benchmark and that departing from that benchmark would be done through logical mathematical reasoning and still maintain as much string-to-string uniformity and inharmonicity virtues as possible. In other words, any departures from the benchmark would be logical trade-offs...." In the paper, the string lengths he proposed increased at a rate of 1.87 per octave, the strings sizes ranged from 12.5 gauge in the treble to 18.5 in the low tenor, equal tension was maintained, and the inharmonicity progressed at the rate of 2.6 per octave.

In his book "A Treatise on the Art of Pianoforte Construction," published in 1916, Samuel Wolfenden states on page 199 that the string lengths should progress at the rate of 1.89 per octave. In a conversation with Dr. Sanderson on this subject, I asked him at what rate per octave the strings lengths and inharmonicity should increase, and he told me 1.89 for string length, and 2.6 for inharmonicity. According to Dr. Sanderson, the parameters for inharmonicity to which Ken Churchill referred were derived from listening tests. The tests showed that for a given note, there could be too much or too little inharmonicity, but that there was an acceptable range of inharmonicity for the note. From these tests, the acceptable range of inharmonicity with the corresponding range of tension for the entire piano was graphed.

It appears the reason that the piano with strings doubling in length every octave did not sound "good" was because too much of the instrument fell outside the boundaries for acceptable inharmonicity levels, although even tension was maintained. Imagine what Franklin Miller's piano would sound like with the inharmonicity eliminated.

So, Ken, I have it on good authority that if you want your piano to sound good, better make the string lengths increase at the rate of 1.87 to 1.89 per octave, and the inharmonicity at 2.6 per octave. Chalk the negative inharmonicity up to bad wire.

Until next month, send your questions and comments to:

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PRACTICALLY SPEAKING

Grand Action Touchweight, Part II

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Last month I discussed touchweight measurements and how they can help us diagnose friction and weight problems to answer customer complaints about the touch of their piano. This month I'll conclude with a look at how we can use touchweight measurements to put the finishing touch on an action rebuilding job.

Using Touchweight Measurements In Action Rebuilding

As we discussed in the preceding articles on hammer replacement, an understanding of touchweight allows us to choose and shape replacement hammers that will closely match the weight of the originals. Together with attention to pinning and other friction points, this ensures that when we rebuild an action it will turn out with a touchweight in the normal range.

To do an even better job after major action work we can make touchweight measurements on all 88 keys and adjust friction and key weighting as necessary so downweight, upweight, and friction are all very uniform from note to note. While not practical to do on all pianos, this work is essential if we are to do the best possible job on a quality grand piano. Look at it this way: We carefully re-pin action parts, we measure key dip, let-off, hammer blow, etc. to make sure that the regulation is uniform, and we fuss over the voicing to make sure that the tone is even. A logical further step is to measure touchweight on all keys. The value of this procedure is that it identifies differences in friction and touchweight that we would otherwise not be aware of, and allows us to add another dimension of evenness to an action. The factory key weighting was done to match the original hammers and action parts; if we are to at least duplicate the original quality we need to reevaluate the touchweight after fitting new parts. I suggest the following procedure:

1. Prior to rebuilding, evaluate the touchweight of sample keys fitted with new action parts and hammers (see my September, October and November 1990 articles) to make sure that these parts match the originals and will not cause touchweight problems. (There may be instances where the original design had problems, and your replacement parts will improve over the originals.) Use the following procedure:

Dry fit three or four new sample hammers in their proper position on the shanks, regulate these sample notes, and measure D (downweight) and U (upweight). Compute F (friction) using the formula F = (D - U)/2. Correct the *friction* if it is out of limits and re-measure D and U. If the tails of the sample hammers are not yet tapered and arced, subtract five to six grams from D and U to approximate the correct figures. As stated last month, normal F will be about 15 grams in the bass, tapering to 10 grams in the treble. U should be above 20 grams to ensure good key return speed.

If D is excessive, you must either remove more weight from the hammers, choose lighter hammers, or add more lead to the keys. Adding substantial extra lead is undesirable since it increases inertia in the action.

If D is low and/or U is under 20 grams, you can either use heavier hammers or remove some leads from the keys. Either remedy will raise both D and U. Using lighter-than-original hammers combined with removing some of the original leads will reduce inertia in the action.

The checks above will tell you whether your prospective replacement hammers are appropriate.

2. Rebuild the action, taking care that hammershank pinning is as even as possible, capstans and keypins are polished, and repetition and jack tops are well burnished. Often two grams of friction can be eliminated from new repetitions by burnishing the graphited areas with a smooth metal rod. Space action parts and bench regulate the action. If the piano is available, install the action and pound in a tuning to settle the new action parts, then re-regulate.

3. Before taking touchweight measurements, eliminate any obvious sources of friction:

Key bushings will add considerable friction to your measurements unless they are eased enough to have some slight play. This requirement may be at odds with your desire to leave bushings on the tight side on heavy-use pianos, but friction here *will* show up in your measurements. Lubricating keypins with dry Teflon spray or McLube 1725 will help.

Wool fibers on closely-spaced action parts can rub, causing surprising amounts of friction. Using an electric burn-in knife or flame-heated knife, iron down the fuzz on the sides of hammers, knuckles, repetition lever cushions, and key end felts to eliminate all contact between neighboring parts. Don't even bother taking measurements until you have done this step.

Lightly talc the knuckles, and avoid touching them with your fingers. If the action has not been played at all, burnish the knuckles against the repetitions by rocking the key and hammer together, as if you were checking backcheck to hammer tail clearance.

Re-check parts spacing, key height, repetition lever height, and capstan height. (Dip, let-off, drop, etc. have no effect upon touchweight measurements and so do not need to be exact.)

4. Measure D and U on all 88 keys, recording measurements on a work sheet as in figure 1. To measure downweight, place your test gram weight on the end of the key, increasing the weight until the key just drops. For consistency, place the test weights at the same position on each key. It is easiest to align the test weights with the front end of each key for both naturals and sharps.

The static friction (friction between parts *before* they are in motion) will be greater than the dynamic friction (friction between moving parts). Therefore, it will usually take more weight to start the key moving than it will to keep it going, and most keys will start dropping slowly and then accelerate. Others, however, will drop slowly and evenly if they happen to have more friction in the latter part of their travel. To get the most consistent measurements, it is best to choose the weight such that the key just starts moving when you bump the bench top lightly with your hand. Look for consistency in the speed of hammer rise. Do not repeatedly pound the bench top, as continuous vibration will cause the keys to drop with a *much* lower test weight. Remember that you are only testing in the range of travel *before* the jack contacts the let-off button, and *without* the dampers in the system.

