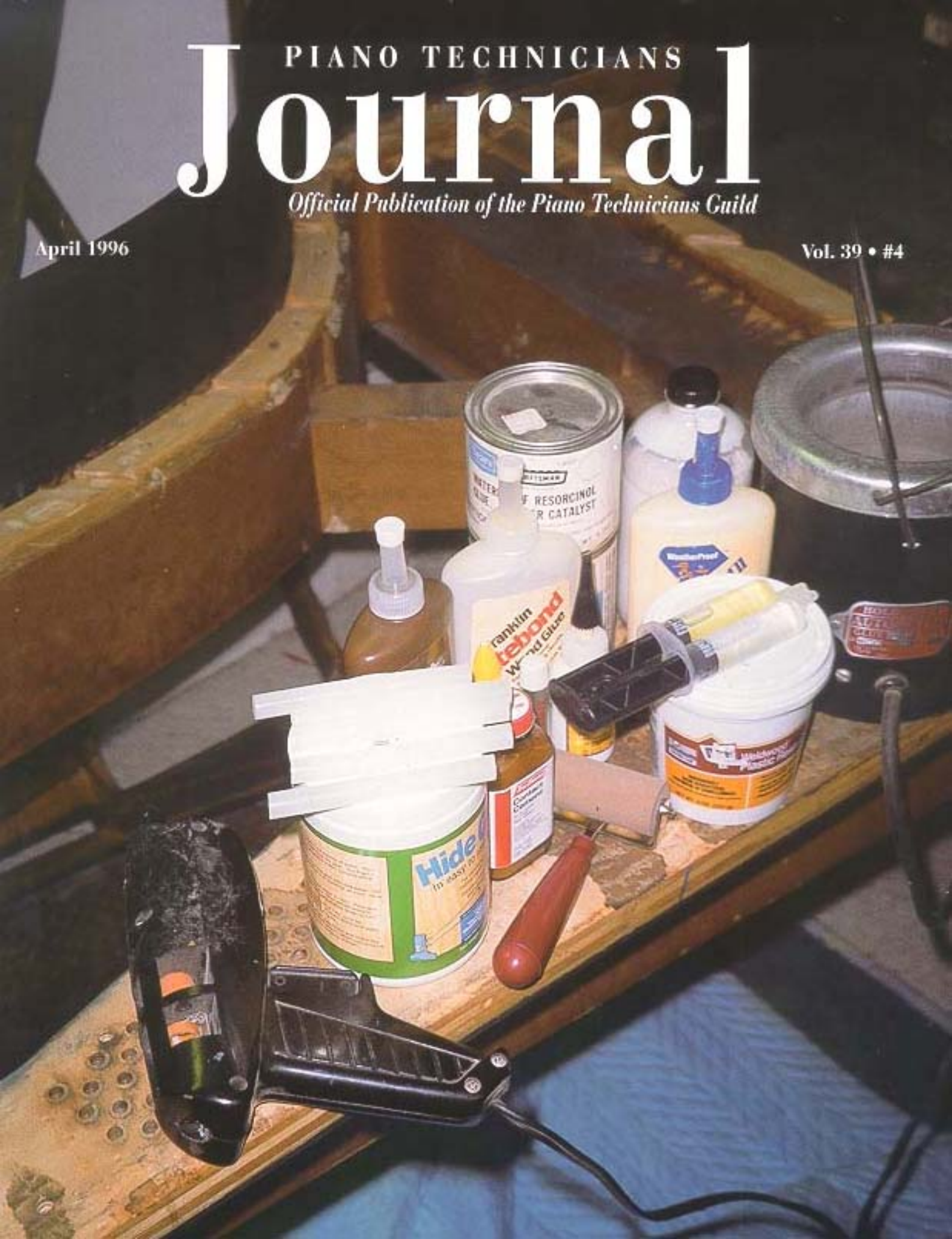
PIANO TECHNICIANS
Journal
Official Publication of the Piano Technicians Guild
April 1996
Vol. 39 • #4
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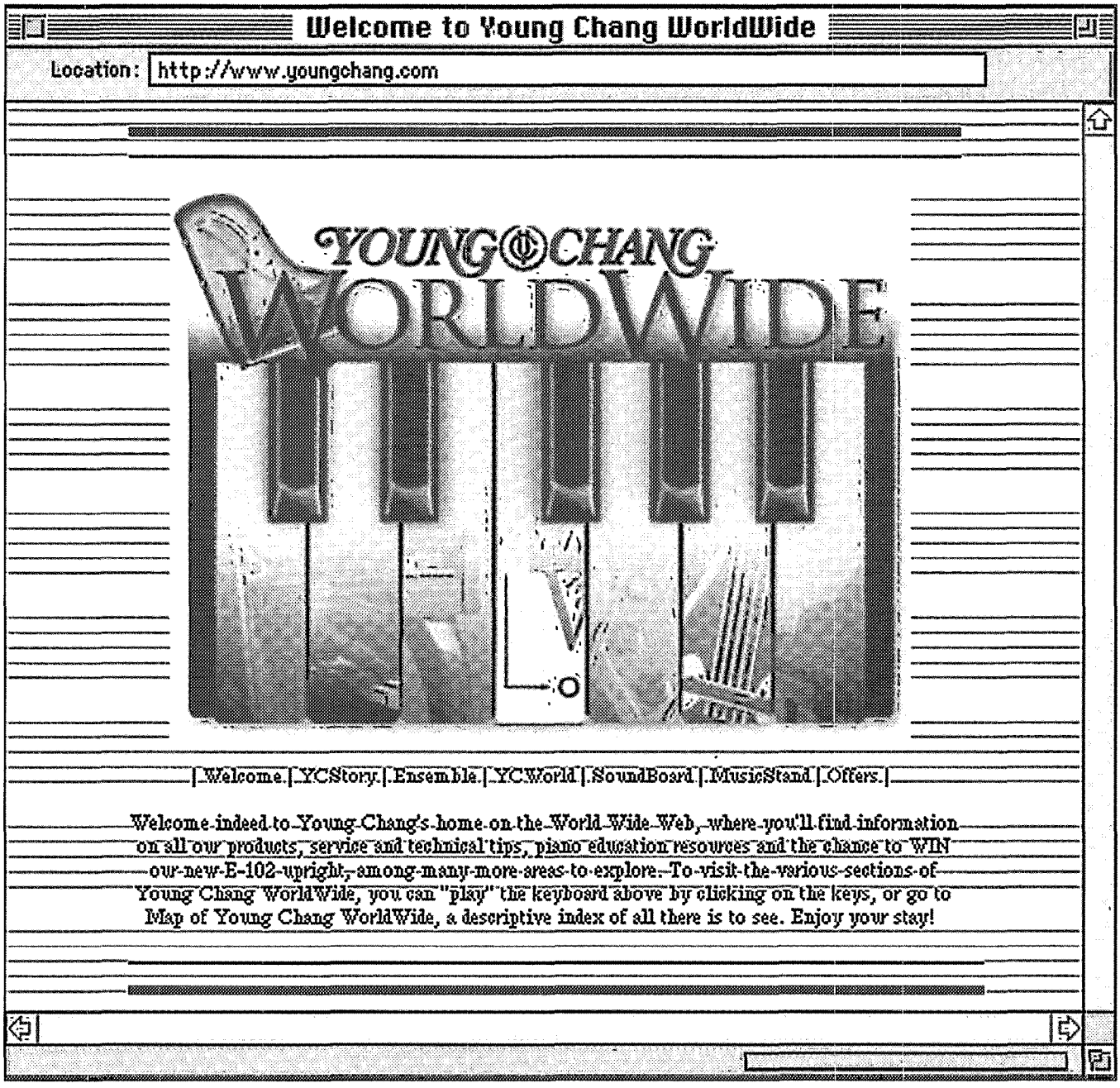