As you proceed, if you come across a key that weighs much heavier than the others you should feel again for slight clearance in the key bushings. Also check for rubbing between neighboring action parts by depressing the adjacent keys; if the test key then drops quickly, you know that some hammer fuzz or other felt is interfering.

To measure upweight, place your test weight on the end of the key, with the key depressed just to the point where the jack first contacts the let-off button, and watch for the hammer to return almost all the way to rest. Here the hammer will usually slow down as it gets closer to rest, and will slow abruptly when the key first touches some felt fibers standing up on the backrail cloth. The correct test weight will usually be that which allows the hammer to return almost to rest. As with measurements of D, look for consistency in the speed of hammer drop.

Since friction is not uniform throughout the key stroke, and does not follow the same pattern from key to key, not all keys will have identical motions during these measurements. Therefore your figures will not be perfectly accurate, but if you are consistent in your technique they will be plenty good enough. (One German firm has experimented with a dynamometer to make measurements of touch *throughout the key stroke at actual playing speed*. It should be obvious that in comparison our crude static measurements should not be taken as the last word.)

5. Using the touchweight formula, compute F for each key. These are very simple calculations that you can easily do in your head. Look over the friction measurements and decide how much friction there should be in each area of the action. Different actions will have different friction levels due to variations in action geometry, parts materials, and hammer weight. Looking at the figures, you should see most of the F values in the low bass are 15 to 17 grams. Find one bass note with a lower F and one with a higher F, remove their shanks and test the pinning by swinging. You will probably find the note with a low F to have loose pinning, and that with a higher F to have either tight pinning or a snug key bushing. By inspecting a few notes with friction that is different from the average in each section, you will be able to see what F is normal for that particular action in the bass, tenor, and treble.

6. Find and correct the problem on any notes that have F levels out of the ordinary. For instance, looking at the data in Figure 1, I would correct notes two, four, and seven because their Fs are higher than average. I would also look at note five because its F is lower than average. Do not expect to be able to achieve absolutely uniform friction from key to key. Slight differences in capstan location, action spread, texture of knuckle leather, etc. will cause differences in friction between adjacent notes for which you cannot account. Besides that, as noted above, the measurements of D and U are not perfectly accurate. I feel that if I get the friction levels all within 1 1/2 to two grams I am well past the point of diminishing returns.

Again, the most likely causes of *high* F are key bushings that tightened up while you weren't looking, or tight hammershank centers. When handling shanks, be sure to avoid touching the knuckles; a little moisture or oil from the skin can temporarily add two grams of friction to the note. Re-talc and burnish if necessary. The most likely cause of *low* F is a loose hammer center.

figure 1: Touchweight Measurements Recorded On Data Sheets

ACTION WEIGH-OFF DATA SHEET

note#	D	U	F
1	56	24	16
2	58	22	15
3	55	24	15½
4	60	22	19
5	50	24	13
6	55	24	15½
7	58	21	18½
8	53	23	15

To emphasize the point once again, the object of making these measurements is to be able to identify the friction level in each note so it can be made uniform. Only then can we proceed to adjust key weighting if necessary to achieve uniform downweight and upweight. The result will be an action with F, D, U and inertia all tapering evenly across the keyboard.

7. Re-measure D and U for any notes on which you corrected friction problems. Figure 2 shows corrected measurements for those notes which had friction problems. You are now ready to evaluate downweight and upweight and possibly make some changes. If your new hammers are close to the originals in weight, and the original factory key weighting was properly done, your job may be finished. That is, you will now see fairly uniform downweight figures that decrease from bass to treble, and upweight figures that increase evenly, starting from no less than 20 grams in the bass. Great! Pat yourself on the back, put away your gram weights, and go home.

Often, however, you will want to change the original key weighting for one of the following reasons:

Sometimes the original weighting was poorly done. The symptom of poor original key leading is that D and U

figure 2: Excessive friction corrected on notes 2, 4, & 7. Below normal friction corrected on note 5. D and U re-measured after correcting friction.

ACTION WEIGH-OFF DATA SHEET

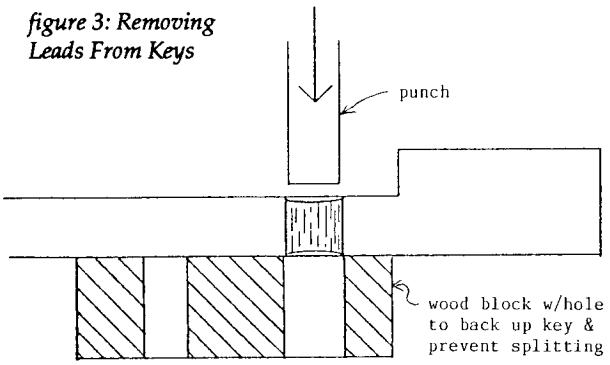
note#	D	U	F
1	56	24	16
	55	25	15
2	~~58~~	~~22~~	~~18~~
3	55	24	15½
	57	25	16
4	~~60~~	~~22~~	~~14~~
	53	21	16
5	~~50~~	~~24~~	~~13~~
6	55	24	15½
	54	24	15
7	~~58~~	~~21~~	~~18½~~
8	53	23	15

figures are erratic even though your friction, hammer shaping, and action geometry are even from note to note. In such cases you will find that the original key leads do not follow a uniform pattern of placement in the keys. This is a sure indicator that the original leads were installed simply to give a uniform downweight without first making friction (or wippen assist springs if present) uniform. The result would be uniform D but very erratic U, and uneven inertia caused by varying amounts of lead in adjacent keys.

Even if you chose and shaped hammers carefully, key leading can often be improved to best match your new hammers and action parts. For example, you might have deliberately gone to lighter-than-original hammers so that you could *remove* some leads from the keys and still have normal D and U, thereby reducing inertia in the action.

Your customer may have specifically requested a heavy or light touch. Here you need to proceed cautiously, since the different tone and response of a rebuilt action will greatly influence the player's perception of their piano's touch. If possible, they should play the action in its rebuilt form before you agree to deliberately modify it further. Remember that you cannot add lead to the keys to make the touch lighter without also reducing upweight. Therefore, for a given friction level, you should only reduce downweight until the upweight gets to about 20 grams.

figure 3: Removing Leads From Keys



Most often, you will be doing relatively minor key re-weighting just to make the action as uniform as possible.

8. Remove a lead or two from any keys with D and U measurements that are lower than desired (see Figure 3). You are now ready to calibrate each key to a uniform downweight. (Since you have already made friction uniform, you will automatically be making upweight and inertia uniform as well). Place a gram weight, equal to your desired downweight, on the end of each key you wish to adjust. Then position a lead somewhere on the front half of the key such that the key just drops when the bench top is tapped. This tells you that the downweight of that key will match your desired value when the lead is installed in that location. Note the lead location by lifting the key slightly and marking the side of the wood with chalk. Space leads at least one lead diameter apart to avoid weakening the key. Proceed across the entire keyboard in this fashion. Try to keep the lead locations fairly uniform from key to key. In other words, try to accomplish your re-weighting with leads of similar size and location of those in surrounding keys.

9. Remove the keys and drill holes for the new leads. You will usually be using 1/2" or 3/8" leads. Forstner bits are best here; they drill the cleanest holes and do not splinter the key as they exit. To minimize weakening of the keys, be sure to center the holes top-to-bottom.

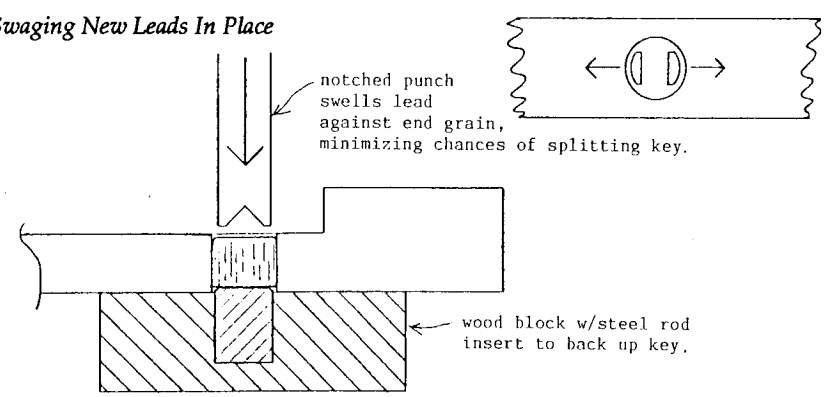
10. Swage the new leads into place, being careful not to over-do it and split the keys. I like to back the lead up with a 1/2" (or 3/8") steel rod set to protrude slightly from a hardwood block as shown in Figure 4; this ensures the lead will not protrude from one side of the key.

To further reduce the danger of splitting the key wood, you can make a punch like that in Figure 4 which expands the lead more fore and aft against the end grain and less top-to-bottom.

11. Holes left empty after removal of original leads can be plugged if desired, using plugs cut from similar wood with grain direction matching that of the keys. This is a good idea if the keys show any splitting between leads, or if you have drilled new holes close by.

This completes the re-weighting job. The action now has uniform resistance to touch across the keyboard. Friction and upweight are uniform, so key return speed is even and predictable. The weight of action parts and key leads varies smoothly across the keyboard, so inertia is uniform. Together with careful regulation and voicing, the piano action will now be as even as we can make it, allowing the pianist maximum control over dynamics and technique.

figure 4: Swaging New Leads In Place



Conclusion

Does all of this sound like a lot of trouble? Well, it is, but it is no more so than any aspect of careful piano work. If we arbitrarily choose to ignore a certain aspect of a job, the end result may suffer. The problem facing us is to establish priorities so we do a job that is appropriate for the customer and the piano.

In the case of touchweight analysis, an "appropriate job" in most cases may only mean having the knowledge to diagnose the real cause of a touchweight complaint, or paying some attention to hammer weight during action rebuilding to avoid creating touch problems. In other cases "appropriate" may mean measuring all keys to find and correct friction problems. In still others, it may mean going through the re-weighting process described above to do the best action job possible.

Next month I'll take a look at another area of action work: felt replacement.

GOOD VIBRATIONS

Laying Out The Bridge, And Drilling Pin Holes

Nick Gravagne, RTT
New Mexico Chapter

We left off our bridge capping adventure having glued on the new cap material, trimmed it flush with the bridge body, and reduced the height down to the desired dimension. Next we must graphite the top, locate pin holes from our pattern, and drill the holes.

Graphite The Top

I use DAG, a graphite in alcohol suspension, to blacken the bridge top. It is available from American Piano Supply Company, and probably other piano suppliers. Apply the DAG either with a brush or rag and cover the entire top; it dries fast to a dull sheen. Rub hard with another rag and burnish with hard wood or a hard piece of plastic-type material such as nylon. You may want to make two applications. Some of the alchemists in our midst claim that exotic concoctions superior to DAG (or straight graphite rubbing) can be mixed, the ingredients even including stale beer for its advantageous chemical composition. I have no experience here, but if you come across a good mix, and can explain why we should go to any extra trouble, let's hear of it.

Locate The Pin Holes With Pattern

Find your pattern of bridge pin holes and locate it according to your chosen method (some ideas on this were presented in recent issues of this series). Photos 1 and 2 show paper rubbings positioned on the new bridge cap. Notice that the paper is quite wide compared to the skinny bridge, and that the pattern position is located and "pinned" to the cap with 1/8" dowels, the holes of which were drilled through the old cap into the bridge body before the pattern was made, and before the old cap was removed.

Punching The Pin Holes

Instead of punching holes one-by-one, make a "gang-punch" to punch holes three at a time, and with greater accuracy. Gang-punches are easy to make. Start with a hardwood handle dimensioned about three inches long by one inch wide by 3/8" deep. Drill three appropriately spaced and in-line holes into one end of the handle into which small finishing nails (3d to 6d thereabouts) can be tightly driven. Clip off the heads leaving 1/4" protruding, and file to a point (more or less) each nail. Since bridge pin spacing varies from piano to piano, and even in the same piano, although usually uniform in any section, the gang-punch needs to be adjustable, or you need to make a few for different spacings. The punch described above is "adjustable" by bending the outside nails in or out as the case may be.

To use, hold the punch upright and give a sharp blow with a small hammer. The indentations will be vertical; don't worry. Make sure the dents are clear. Be aware to center punch in the pattern holes which will be of larger diameter than the nail points. Also be alert not to misalign the punch thereby leaving dents which are perfectly in-line but at the wrong angle relative to the agraffe or capo bar. You might want to make a bichord punch as well. Use good lighting.