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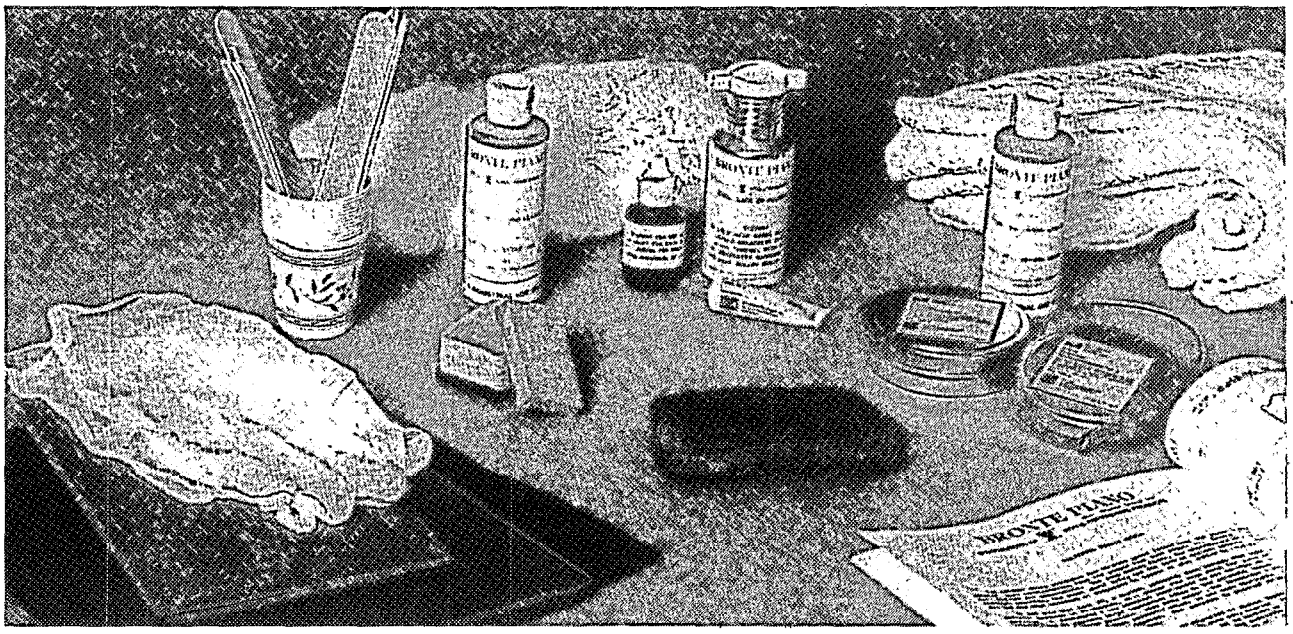

The König Company of West Germany is the European leader in the development and manufacture of "State of the Art" refinishing and touch-up materials. Over 40 years ago, German piano makers started using polyester finishes — just in the past few years, German chemists have found a fool-proof way to fix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

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Editorial Perspective

That Spinet Controversy

Ken Serviss, RPT, of the Portland Chapter, recently brought this editorial on spinets to my attention. It appeared originally in the July, 1947 issue of The Piano Technician, *and I thought it appropriate to reprint it in this issue of the* Journal, *which includes coverage of the 1996 NAMM show. We present the "guest editorial" here in its entirety; unfortunately no author was named.*

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

■ ■ ■

The views presented in the editorial department of this publication are solely those of the writer. They may or may not agree with the opinions of American Society national officers, but are offered for the purpose of directing reader attention to matters which are deemed worthy of thought. Reader criticism is invited.

It has been said that there are two sides to every question — your side, my side and the right side. The proponents and the opponents of the small upright pianos have been waging a heated controversy for some time without, apparently, settling anything, so it may be well to re-examine the evidence to see if the right side has been properly represented.

The opponents declare that the small upright is hard to service, that it lacks a robust musical tone and that a good clear tuning is impossible to achieve. The opposing group consists of technicians and teachers.

The proponents, salesmen and piano dealers, state that the small upright is the backbone of their business, and they further point out that the wide public acceptance of the attractively styled little instruments has created hundreds of new students and has placed pianos in homes that otherwise would be without one.

The validity of the arguments on both sides is well established. Continuing to advance them month after month results only in an impasse which does no good and may do considerable harm. If each side will concede the correctness of the other's viewpoint, then an unbiased appraisal of the spinet's place in the piano world should be possible.

Why does the spinet exist? Did some piano man dream it up and then foist it on an unwilling public? We know that isn't true. We know that the piano industry went into a decline in the 1920s, even before the great economic collapse hit the nation. From a peak production of some 350,000 pianos per year, shipments fell off until an all time low of 65,000 was reached in the early 30s.

It isn't necessary to review the all too painful situation. Factory after factory closed its doors forever. Piano merchants went out of business or else switched to other lines of merchandise, and trained workmen by the thousands were left to adapt themselves as best they could where other work could be found.

Pianos were out of favor; the market had reached the vanishing point. In the desperation of a drowning man grasping at straws, an attempt was made to redesign the piano so that it would once more catch the public fancy. From this attempt the spinet — more properly called the console — type gradually evolved. The new style

had the important stamp of approval by interior decorators. It got a lot of favorable publicity and sales began to mount. Now manufacturers expect to produce about 200,000 units in the next 12 months and fully 75 percent of them will be small uprights.

We have never heard a manufacturer say that he would rather build spinets than any other type. We have never heard a dealer say that he would rather sell spinets than grands. It is simply a case of give the public what it demands or sit idle and watch the dollars go elsewhere.

Some tuners have been loud in their denunciation of the spinet. They seem to feel that if they oppose it vigorously enough they can remove it from the market. They can't, of course. No small group can change a national trend. Horse shoers tried it when the automobile first came out. But if the tuners could remove it from the market they would at the same time remove themselves, for anyone who believes that the public would buy large uprights if spinets were not available is suffering from a delusion. Nor could all prospective piano owners afford grands even if they had room to house them.

We are not here defending the spinet as a musical instrument. Whether some are good and others bad is entirely beside the point. We readily agree that some manufacturers went to extremes in an effort to cash in on buying whims, and we have always believed that if the height of the little pianos had been reduced to no less than 42 or 44 inches, the instruments would have been just as acceptable to the public and to the service men also.

The question we have to consider now is would the opponents be better or worse off if the spinet had never been invented? There is no law which compels the tuner to service a spinet if he doesn't want to. He can take them or leave them alone. If he leaves them alone he will be in the same position he would be in if no spinets had been manufactured. Likewise there is no law which compels him to take them and like them. If they are difficult to service he can charge more for his work.

In the long run a higher service charge will do more to incline buyers toward a somewhat larger upright than all the sputtering and grumbling a tuner can do. Upkeep is an important consideration in the purchase of any mechanical contrivance.