Un-notched bass bridges, whether straight or curved, will not look quite right unless a precaution is taken. The pin holes will not line up in a straight line (or nicely curved line) by punching

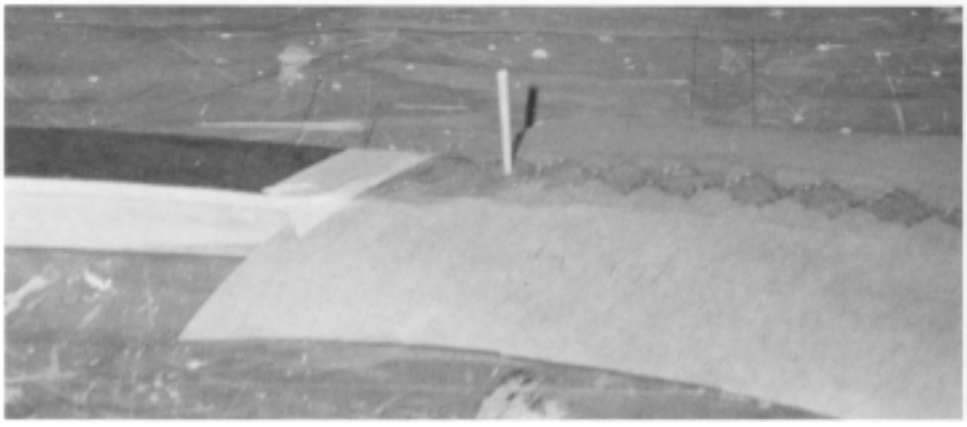


photo 1

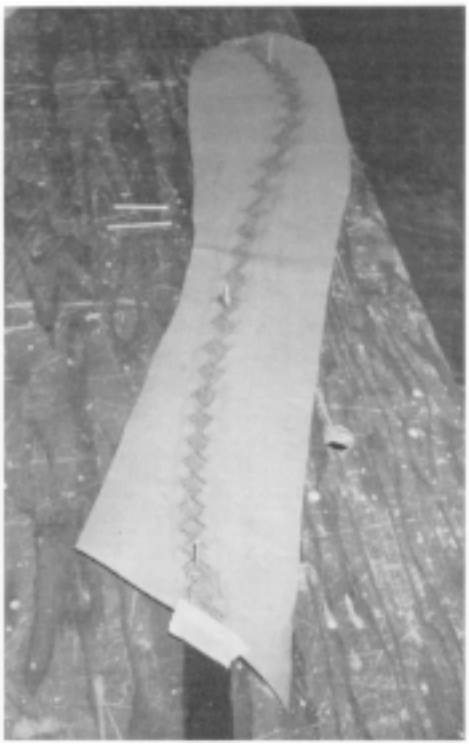


photo 2

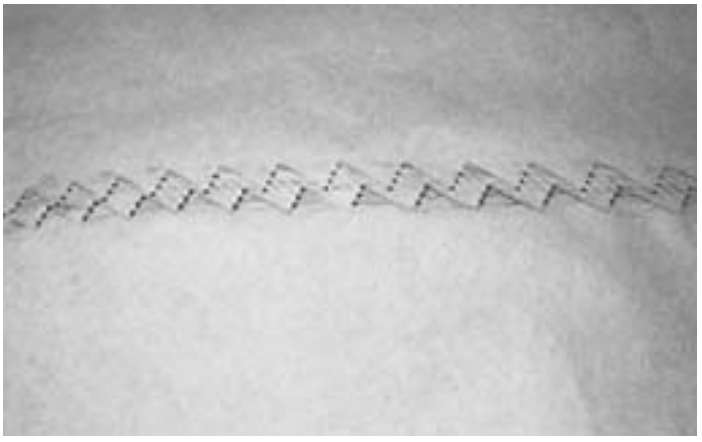


photo 3

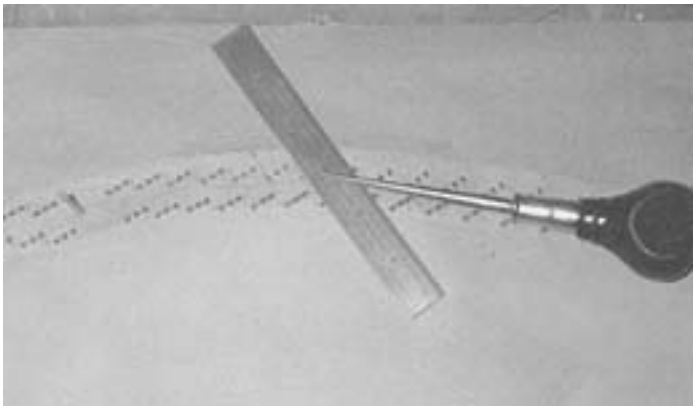


photo 4

photo 5

from the pattern only. To be more accurate scribe a line in the graphited top using as ends of the line the first and last pin hole as picked up from the pattern. That is, locate the pattern and punch the first and last hole with a small nail-set, remove the pattern and scribe a line between the dents, reposition the pattern and punch the remaining holes on the line: This scribed line isn't so easy to get on curved bridges; but if the distance from all holes to the edge of the cap is the same (or a decent average), a simple marking gauge can be made. My gauge is a wood screw inserted in a small wooden cupboard knob. It adjusts by screwing in or out. To use, first set the dimension from the sharp edge of the screw head to the base of the knob. Place the base of the knob (its underside where the screw goes in) flush up to the side of the new cap, press the screw top edge into the wood and drag it along the cap surface inscribing the line.

If the holes, however, are not of equal distance from the cap edge, put the pattern in place and instead of punching all holes, pencil them in. Remove the pattern and with the aid of french curves (found in stationery stores) or other curved edge, draw a curved line which clearly averages in most of the holes. Place the pattern back on and punch all holes so they fall on the line. The line should be clearly visible through the pattern holes.

These techniques are not cosmetic only. It is much easier and more accurate to bevel these bass bridges back to a common line than to a ragged one. There is yet another technique for lining up bass holes, but it will make more sense after reading the following heading.

There Is More In
Your Pattern Than Holes

If you made a paper pattern such as shown in the photos, exploit the information found on it to the dregs. Notice in photo 3 that more than the pin holes can be seen: also clearly evident are the sides of the notches. Seen as such, the pattern presents a written diagram. Study it and some important lessons will be learned (actually you should have studied the original bridge cap in like manner before it was removed). Let's notice a couple of things. The lines represented by the front and rear pin holes are generally parallel, or should be. Where you see something out of whack, start asking yourself questions, and make corrections to the layout. Also notice that the sides of the bridge notching indicate something of a parallel nature, and that these notch sides meet the pin hole line at about 90 degrees or a bit more. The visual effect is that of a staircase, or connected "Ls." You want to copy these outlines onto the new cap. Photo 4 shows how. Take a small straight edge and trace the bridge notching outline onto the new cap with an awl. Use enough pressure on the awl so that the lines will inscribe through the pattern paper and onto the cap.