The tuner is entirely within his province if, when a friend or customer asks his advice, he points out the advantage of a direct blow action as against some of the questionable contraptions that have been offered. And it is his privilege — perhaps his duty — to explain the superior tone quality which becomes possible with a few inches added to the height. But to go about offering advice that hasn't been asked for, or to condemn a piano after the purchase has been made is decidedly wrong. It is a blow to the best interests of all concerned.

It is difficult to tune or action regulate some of the spinets correctly. At times impossible. And it is only fair for the tuner to protect himself by explaining to the customer that she cannot expect the same results she would get from a larger instrument if she expresses dissatisfaction with his work. He can do this without being nasty and without arousing the hostility of those who built and sold the piano. They would prefer to build and sell better pianos just as much as the tuner would prefer to tune better ones. They will do so just as soon as the public shows a willingness to buy better ones. But they aren't going around butting their brains out against a wall of buyer's resistance.

Let's all do the best we can with the pianos placed before us, and at the same time use a benign influence toward improvement. But first let's make sure that we are doing our best.

FEATURES

PACE
Professionals Advance through Continuing Education
LESSON PLAN

COVER ART

Many of the adhesives used in wood working are useful in piano work as well. See Chris Minick's article beginning on Page 17.

COLUMNS & COMMENTS

DEPARTMENTS

IN ADDITION

PIANO TECHNICIANS
Journal
Volume 39 • Number 4 • April 1996

Education Key to PTG

PTG President
Leon Speir, RPT

During the past few years there has been an expanded focus by PTG to improve the educational offerings provided to members. Marketing products were developed to enhance our ability to market ourselves and to explain the need for proper piano care. The *Journal* has been enhanced with a new format, a better technical content and the introduction of the PACE series of articles. The Annual Technical Institute has expanded the variety of classes offered and increased the emphasis on hands-on classes. The Tuning and Technical Exam study guides were developed to provide information on the exams and to encourage more Associates to participate in the exam process. For the first time ever a comprehensive curriculum was developed. The *Vertical Regulation* curriculum was produced as an advanced course to be used in a classroom setting. Currently, work is underway to add a *Field Repair* curriculum to the courses offered.

Education is the primary purpose of PTG. In the 1994 Council Report by chairman **Mike Drost** of the Special Panel on Education, it states: *"There is widespread agreement that education must be a priority if PTG is to flourish as a contributing organization to our profession...."* The new mission statement proposed by the Board in the Strategic Planning meetings states: *"Through continuing education and open communication, we will provide our members opportunities for professional development to render quality service and to promote the use of pianos."* At the 1994 Council in Kansas City the delegates identified the *Journal* as the most important member benefit. Clearly, PTG exists because of the educational opportunities that it offers.

Defining the role of education is important to the future success of the PTG. It is time to earnestly consider the value of hiring someone to coordinate all the educational offerings. The following is stated in the 1994 report by the Special Panel on Education: *"The Panel is in complete agreement that the concept of having a Director of (Continuing) Education is most worthy. Our consensus is that there is genuine need and it is plausible...."* Bringing this kind of coordination and focus to education within the PTG will enhance the quantity and quality of all the educational offerings to all members.

Last month each member received the Vision 2001 Strategic Planning document, which was developed by the Board to be presented to the Council delegates for action. As you study the planning documents and prepare your chapter delegate for the upcoming Council, consider the major role education plays within PTG. The *Journal*, the marketing program, the Annual Technical Institute, area seminars, and curriculum projects are just some examples of PTG's role in providing education opportunities. Is it time to employ a **Director of Education** to coordinate the work of providing education for members? Serious consideration should be given during the Strategic Planning process to this recommendation by the Special Panel on Education.

Leon Speir

More on Why Pianos Go Out of Tune The Way They Do

I was very impressed by Del Fandrich's exposition of the factors at work in the soundboard assembly and how they might relate to tuning instability in response to humidity change. I am sure all of those factors are involved, but I think there is a simpler answer to the question, "Why do those strings at the bottom of the treble bridge go out of tune the most?"

My approach to that question, which puzzled me for years, was different from Del's. I figured the bridge was so much more massive and stiff than the soundboard, being constructed of maple or beech, that in all likelihood it would rise or fall as a whole when the soundboard absorbed or desorbed water. Certainly there would be some twisting and distortion (as described at length in Del's article), but I couldn't imagine a scenario that would make the bottom end of the treble bridge push out against the strings more than the bass bridge or the remainder of the treble bridge. I decided the answer must lie elsewhere.

Different models of piano vary somewhat in response to humidity, but my experience has shown that all pianos share a couple of characteristics: the strings at the top of the bass bridge change very little, perhaps the least of all piano strings; the plain wire strings at the bottom of the treble bridge change the most; and where there are wound strings on the bottom of the treble bridge, they change much less than the plain wire strings just above them. What are the major differences between plain strings and wound strings of approximately the same lengths and pitches? The wound strings have thinner cores, and are generally at higher tensions. Thus, the wound strings are considerably closer to their breaking points than the plain wire strings. I theorized that this might be a major factor at work in determining which strings will go out of tune more in response to humidity. I theorized that strings whose tension is closest to breaking point will go out of tune the least.

This hypothesis was reinforced by my experience when pulling newly strung pianos to pitch. It takes a lot more turning of the tuning pin to move the highest wound strings up that last half step to standard pitch than it does to move the lowest plain strings the same distance. It is also in keeping with the scientific formula for pitch and string tension. Other factors remaining constant, a change in tension of a certain value will produce a pitch change which will vary as the square root of that value. In other words, to double the pitch requires quadrupling the tension, tripling the pitch requires a nine-fold increase in tension, and so forth. The higher the tension, the more of an increase in tension is needed to produce the same pitch change.

How does this apply to humidity change? Let's assume for the sake of argument that the treble and bass bridges rise about the same amount along their entire lengths. Let's also assume that the rise of the bridge will produce a fairly similar increase in tension for each string crossing the bridge. We would expect to find that strings closest to their breaking points would change pitch the least, and those at lower tensions relative to their breaking points would change the least. This is a lot of assuming, and is based on mostly anecdotal evidence. I had thought of writing in response to Mr. Fandrich's earlier article (February 1995), but thought I would gather some hard data to back up my hypothesis first. I'm afraid I haven't got around to setting up a plan for gathering data yet (a good intention that I'm sure I'll get around to some time), but I thought that this would be as good a time as any to throw the idea out for public scrutiny. Whether it holds up to experiment or not, it does have one thing to recommend it. Scientists call it "elegance," meaning a simpler explanation for a complex set of data.

—Fred Sturm, RPT

Test Blows and Tuners' Health

I was very pleased to see the strong emphasis on health in the January *Journal*. Much was said that should be very helpful, but I think there is still more that could be said.

For more than 30 years I have serviced the two Steinways of Katherine Glaser, one of the fine teachers in the Chicago area. Her specialty is working with students who have developed physical problems by playing with incorrect technique, and teaching them to play pain free with correct technique. I have sent several students with physical problems to her and she has helped each one to play pain free. She has many remarkable stories of students who have not only been helped in their piano playing, but who have been able to use the techniques successfully in other areas such as operating computers. Evidently repetitive operations are not nearly the problem if a correct technique is used.

For the last three years I have been studying with Mrs. Glaser, not only to improve my piano playing, but to apply what I was learning to piano tuning. The results have been most gratifying, not only in playing, but significant help in tuning touch, hammer technique and voicing. With correct technique it is possible to produce twice the tone volume with half the effort and no discomfort.

The principles are simple, but take time to master. They involve using the larger muscles and the whole body with no stress or tension in the joints involved. Impacting of the joints is avoided by aiming for the point where the hammer strikes the string rather than the key bottom. Even on a hard blow the downward force can be stopped at hammer contact eliminating any hard contact with the key and resulting key slapping noise. A natural, free movement of the shoulder, elbow and wrist will avoid any joint impact. Any tension involved in the joints blocks energy from the body to the key just like a tight flange in the piano action.

Much is being made of the test blow. It is really not a part of the tuning process, merely a check on how well the note has been tuned. More important is the stroke when the note is actually being tuned. Not only must the pin be set correctly, but the note must be struck strong enough to equalize the tension in all the string segments, but still be free from distortion so that the beat movement can be clearly heard. If this is done forcefully with the whole arm

aiming for the point of hammer contact with no tension in the joints, this can be accomplished and probably eliminating the necessity for a test blow.

— *Virgil E. Smith, RPT*

More on Hearing

Thank you for the copies of your most impressive *Journal.* I read with great interest your article on Tuning and Hearing Protection and have, if I may, a few comments to make. Dale Probst commented that he used the white foam ear plugs which he tossed out when they got dirty. If he had put those plugs in a shirt pocket (pinned closed) then, as it was going through the washer, the plugs would have come out clean. After three or four washes, the plugs tend to lose their sound attenuating value, but washing does allow you to extend the life of the plug.

Ear plugs have the disadvantage of becoming unseated as one chews or speaks. Thus, one should reseat the plugs on a regular basis to insure maximum protection. Your people need to know that.

John McKone indicates that he uses Musician's Ear Plugs, and I think there is no doubt but that they are the best and well worth the cost. Your people should know that cotton is almost useless as an ear plug. Yes, I know it feels like the ear is blocked, but the difference between a cutaneous feeling and actual sound attenuation is two different things. The thing that impresses me is that one can actually tune a piano better with ear plugs than without ear plugs. I especially like John Baird's comparison between the pilot with sun glasses and the tuner with ear plugs.

John McKone also mentioned his tinnitus and that is something your tuners should be on the alert about. If, after any noise exposure, they notice tinnitus, even faint tinnitus, even temporary tinnitus, that is a signal that the exposure was too loud for their ears and that to continue to be subjected to that exposure will eventually produce not only hearing loss but permanent tinnitus as well.

Conrad Hoffsommer provided very interesting sound level measures. Imagine a trumpet producing 121 dBA by 4 feet!

One final comment. People vary enormously as to their susceptibility to hearing damage produced by loud sounds. Thus, just because one individual is able to tolerate certain loud sounds does not mean that everyone should also be able to tolerate those same sounds. I am reminded of the age old advice given to youngsters who wanted to become blacksmiths. If after the first day as an apprentice their ears were ringing, the blacksmith would say, "Kid you have tin ears, better get out of this business."

Thank you for including our article in your *Journal* and for the good work you are doing with your articles. Anything that makes the public more aware of the dangers of excessive sound levels will help so that eventually perhaps even concerts will be presented at reasonable sound levels. Movies have gotten so loud that I refuse to go to them; perhaps even they will come down to something reasonable.

In closing, may I once again say how favorably impressed I am with your *Journal*—it is first class.

—Jack Vernon, Ph.D.
Professor of Otolaryngology
Director, Oregon Hearing Research Center
Oregon Health Sciences University

T T & T Antibacterial Hand Cleaners

I'm sure many of you, like me, like to clean your hands between jobs, and a real lavatory is sometimes not convenient. For a time, I was unable to find a source for my favorite solution, "WASH'n DRI®", a one-shot, disposable moist towelette. I had experimented with variations such as baby wipes, but found them unsatisfactory. Recently I've found the originals, again. However, unlike before, they now promote an antibacterial formula on the package.

Available in boxes of 20, the rap goes: *"Antibacterial WASH'n DRI towelettes are the convenient way to clean up when soap and water are not available. Each towelette contains mild cleaning ingredients and moisturizers, leaving your skin feeling fresh, soft and protected against drying. Plus, its Antibacterial Formula (caps theirs) helps to kill bacteria.*

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And now we know!

— Jim Harvey, RPT

T T & T Making the FAC Tuning

The making of the FAC tuning on the Sanderson Accutuner with a high degree of accuracy is important if you wish a fine tuning. After speaking to many technicians, it's come to my attention that the instructions are either inadequate or misunderstood.

If a technician were to measure the FAC numbers, he/she would pull each note up as instructed, measure, then input them. After that, not wanting to pitch-raise the piano, he/she will lower the pitch back down and proceed to tune the piano. This is, of course, ridiculous, considering the fact that the stretch numbers change with pitch. Also, after pitch is changed the measuring becomes inaccurate due to the falling of the pitch when the string was tightened.

I hesitate to make this final suggestion which might confuse some, but here it is: when measuring the two partials of each of the three notes, it's better to lock onto the higher one first. Move the machine around until you have a clear pattern, then after resetting to zero, go down one octave and stop the lights. Write the number down, disregarding the minus sign.

Here is my 32-step (next column) procedure for obtaining the stretch numbers and making the FAC tuning.

— Steve Fairchild, RPT

Steve Fairchild Method Of Making An F.A.C. Tuning

Turn Machine On By Pressing "On" Then "Tune"

Getting The Stretch Number For F3

1: Set machine to F5 by pressing "NOTE" up
2: Play F3 and stop lights by pressing "CENTS" up or down
3: Hold "SHIFT" button down and press "RST" *Cents window should read 0.0.*
4: Set machine to F6 by pressing "OCTAVE" up.
5: Play F3 and stop lights by pressing "CENTS" up or down
6: Write the number in the cents window down on paper. *This is the stretch number for F3 to be entered later.*

Getting The Stretch Number For A4

7: Set machine to A5 by pressing "NOTE" down
8: Play A4 and stop lights by pressing "CENTS" up or down
9: Hold "SHIFT" button down and press "RST" *Cents window should read 0.0.*
10: Set machine to A6 by pressing "OCTAVE" up
11: Play A4 and stop lights by pressing "CENTS" up or down
12: Write the number in the cents window down on paper. *This is the stretch number for A4 to be entered later.*

Getting The Stretch Number For C6

13: Set machine to C6 by pressing "NOTE" down
14: Play C6 and stop lights by pressing "CENTS" up or down
15: Hold "SHIFT" button down and press "RST" *Cents window should read 0.0.*
16: Set machine to C7 by pressing "OCTAVE" up
17: Play C6 and stop lights by pressing "CENTS" up or down
18: Write the number in the cents window down on paper. *This is the stretch number for C6 to be entered later.*

Turn Machine Off

Entering The 3 Stretch Numbers

19: Turn machine on by pressing "ON" then "TUNE"
20: Set machine to F6 by pressing "NOTE" up
21: Enter stretch number for F3 by pressing "CENTS" up
22: Hold "SHIFT" button down and press "STO" *Machine advances to A5.*
23: Set machine to A6 by pressing "OCTAVE" up
24: Enter stretch number for A4 by pressing "CENTS" up
25: Hold "SHIFT" button down and press "STO" *Machine advances to C6.*
26: Set machine to C7 by pressing "OCTAVE" up
27: Enter stretch number for C6 by pressing "CENTS" up
28: Hold "SHIFT" button down and press "STO" *Machine advances to F5.*