(Note: there are some old, large Steinway and Baldwin grands which have atypical layouts through the lower capo bar area. Unlike the typical string scale which aims to cut the notch at the bridge so that the three strings of a unison are of equal length, these scales have three different length strings; that is the notch is not parallel to the capo bar. In recapping such a bridge you can either follow the original plan or, using the center hole as a reference, cut new notches parallel to the capo. Having done it both ways I cannot claim the superiority of one plan over the other).

Again referring to the photos, here is a caution. Notice the pin holes closest to the bridge edge. Running dangerously close is the cut edge of a notch for the neighboring lower unison. If the original notching was cut too close to that outside pin hole, that is there was practically no wood left for the string to sit on, *do not copy*. Leave a healthy landing for that outside string. Original notching is usually worth following, but be alert to this condition.

When the holes are punched and the lines scribed, remove the pattern and a faint image of what the bridge top

will actually look like will have begun to emerge. It, of course, appears as a drawing in two dimensions; but you should be able to imagine it carved in three-dimensional relief.

Drilling The Holes

Side-to-side pin lean varies with the makers but I have found in a good many quality pianos the angle to be 25 degrees,z give or take. In the highest bridge section, and in un-notched bass bridges, there is usually an additional angle which orients the point of the driven pin toward the center of the bridge body. The purpose of this front-to-back lean is to minimize the danger of cap splitting by anchoring the pins in plenty of wood. There is apparently no rule as to this front-to-back angle, but it appears to be roughly one-half of the side-to-side lean. In practice, however, what really matters is the avoidance of drilling one hole such that it enters a previously drilled hole of another unison. More on this momentarily.

Drilling The Bridge Pin Holes

Drill bits for the various size pins are available from the supply houses; I have not had any trouble using the listed bit for a particular pin size. As to the pin length, I generally use the one-inch long pin (has a nice point at one end), sometimes switching to a 3/4" length for the rear pins. Bits must be clean and sharp or they will burn the wood or, worse, skim off your location dent and begin drilling a hole in the wrong place. This can make you mad.

My drilling apparatus is shown at photo 5. The arrangement includes a 1750 rpm motor mounted on plywood. The motor has a 1/2" shaft to which a suitable chuck is fitted and secured with set screws. A "flexible shaft" is chucked on, the business end of which contains a slim, controllable handle along with a 1/4" capacity chuck for holding the drill bit. The plywood base is small enough to allow the set-up to be lugged around the shop for various applications; in this case it is sitting on the soundboard for use in bridge pin drilling. In use, the set-up runs quietly and smoothly, and the relatively slow rpm's allow for a little more control compared to the maniacal speed and bulkiness of the small electric drill. There are many rebuilders, though, who swear by the electric drill here. Notice the masking tape "depth stop." Don't believe it, it doesn't stop anything. At best the tape is an indicator of when to stop drilling and pull the bit back out. From time to time check the tape setting — which should allow for at least 1/8" of pin top protruding from the top of the cap — and correct with new tape when necessary.

A visual reference check of your drilling angle is a handy friend here. Set an adjustable square (also called a sliding bevel) to the correct angle and stand it up on the soundboard near the drilling site. These bevels tend to fall down on the job since their bases are narrow; to prevent, attach a clamp to the base to steady it. In lieu of a sliding bevel cut a block of wood to the angle and stand it on the soundboard. To use as a visual reference while drilling, occasionally peek at the bevel angle and always keep it in the "corner of your eye." Do enough bridges and you will hardly refer to it at all.

Remember that the lean of the front pins (as standing in the front of the piano) is toward the left, and the rear pins lean toward the right. I remember it this way: "The Leading pins Lean Left, and the Rear pins Rake Right." If you add a little melody to this you would, of course, want to keep it to yourself.

As to pin orientation, not only do we want the pins inserted at the same angle, but we want them also in the same plane, that is lined up like little soldiers, only all sleepy and leaning the same way. To insure this, imagine the three holes of the front notch all lying in a common line (which they are). Now imagine a drill bit lying over that line and covering the holes. It is obvious that if you look directly down at the bit while lifting one end of it, that is the other end of the bit is a "hinge," the holes will remain hidden until the bit angle becomes very great. That is how to imagine drill bit orientation. This might be called "right-angle" drilling because, although the pin will lean to the right or left at some angle, it is leaning in a plane which is parallel to the agraffe, and in a plane which is at a "right-angle" to the piano string. Look again at photo 4: it is all of a sudden apparent that the drill bit is *not* positioned for right-angle drilling; this is because my assistant is holding the tool for the photo, and he knows nothing of such matters, not yet anyway. Now, having said all this about right-angle drilling — forget it, at least for the rear pins, the high treble, and most bass bridges. In these areas, as mentioned earlier, you must point the drill bit somewhat toward the center of the bridge body while maintaining your side-to-side angle of lean. It sounds complicated but it isn't, really.

My practice is to use right-angle drilling everywhere possible at the front notches, fudging in the high treble, especially in high-overhang bridges. When this is done, however, the rear pins, at least in many places, cannot be right-angle-drilled since their holes will certainly intersect some of the front holes. It is here that the "fudge factor" increases significantly. The danger is that a rear hole of one unison will cross a front hole which exists two unisons away. This can be greatly minimized by using the shorter 3/4" pins in the rear holes. With these facts and pitfalls in mind, study your bridge layout until it becomes clear what course of action to take. After a while bridge drilling becomes a game of darts: You learn to aim your bit so as to avoid the hidden, evil holes which are laying horrible traps at every turn. You must outsmart the holes! (You also must, however, keep this little game, along with the little song about leaning pins, to yourself.)

When the bridge has thus been laid out and drilled, it is time to notch it. And that will be the subject of our next article. Happy New Year!

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AUXILIARY EXCHANGE

President's Message

I wonder whether I am only one of a few who suffer from what might be called "Calendarphobia?" Are there many of us out there, shivering in our collective boots, or is it only I? Am I alone with my apprehensive feelings and the notion that time flying by and I am standing still?