Putting The Tuning On A Page

29: Hold "SHIFT" button down and press "PAGE" Look in the cents window and select any blank page in memory. *Machine advances to A0.*
30: Hold "STRETCH" button down. Hold "MEM" button down. Release "STRETCH" button. Release "MEM" button *Machine advances to F3.*
31: Wait 10 seconds for machine to make the tuning. When done machine advances to A0
32: Press "NOTE" up to A#0. Press "NOTE" down to A0
33: Tune all 88 notes. *If you change the pitch more than 10 cents, repeat steps 1 - 32 and retune the entire piano.*

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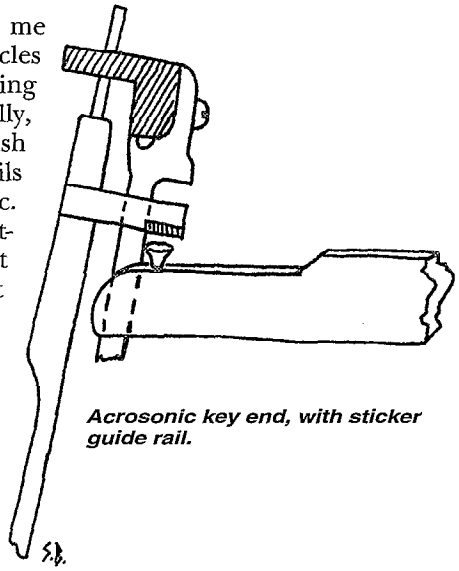
Q — Rebushing Sticker Guide Rails

Could anyone guide me to some good *PTJ* articles dealing with rebushing guide rails; specifically, I'm needing to rebush the sticker guide rails on an Acrosonic. Looks pretty straightforward, but I thought I'd ask before I get started. Are these bushings generally glued or not? What do you use for sizing? How tight/loose should these be? Any help would be greatly appreciated.



Acrosonic key end, with sticker guide rail.

— Bob Simmons, RPT

A — From Paul Dempsey

You are right, rebushing the sticker rail in your Acrosonic is a straightforward job, exactly like rebushing the damper guide rail in a grand. The toughest part is ripping the felt strips to just the right width. You should have both edges ripped (read fuzzy) as the torn edges will tend to weave together. You should also try to match the thickness of the original felt.

Take your long strip (with a point cut in one end) and insert from the bottom of the rail. Drag it through and just before the strip goes out the other side put a small drop of glue and drag it in the hole. (Hide glue is good, white or yellow, too.) Trim flush on top with a razor blade.

I use a round toothpick to press the new cloth lightly in place until the glue sets. A small nail or anything the same diameter as the sticker pins will do.

Sizing ... After you reinstall the stickers back in the rail (this is the really tough part, hitting 88 holes with 88 moving stickers), I put a small drop of Protek on each bushing. Works great.

The fit need not be snug.

A — From Horace Greeley, RPT

I'd like to add a suggestion regarding a tool that Susan Graham used to use for this kind of work — a specially turned piece of threaded rod of the right diameter for a 25-watts soldering iron. I have several diameters for different jobs, have used them for years, and feel that they have saved me countless hours of working with less efficient and effective means of sizing bushings.

A — From Rob Edwardsen, RPT

I have taken the threaded rod, drilled an appropiate-size hole in the end, and glued in a bridge pin for sizing bushings. This is a little easier then turning down the rod on a drill press.

I think I used a number 6 bridge pin for damper guide rails but it's been a few years since I made them up. I also use a voltage regulator with the soldering iron so that the felt doesn't get scorched.

A — From Horace Greeley, RPT

You're absolutely right. I forgot to mention the regulator, it makes a big difference!

Q — Poor Damping in an Old Upright

We have restored a beautiful ebony Steinway "V" 49" upright, circa 1900, and have one "lingering" problem — the dampers. We have added extra over-dampers, we have plenty of tension against the strings, the tension follows the strings if the strings are pushed away, we are properly lifting as the hammer comes forward, there is no one string causing this lingering, such as a misplaced damper pad hitting two of the three strings, yet we have a chorus of sound which lingers on too long. I have placed my hand on various parts of the piano

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trying to dampen the sound manually and cannot even locate the source of the problem. It is a phantom!

I'd like to ignore it and say that's just the way it is, but I am compelled to solve this one. In reading Del Fandrich's article in the December, 1995 *Journal*, he compares the weight in the upright damper system to the weight in the grand and marvels that the upright system dampens at all. He seems to fault the mass of the damper itself in not being able to dampen the strings.

I am wondering if anyone, first of all, has had this problem and solved it, and second, if anyone has experimented with adding weight to the upright damper system. I had even thought of clamping split shot (fisherman's stuff) onto the damper wires to add weight. Any input would be appreciated.

— David Sanderson

A — From Les Smith

Hi, Dave. You may very well find that the lingering sound is coming from the undampened high treble strings, which are vibrating sympathetically when the lower, dampened strings are played and continue ringing, even after you release the lower key and ***its*** strings are dampened. So, try your test again, only this time as the sound lingers, try placing your hands on the high treble strings and see if this corrects the problem. Actually it's ***not*** really a problem, it just indicates that the soundboard and bridges are doing their job (perhaps too well!) and reflects favorably both on the original design of those old Steinway uprights and also on the fine job you did in restoring it! The problem you describe is frequently found in older, high-quality uprights such as Steinway, Knabe, Bluthner, etc. Since there are no dampers in the high treble section, you very well might have to live with the lingering sound.

A — From John Hartman, RPT

The kind of damping problem you are experiencing may not be related to the dampers themselves. There are a number of piano designs, large uprights and squares, that seem to promote poor damping due to the soundboard, not the strings. In these the sound will continue even if all the strings are muted. I am not sure exactly how this happens, but speculate that an area of soundboard is either too far from the bridges or insufficiently stiff either by being too thin or lacking downbearing. In your case maybe the board is flat and the bearing does not compress the far corners enough.

A — From David Porritt, RPT

One more thing you might check is the "non-speaking" segments of strings. I have had some of those really ring. I am a big believer in string braid, even where the manufacturer didn't use it. I had a Steinway & Sons D that had a loud ring on B. I checked every B, E, G, etc. ... I finally found a section of wire in the low tenor that was part of the rear duplex, and it was singing like gangbusters. A little string braid cut it out completely. On some upright scales these waste sections of string are very long. Worth a try.

A — From Paul Dempsey

Right! And also, the placement of the braid in the waste section is important. Too close to the bridge or too close to the hitch pins and the string will still sing, sometimes.

A — From Jim Harvey, RPT

John Hartman, a light came on when I read your response. Before I dwell on this too much, I want to run a thought by you. Based on your reply, it would seem that a wave trap would also be effective in this situation. However, many pianos that experience this "leakage" or "overring" already have one or more wave traps in place. At least one make of piano experiences this phenomenon with a chunk of the soundboard removed.

This is not to challenge your statement, rather to extend the thought. So, any extended thoughts?

A — From John Hartman, RPT

I am not very well acquainted with upright pianos, so I am assuming you are referring to some sort of dumb bar where the corner of the soundboard is cut off. As grand pianos get bigger, a dumb bar is used to cut off the bass corner. I can think of another reason why this is done (better support of the crown), but you may be right in thinking it helps prevent damping problems.

One interesting observation is the use of the "pulsator"

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

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

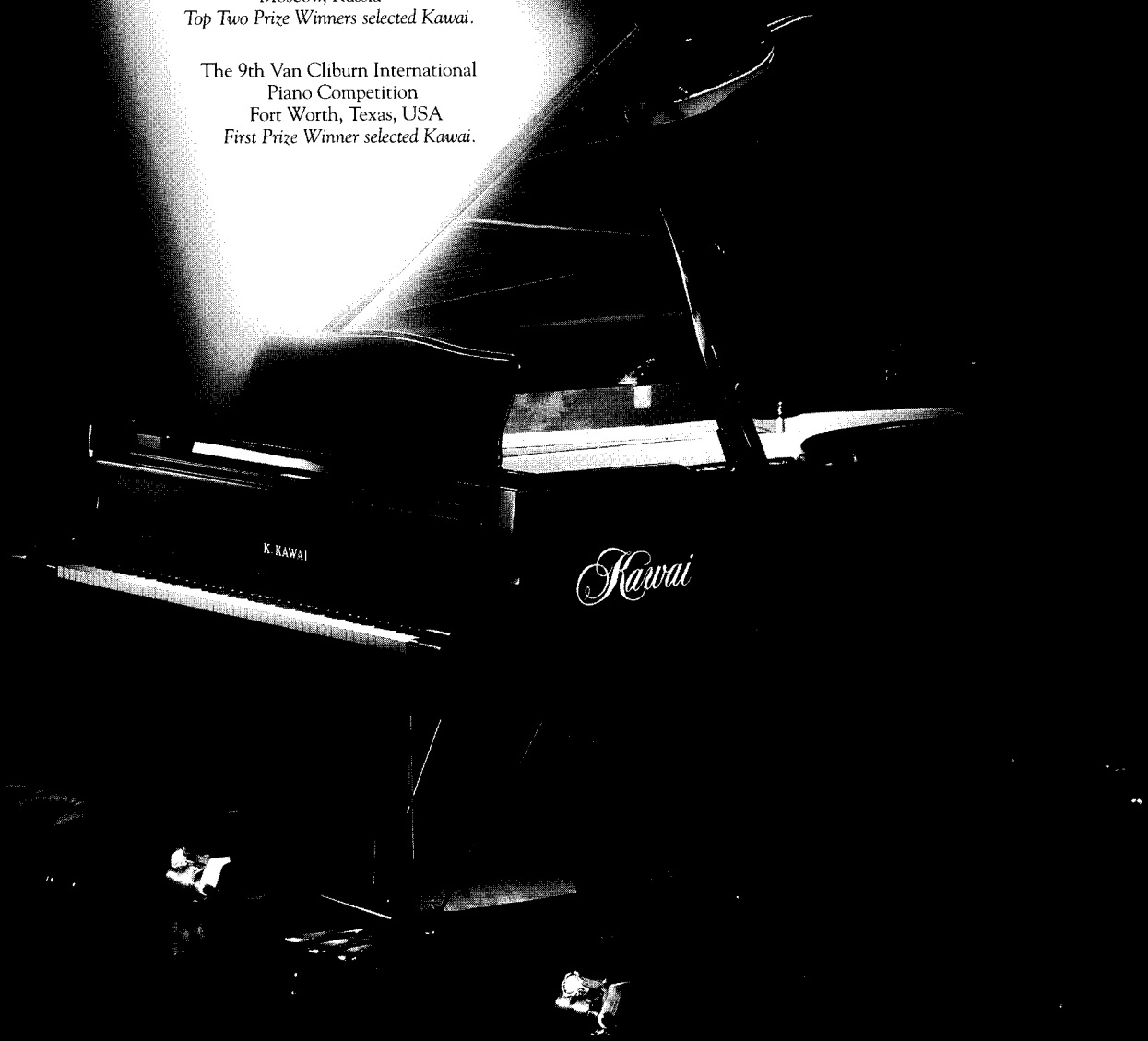
The 45th Ferruccio Busoni
International Piano Competition
Bolzano, Italy
First Prize Winner selected Kawai.

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

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

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

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



It's becoming a familiar refrain.

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on the S&S B (who thinks up these gimmicky names?). This strange arrangement acts sort of like a dumb bar. If you think about it, it stiffens the corner of the board without adding much mass. Apparently, the thing to avoid is an area of the soundboard remote from the bridges that has a low resonant frequency. If this happens, an area of the board can act like a "sound trap" (your term). The reason could be twofold: one, this area being remote from the bridges can not be bridled (damped?) by the strings; two, the lower frequency response could hinder the transmission of sound waves to the air. As usual, just speculating here.

Is it just me or do others notice poor damping on older pianos with tired soundboards that lack crown and downbearing? Maybe lack of compression can cause the problem or make it worse. In some cases it may be caused by the design and in others by a deterioration of the soundboard, or, if you are unlucky, both.

A — From John Musselwhite, RPT

I've always wondered if the preference in the latter part of the last century and the early part of this one was for a slightly "wetter" sound, including not installing as many treble dampers. Many of the pianos from that period that I see don't damp well at all compared to modern standards, even if you replace all the damper parts. Is this a "fault" or a deliberate effect because that's the way they liked it back then? Maybe I've just tuned too many birdcages....

Postscript

I had complained that I was unable to locate some ringing or phantom sounds coming from a Steinway upright that we had restored. We had muted off all non-speaking lengths of wire, checked for damper bleed, installed over dampers, you name it we had tried it. I even removed the wooden-framed metal screens on the back of the piano and experienced some improvement. One technician suggested that the board might be contributing to this problem and I wanted to check that out. The people left town and I was unable to revisit the piano until this week.

It turned out that the bass strings were the culprit after all, not the soundboard (I'm embarrassed). I had mistakenly ruled out the strings at first because I had checked for poor string dampening by placing my hand over the strings above the dampers. Since this had no effect, I ruled out the strings as contributors. But this part of the string was sufficiently muted and was not the origin of the sounds.

When I rapped the board with my knuckle and placed my arm on the lower part of the bass strings, just above the bass bridge, the phantom sounds did stop. The strings were indeed moving. The lower part of these bass strings are very unaffected by the dampers and have a definite life of their own. The problem is only diagnosed at this stage. Perhaps my next step is to try the oversized dampers, as someone had suggested, to see if this will help dampen the sympathetic volume. I kind of doubt it will but am going to try it. It really is annoying.

—David Sanderson

Woodworking Adhesives And Their Uses

By Chris A. Minick

(A version of this article appeared in the September/October 1992 issue of *Fine Woodworking* magazine. This article appears here with permission of the author — **S.B.**)

Gluing boards together to make large panels and gluing up a furniture project during final assembly are everyday occurrences in woodworking shops across the country. Most of us don't pay much attention to this critical operation until for some reason our standard glue doesn't work anymore. Then the search for an alternative adhesive is on. With about 1,500 adhesive products representing almost 100 different chemical classes being manufactured annually in the United States, the search could be a long one. Fortunately only seven or eight generic types from this mind boggling array of glues are suitable for our woodworking needs.

Adhesive Types

Woodworking adhesives can be divided into two broad categories: structural thermosetting adhesives and non-structural thermoplastic adhesives. Thermosetting adhesives are high-performance, special-purpose adhesives. They are used in woodworking to join difficult-to-bond materials (like metal to wood) or where exceptionally high bond strengths are required. Epoxies, plastic resin glue and resorcinol adhesives typify this group. Most thermosetting glues cure by a chemical reaction (usually after mixing two components) to form rigid, structural water-resistant bonds with wood. Thermoplastic adhesives, on the other hand, cure by evaporation to form semi-flexible, non-structural bonds. White glue and yellow aliphatic resin glue are the best known and most frequently used members of this category. In this article I'll explain the common types of woodworking adhesives, how they work and what to expect when you use them.