Many of you already know that I travel with my husband on all his tuning excursions, and it is true that time is short when one returns later in the afternoon or evening to accomplish all those chores left undone, to prepare meals, make all those necessary phone calls to keep up with one's club and organizational activities, as well as PTGA duties, but the biggest bugaboo on the horizon, for me, is always the calendar!

I create this monster of a problem for myself, I know. After all, I take all the calls for appointments and arrange them so "cleverly" that they are located within as efficient a travel pattern as possible. We do have to be saving gasoline as well as travel time, don't we? Living in the country has many charms we are told, but convenient short trips to needy pianos are not among those charms.

Often these pianos are not to be found lined up patiently waiting for the tuner. Some are miles apart. Some are separated from one another by the entire span of what in our area is called a county. Some are even across the mighty, beautiful Hudson River or some other geographic divide. Sometimes the travel pattern breaks down completely, becomes very inefficient, and tunings have to be filled in haphazardly with no regard to location and convenience.

The little pressure-imp that sits on my shoulder breathing down my neck is not to be found as a traveling companion touring the country with us. No, it abides smugly in the calendar waiting for me to get that anxious feeling as early in the month — any month — by the sixth or eighth of whatever, I begin to notice that the month is really just as well as over already and I'm booking appointments for the last week of its existence or even lightly sprinkling some of the "have-to-be-dones" into the next month. And I haven't started to prepare for the holidays yet, or those visits from out-of-town family.

Time to take a deep breath, stare down that calendar-imp and realize it is actually only the sixth or eighth of whatever month and there is still catch-up time available. It might even snow, and like all students and teachers everywhere, having been a former member of each group, I still relish a "snow day." It always seems to be made up, and it ushers in a fresh relaxed feeling, a time to "Stop the world — so I can get off." Remember to extend important messages such as "Have a most happy, prosperous, healthy New Year everyone."

I am looking forward to spending much of this new, infant-year 1991 with you, and together we'll make a grand time of it at our annual convention in Philadelphia. Remember to pay your PTGA dues. If this has slipped your mind, or if your spouse usually does this for you, check up on them. See if your dues have truly been paid and we'll all have a wonderful time together come next July!!

Arlene M. Paetow

The Auxiliary Scholarship Fund

—

A Living Memorial

"Music is harmony, harmony is perfection, perfection is our dream, and our dream is Heaven." — Amiel

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Ginger Bryant is already working out all the details for this year's scholarship presentations. Any money you give to this fund is put into action to make these annual scholarships possible. Your donation can do two important things: help young students study music and honor someone close to your heart. Send your donation with your dues or directly to our treasurer.

Would You Like To Join The Piano Technicians Guild Auxiliary?

PTGA is an active support group for the Piano Technicians Guild. For information about joining, please call or write our Membership Chairman:

Phyllis Tremper
413 Skaggs Road
Morehead, KY 40351
(606) 783-1717

Keytop Soup

(Reprinted with the author's permission from the October 1990 issue of The Piano Wire, the newsletter of the Dallas PTG Chapter.)

Keytop soup—this is what I would like to feed my husband sometimes when I've had it up to here with piano business. Now, now, don't think that customer calls on our private line during a romantic dinner are finally getting to me! It's just that sometimes this is a crazy business, and a technician's wife sorta feels like she'd get more attention if she were a high-gloss nine-foot Steinway Grand (any color will do). Or maybe she should roll her hair with tuning pins and tell her husband the pinblock is separating, so he won't think her no-curl hairdo is an accident. She could always con him into an evening out by telling him there is a once-in-a-lifetime exhibit of Liberace's gold-plated hammers at a hotel near *her* favorite restaurant. Yes, my face hurts at the end of the day from smiling on the phone, explaining over and over what a pitch raise (a pitch what?) is and politely trying to make sense of customers' terms like "high boy" (uprights) and "duck heads" (hammers).

I don't bend over musty spinets day in and day out, but I do feel very much a part of the piano technical world. I guess it is a rare privilege to sort paper punchings that fell out of the various sized jars in the work van. It's a great opportunity to be trusted with a micrometer and measure those tiny little metal things that you stick into wooden hinge pieces. And oh, I love typing appraisals, deciphering my husband's quotations and mistakenly listing grand hammers "with butts" for a certain price. I'll never live that one down! You know, I dream about invoices and sales tax deadlines, mapsco numbers and apartment directions, Guild meetings agendas and manufacturers' price lists. I'm not an "RTT," but I love the business anyway.

Cat Ello

They Swallowed A Myth

The November 1990 issue of *Music, Inc.* reports on the findings of the 22nd Annual Gallup Poll of the "Public's Attitudes Toward the Public Schools," and the news is not good for those who believe in music education. Thirteen percent of those polled thought music should get more emphasis in schools, but 39 percent of those polled thought it should get less emphasis.

In response to this and other disheartening findings of the poll, Larry Linkin, executive vice president of the National Association of Music Merchants, had this to say, "The poll simply validates what we already know — which is that the American people have swallowed a myth. Somewhere, Americans got the idea that there is no intrinsic value to teaching our children music and the other arts; that they are, at best, a kind of curricular caboose that follows in the train of math, English and social studies. Their opinion is 180 degrees at variance with what we have learned about the importance of those subjects since the time of Plato. No people who have forsaken the arts or failed to develop their aesthetic sensibilities can survive because in doing so they starve their souls; eventually their minds wither."

Birthdays

Corresponding secretary Marge Moonan provides this list of birthdays of our members. If you are a PTGA member and we don't have your birthday on our list, please let Marge know. (If you haven't joined yet, why not go ahead and join so we can list your birthday too.)