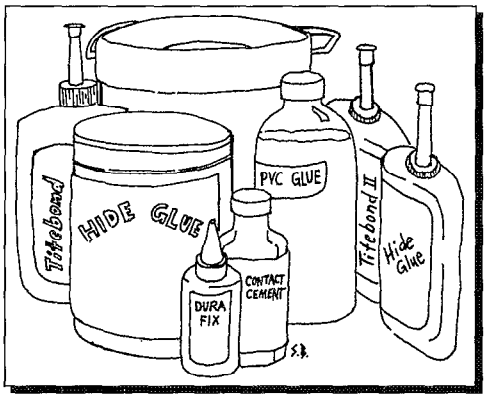

Figure 1

Thermoplastic Adhesives

Polyvinyl Acetate — White and yellow glues are the most frequently used adhesives in the shop for wood bonding, and for good reasons. PVA adhesives have a balanced set of properties that make them ideal for gluing wood. They are easy to use, have quick grab, set rapidly, clean up with water, are non-toxic and best of all work in most situations. Polyvinyl acetate adhesives useful for woodworking purposes come in three main varieties: white or craft glue, yellow aliphatic resin glue, and crosslinking PVA emulsions. PVA glues dry by evaporation and coalescence to form semi-elastic slightly flexible bonds. The thermoplastic nature of the adhesive allows the bond line to move somewhat and absorb a sudden shock rather than breaking like more brittle thermosetting adhesives. PVA adhesives are non-structural; under a sustained load the adhesive slowly stretches (known as dead load creep) and the glue joint eventually fails. Polyvinyl acetate adhesives should never be used in structural assemblies, like load bearing beams, without some form of mechanical fastening. Another problem common to PVAs is poor water resistance. Yellow carpenter's glue can be used in outdoor projects that are protected from the weather but traditional white and yellow glues cannot survive continual immersion in water.

General purpose white glues are considered by many woodworkers to be hobby glues and have largely been replaced in the shop by the higher performance yellow glues. White glues have unique flexibility and high sheer strength properties that make them particularly well suited for use in flexible joints. General purpose white glue, Elmer's Glue-All® for instance, are excellent adhesives for bonding the canvas backing to the wood slats of tambour doors. The flexible adhesive bonds allow the slats to move freely and the high peel strength prevents the cloth from coming loose. When dry, white glues form a translucent rubbery glue line, the rubbery nature of the glue makes sanding difficult. The adhesive gets gummy from the heat generated during sanding and clogs the sandpaper.

Aliphatic resin glues are probably the best all-purpose wood adhesives made today. They share many of the same properties of their white cousins: high bond strength, easy clean up and rapid set. The polymers used in yellow glues have been chemically modified to be harder and less thermoplastic (the yellow color is a dye added to distinguish the two glues). Technically, both aliphatic resin glues and white glues contain the same polymer, polyvinyl acetate, but yellow glues have better moisture resistance coupled with improved creep resistance, higher tack and better sandability. They do have a pretty short shelf life though; after about a year most brands are usually too viscous to be useful. Adding a small amount of water to revive a slightly thickened adhesive will do no harm but resist the temptation to salvage one that looks like jelly. It's better to buy new adhesive than risk ruining a three-month project.

Crosslinking polyvinyl acetate glues are the high-performance adhesives of the PVA family. During the drying process, chemical bonds are formed within the adhesive, (crosslinking) improving the toughness of the glue bond and increasing the water resistance. Until recently, crosslinking PVA

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adhesives were only available to large shops and commercial users, but the introduction of Titebond II Wood Glue® by Franklin International has brought this technology to the amateur craftsman, too. Titebond II® is a one-part self-crosslinking glue that does not require the addition of a catalyst to activate the adhesive. In my testing, I've found that Titebond II® has a little higher tack and a shorter drying time than regular yellow glue. Other than that, this adhesive handles like any other high-quality yellow glue.

To test the water resistance of the glue I prepared identical maple test panels, one glued with Titebond II®, the other with Dap Weldwood Carpenter's Glue®. Both panels were submerged in a bucket of water and allowed to soak overnight. The next morning, the Weldwood sample came apart as I pulled it from the bucket for inspection. After 48 hours underwater, Titebond II® was still holding firm and I could not break the joint by hand. Quite impressive for a polyvinyl acetate glue. It occurred to me that the crosslinking character of this adhesive should give it better than normal gap-filling ability, so I glued up some maple boards to test the theory. In my shop, I glued up samples with various gap sizes ranging from a tight fit (zero gap) to 1/32" (the gaps were produced by inserting spacers into the glue line). After the samples had dried for a week, I tested them on a laboratory tensile tester to determine the bond strength of the joints. The maple boards split apart (at about 2600 psi) before the glue line failed in all the samples with gaps up to 1/64 inch. At a gap size of 1/32 inch, huge by woodworking standards, the adhesive strength of the Titebond II® was close to 1700 psi, sufficiently strong to keep the boards together despite the large gap.

(***Editor's note:*** *PVC-E — polyvinyl chloride — is a thermoplastic adhesive popular among piano technicians for gluing felts and plastic keytops, among other things, but is not included in this article because it is not a common "woodworking" adhesive.* — ***S.B.***)

Hide Glue — While modern synthetic adhesives are the workhorses of the woodshop, old-fashioned hide glue has a few unique properties that still make it useful. Fresh, hot hide glue easily bonds to old, dried hide glue, making it great for restoring pre-1940 furniture, which was probably originally assembled with hide glue. Hide-glued joints can be disassembled by applying steam or hot water, a quality embraced by those who repair furniture and stringed instruments. Because hide glue is a natural protein, it will absorb an oil-based stain just as the wood does. Thus, if any glue remains on the wood, the piece can be stained or dyed without light splotches appearing — a common problem with synthetic glues.

Chemically, hide glue is a protein-based adhesive derived primarily from the hides and hooves of cattle. It comes in several different grades (most woodworking supply catalogs sell it), with gram strengths between 164 and 251. Gram strength is not an indication of the glue's bond strength — all grades of hide glue are strong enough for woodworking. Rather, glues with a higher gram strength are more viscous and gel quicker.

Unlike synthetic liquid adhesives, traditional hide glue is prepared by soaking the glue granules in cool water for a few hours. Typically, a mix of from one-and-a-half to three parts water to one part glue granules (by weight) yields the proper consistency. The exact amount of water needed is different for each glue grade (see the instructions that come with your glue), but don't exceed three parts water to one part glue because the resulting mixture will be too weak for proper bonding. When the soaked granules resemble mushy oatmeal, liquefy the hide glue by warming it. Special glue pots are available for this, but a double boiler or any heating device that keeps the glue at around 140 F will work well. Use a candy thermometer to read the temperature, and don't let the glue boil, or you'll weaken its bonding strength. Incidentally, for small jobs, you can use unsweetened gelatin powder from a grocery store, which is really hide glue that's been purified. Mixed two-and-a-half parts water to one part powder, gelatin's high gram strength gives it an open time of about 60 seconds, too fast for veneering large panels but perfect for quick repairs.