November

3	Nancy Kranendonk
5	Marge Williams
13	Barbara Welton
23	Carolyn Sander
27	Virginia Daehnert
28	Helen Wheeler
30	Jean Fornaci

December

3	Lila Shattuck
4	Catherine Ello
5	Beatrice Drago
7	Kathryn Snyder
12	Marjorie Hatzenbuhler
14	Frances McVay
21	Wendy Peck
22	Frances Trefz
23	Virginia Gibson
26	Marjorie Meyermann

January

1	Shirley Martin
3	Susan Lain
15	Charlene Sheppe
31	Florence Reigelman
31	Jeanne Scheneman

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Jan. 4-5, 1991	**Arizona State Seminar** Tempe, AZ Contact: Gary Miles; 3722 W. Port Royale Lane; Phoenix, AZ 85023 (602) 942-2588
Feb. 22-24, 1991	**California State Convention** Radisson Hotel, Sacramento, CA Contact: Patrick C. Poulson; 15474 Airport Road; Nevada City, CA 95959 (916) 265-6739
March 8-9, 1991	**South Central Regional Spring Seminar** Bentley Hotel, Alexandria, LA Contact: Elizabeth Ward; 1012 Warren Street; Alexandria, LA 71301 (318) 443-0327
March 14-17, 1991	**Pennsylvania State Convention** Allentown Hilton Hotel, Allentown, PA Contact: John J. Zeiner, Jr.; 830 Hanover Avenue; Allentown, PA 18103 (215) 437-1887
March 16, 1991	**Bluegrass Tuning Seminar (one-day)** Transylvania University, Lexington, KY Contact: Ben Griffith; 101 Crestwood Drive; Frankfort, KY 40601 (502) 875-2297
March 20-22, 1991	**Pacific Northwest Conference/Convention** Tyee Hotel, Olympia, WA Contact: David J. Stocker; 9324 Littlerock Road SW; Olympia, WA 98502 (206) 786-TUNE
April 25-28, 1991	**New England/Eastern Canada Regional Seminar** Sonesta Hotel, Portland, ME Contact: Joseph Bacica; P.O. Box 104; South Windham, ME 04083 (207) 892-0031
July 13-17, 1991	**34th Annual PTG Convention & Technical Institute** Adams Mark Hotel, Philadelphia, PA Contact: PTG; 4510 Belleview, Suite 100; Kansas City, MO 64111 (816) 753-7747

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

BUMPER STICKER. "Have You Played Your Piano Today?" Two-color with piano on quality vinyl. Send $4.00 each to: **TPT; P.O. Box 906-A; Johnston, IA 50131.**

KNABE BABY GRAND PLAYER PIANO. Mahogany — arts case — restrung. $5,000 telephone **719-593-9231 Frank Howard**

ANTIQUE PARTS SERVICE manufacturing of jacks, wippens, flanges. Send sample on blueprint. **Starr Taylor, 313 S. Howard Avenue, #7; Tampa, FL 33606. (813) 251-1650**

Wanted

WEBER PIANO WANTED: Old upright, grand, or square grand (no players). Any condition, preferably from Mid-Atlantic states. Write or call **McClure's Piano Shop, 63 E. Franklin Street, Hagerstown, MD 21740 (301) 797-6989**

WE BUY AND SELL ALL GRAND PIANOS. PREMIUM PAID FOR STEINWAYS. CASH ON THE SPOT. IMMEDIATE PICK UP. CALL HOME PIANO CENTER TOLL FREE 1-800-876-1748

WANTED: Piano rolls, artrio-angelus, angelus reproducing, and duo/art-audiographic, any quantity will help, thank you. **Kirk Russell, 37 Liberty Street; Wakefield, RI 02879 (401) 783-1966**

WANTED: Steinway grands suitable for complete rebuilding. Models M, L, O, A and B from 1880 to 1936 in ebony and woodtones with carved or spade legs. Top prices — cash. **5840 Alpha Road; Dallas, TX 75240.** Call Alan or Alex **(214) 233-2967**

UP TO $1000.00 FINDER'S FEE will be paid for successful purchase of a Mason and Hamlin Ex-Player. I have mechanism to install. **Please call collect (317) 259-4307 or evenings (317) 849-1469. Jim Brady; 4609 Cranbrook Drive; Indianapolis, IN 46250.**

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

HIGHEST FINDER'S FEE paid for successful purchase of STEINWAY or MASON & HAMLIN EX-PLAYER GRAND. Please call me collect at **(612) 824-6722** anytime. **Grant Leonard, 401 W. Lake Street; Minneapolis, MN 55408.**

WANTED: Used Sight-O-Tuner in good condition. **Ashley Johnson; 843 Woodway Lane; Rock Hill, SC 29732 (803) 327-1434**

WANTED: Fair price paid for working Sight-O-Tuner or will trade? **J. A. Meehan, Rt. 5A, Box 319; Gardiner, ME 04345 (207) 582-1540**

WANT TO BUY. Steinway duo-art player grand. Will pay finders fee. Especially want carved (fancy) case. Call Collect, **Jim Brady; (317) 259-4307; 2725 E. 56th Street; Indianapolis, IN 46220.**

WANTED: ACCU-FORK. Sanderson Accu-Fork wanted in any condition. Please contact **Evan Giller (212) 249-4398**

INDEX OF DISPLAY ADVERTISING

Accu-Tech Tool Cases 20
Baldwin Piano & Organ Co. ..... IF
Dampp-Chaser Electronics 21
Decals Unlimited/Schroeder's Classic Carriage 17
Dryburgh Piano Services 25
Fleisher Piano Cabinetry 17
Bill Garlick 12
Houston Community College 21
Inventronics, Inc. 12
A. Isaac Pianos 32
Jay-Mart Wholesale 28
Johnston Piano Key Service 28
Lunsford-Alden Co. 21
Mapes Piano String Company 7
North Bennet Street School 25
Onesti Piano Restorations 17
Pacific Piano Supply 4
Perkins School 7
Pianotek 21
Randy Potter School 3
Pro Piano 8
Reyburn Piano Service 25
Schaff Piano Supply 1
Shenandoah College 8
Shuler Co. 25
Bill Spurlock 6
Superior Instruction Tapes 35
Tuners Supply, Inc. 3
Vestal Press 8
Yamaha ..... BC
Young Chang America 5

Music Makes The Difference

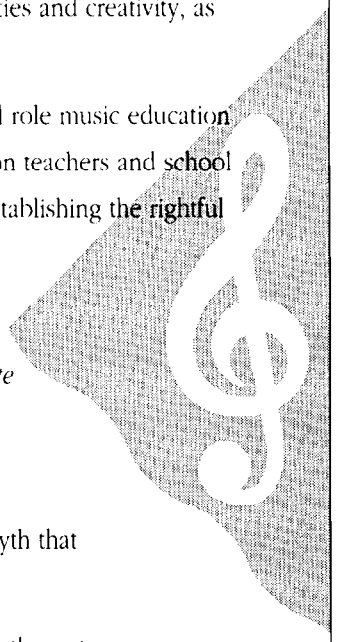
A DECLARATION OF CONCERN ABOUT MUSIC EDUCATION

*D*uring the 1980s, educational reform made it onto the front pages of American newspapers for the first time in decades. Politicians, policy makers, and business figures have been quick to trace much of the nation's *"competitiveness gap"* to the schoolhouse door. They have voiced ringing alarms over the slippage in math and science scores. But when the discussion has turned to making sure our children learn to understand and participate in music and the other arts, there has been silence. We believe such near-sighted concern short-changes our children because it leaves them only half-educated. Since the beginnings of civilization, music has been universally recognized as crucial to quality education, for two reasons.

First, every civilization recognizes that both formal and informal music education prepares children for what life ultimately requires. Music education fosters creativity, teaches effective communication, provides basic tools for a critical assessment of the world around us, and encourages the abiding values of self-discipline and commitment.

Second, music and the other arts have been recognized as unique to human capabilities and creativity, as a means to self-discovery and self-expression, and as a fundamental part of civilization itself.

We, whose lives are marked indelibly by a love for music, and, who understand the essential role music education can play in developing the whole human being, call on the parents of our school children, on teachers and school officials, on local and state boards of education, and on the American people to join us in establishing the rightful place of music in the schools.



OUR CREDO IS SIMPLE

Just as there can be no music without learning, no education is complete without music. Music makes the difference.

TO THAT END

*W*e call on all who care about education to destroy, once and for all, the myth that education in music and the other arts is mere "curricular icing";

*W*e call on all who cherish the arts to insist that instruction in music and the other arts be reestablished as basic to education, not only by virtue of their intrinsic worth, but also because they are fundamental to what it means to be an educated person;

*W*e call on parents, educators, and citizens who know and understand the value of music in our common life to bring the message about the value of music education to decision makers at all levels and to encourage them to establish music as a priority, so our children can continue to learn and make music and;

*W*e call on those whose livelihoods depend on music–as manufacturers, technicians, retailers, educators and performers, composers and others–to lend their support to the cause of music education in our schools.

❧

In witness to our commitment to these goals, we have signed our names to the accompanying petition.

The National Commission on Music Education, 1902 Association Drive, Reston, Virginia 22091-1597 1990-1991

P E T I T I O N S H E E T

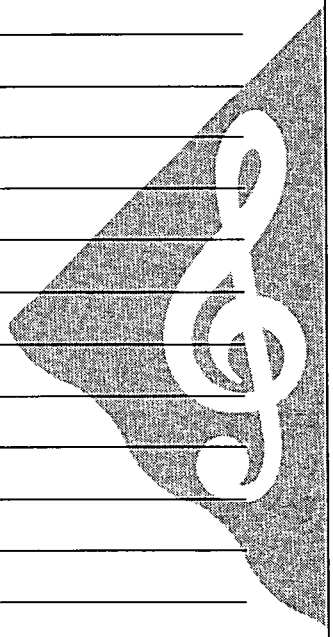
Music Makes The Difference

THE NATIONAL COMMISSION ON MUSIC EDUCATION

Just as there can be no music without learning, no education is complete without music. Music makes the difference.

YES! I want to make music education a driving force in America's schools. If our children are to succeed in the workforce and world of the future, they must be provided with a well-rounded educational curriculum incorporating music and the other arts.

NAME ADDRESS



IMPORTANT: We can accept signatures from adults of legal voting age only. Please be sure to sign your name to verify the authenticity of the signatures.

This petition sheet voucher authenticity verified by NAME:

ADDRESS:

CITY: STATE: ZIP: DATE:

Please return to: The National Commission on Music Education
1902 Association Drive
Reston, Virginia 22091-1597

Tech Gazette

Yamaha Piano Service January, 1991

Grand Action Regulation in 37 Steps... One at a Time

STEP 2: FITTING OF THE FRONT RAIL

The front rail maintains proper key position and, through the use of front rail punchings, stops the downward movement of the key when it has traveled the proper distance. Since this rail must be able to move from side to side when the shift pedal is used, yet remain in solid contact with the keybed, careful fitting of the rail to the keybed is mandatory. This provides a solid foundation for the action, and contributes to the "touch" pianists find desirable.

The entire action rests on three rails in the front, center and back of the key frame. Correct fitting insures that the front rail and top of the key frame touch along their full contact area. Only a very small area of the front rail contacts the keybed, so correcting the fit requires removing only a small amount of wood.

FIRST, PREPARE THE ACTION

Correcting the fit is simple. You use garnet paper with its cutting surface upward to remove wood from the bottom of the rail until the entire rail settles in full contact with the keybed. Never remove wood from the top of the keybed to achieve the right fit.

First, however, you must remove the keys from the action. Find the screws in the feet of the action brackets. Most are positioned at 90 degrees to the wood surface; others, usually on the front feet of the inside brackets, are angled differently to better hold the action brackets and enable them to withstand the upward thrust of the capstans.

Loosen the angled screws first, then the others. Remove the hammer action. Remove the keys. Then replace the hammer action, tightening the angled screws last to avoid moving the bracket out of position.

Next, raise all bedding screws until they no longer touch the keybed. Usually a 3/4 turn counterclockwise is sufficient to allow a narrow strip of paper to pass under the bedding screw without friction, your guide to judging how far to raise the screws.

On some pianos, a few bedding screws can be reached only from the action's underside. Use needlenose pliers to make the adjustment on these types of pianos.

CORRECTING THE FIT

At this point the key frame should be resting on only a small area of the front and back rails, like a bridge spanning a river. The bedding screws of the center rail should not be touching the keybed.

Place the key frame and action into the piano. Install and tighten the key blocks in position. Check to insure that slight downward pressure exists on the key frame pin. If not, adjust by turning the screw in the key frame guide assembly or, on some pianos, by raising or lowering the entire key block.

Tap downward on the top of the front rail, listening to the character of the sound produced. A solid sound will be heard where the rail is in firm contact with the keybed; a somewhat hollow "tap" will be heard where it is not. Use chalk to mark on the front rail each end of where the "tap" is heard.

Place the garnet paper with the grit upward under the key frame in the areas that created a solid sound. Pull the paper out, removing a small amount of wood from the underside of the key frame front rail. Sand in stages, removing only the necessary amount of wood, until the front rail is in solid contact with the keybed along its full length.

A FEW LAST TIPS

Necessary tools include a tuning hammer or other tool capable of turning the bedding screws, needlenose pliers, fine-grit (100 to 150) garnet paper and chalk. You can create your own handheld tapping tool by felting the end of a dowel, or by gluing two hammers together.

Finally, if the piano is older, it makes sense to check the keybed itself for flatness in the contact areas and correct any imperfections there.

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