Once the glue is hot and of even consistency, it's ready for use. Brush the hot glue on the joint, and assemble the pieces quickly. Regular hot hide glue has a short open time — two to three minutes — and the joint must be assembled while the glue is still liquid. Warming the wood with a hair dryer will extend the open time, as does adding small amounts of water to the glue. Products called liquid hide glue come premixed with chemical gel depressants (to keep them liquid and extend their open time) and are an alternative to cooking your own. While some woodworkers claim that liquid hide glue is weaker than hot hide glue, I haven't found this to be true. All hide glues cure in about 24 hours, but the clamped joints can be unclamped after two hours provided the piece isn't handled too roughly. Excess glue is easily cleaned off with warm water or by peeling the squeeze-out off the surface with your fingernail before the glue has a chance to set.

Contact Cements — These are rubber-based adhesives. Synthetic neoprene rubber forms the adhesive base of most modern contact cements. As you might expect, these adhesives have very low strength in the traditional woodworking sense and suffer from high creep. Contact cements are definitely non-structural but are very useful in veneering and laminating operations. Their strong point lies in their ability to bond a wide variety of porous or non-porous materials to one another, bonding metal or plastic to wood for instance. Contact cements are easy to use and produce instant, clamp-free bonds.

Contact cements come in three main varieties based on solvent type: flammable solvent, non-flammable solvent, and waterborne. The choice between these varieties is more a matter of personnel preference and safety concerns rather than performance. I've found all three types to work equally well. Safety, though, is another matter.

Since these products are usually spread over very large areas like kitchen countertops or large veneered panels, a lot of solvent is evaporating into the shop. Flammable solvent-based contact cements pose a very real fire and explosion hazard unless used in a well ventilated shop. Pilot lights or sparks from operating equipment or even static electricity can ignite these vapors with predictable results. Non-

flammable solvent-based contact cements have problems, too. This variety almost always contains a high proportion of chlorinated solvents, usually methylene chloride. Chlorinated solvents are known to cause severe health problems in some individuals and adequate respirators, ones specifically designed for chlorinated solvents, must be worn to protect yourself from the adverse health effects of chlorinated solvents. From a safety standpoint, waterborne contact cements are a clear choice. But waterborne cements tend to warp and buckle thin wood veneer making assembly difficult. Sometimes the buckled veneer can be forced flat during application only to lift and form bubbles after the project has been completed.

Regardless of solvent type, the procedures for using contact cements are very simple. The entire surface of each piece to be joined is coated with adhesive and allowed to dry until tack-free. Some brands, like Fastbond 30®, have a built in color change indicator that tells when it is ready to bond. Generally, if the surface is not sticky, it's ready to bond. Proper alignment of the two panels is critical. Once the adhesive coated surfaces touch they are bonded. No second chances with this adhesive. It's customary to place sticks or paper between the adhesive-coated surfaces during alignment to keep the surfaces from contacting each other. Once aligned, remove the sticks one at a time and push the surfaces together as you go. On large panels it is usually better to start in the middle and work toward the ends. This method minimizes the chances of trapping air between the glue layers causing a bubble on the surface. Simply apply pressure to the face of the lamination to complete the bond. A veneering roller, sometimes called a "J" roller works quite well for this operation.

The major drawback to contact cements is the thin viscosity of the adhesive. Low viscosity is necessary so the adhesive can cover large areas in a reasonable time period, but the low viscosity is a real problem when it comes to thin wood veneers. Solvent-based contact cements can soak completely through thin unbacked wood veneers and ruin the face of the veneer. Once hardened, the stuff is too rubbery to sand and isn't soluble in most common shop solvents. A backsize of hide glue could be applied to the veneer before application of the contact cement. This treatment usually solves the problem but it also adds another step. I think it is easier simply to switch to a different veneering adhesive and use the contact cement only for non-porous materials.

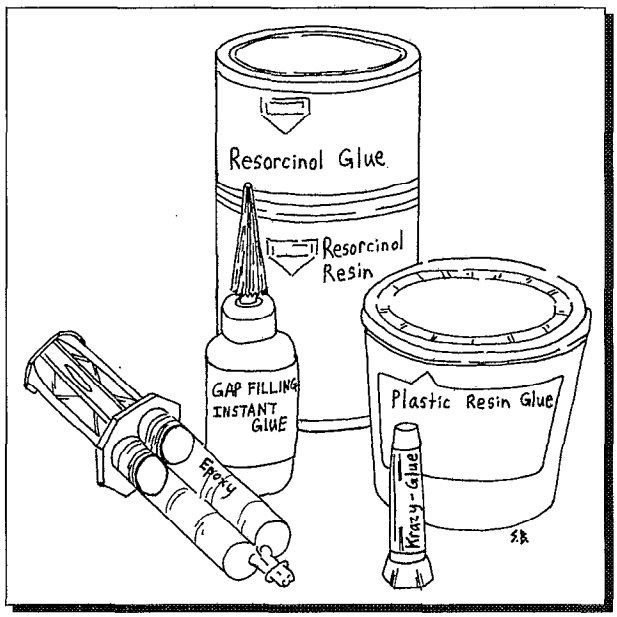

Figure 2

Thermosetting Adhesives

Epoxy Adhesives — These high-performance cars of the woodworking world possess high strength, have true gap-filling characteristics, produce structural bonds and are waterproof. The uncanny ability of epoxies to structurally join difficult-to-bond materials is perhaps their biggest asset. I recently constructed cabinets for my laundry room from melamine-coated particleboard; an epoxy adhesive was the logical choice for the project. Epoxies do have some drawbacks. They are expensive (about $25 per pint), require precise mixing, are difficult to clean up, and toxic in the uncured state.

Epoxy adhesives are solvent-free, two-part systems consisting of an epoxy resin and an amine hardener. Usually equal parts of resin and hardener are mixed to activate the adhesive and start the curing process. The exact mixing proportions are fairly critical; too much of either component will adversely affect the bond strength of the adhesive. Once mixed, they cure by a chemical reaction rather than solvent evaporation, forming structural chemical bonds in the process. The low-shrinkage and exceptional gap-filling qualities of epoxies is due to this lack of solvent. Uncured epoxies are irritating to the skin and can cause contact dermatitis in chemically sensitive people. It is best always to wear gloves when using epoxies or other chemically reactive adhesives.

Epoxies have very low tack and poor green strength, so the joints usually have to be clamped until the adhesive is fully cured — overnight is usually sufficient. Clamping presents another problem: glue squeeze-out and clean up. Uncured epoxies are not soluble in common workshop solvents, making clean up difficult. Alcohol and mineral spirits will just spread the uncured glue over the surface. Acetone and MEK (methyl ethyl ketone) are the preferred solvents, but lacquer thinner works equally well. Cured epoxy glues sand and machine well, but once completely hardened, the squeeze-out is difficult to scrape off and will require a lot of sanding. I've found it easier to let the squeeze-out harden until it is cheesy and then scrape the partially cured adhesive off with a sharpened putty knife.

Curing time, and hence clamping time, is dependent on temperature. Common epoxies are designed to cure at room temperature (65 - 70 F). At temperatures below 50 F the reaction rate slows dramatically. An epoxy can take several days to cure fully at 40 F. Special low-temperature-curing epoxies are available from Industrial Formulators of Canada, Ltd. if the need arises. Resist the temptation to speed the cure by heating the joint. The vapors that come off the hot epoxy are toxic and the viscosity drops, causing the epoxy to flow out of the joint.

Rapid-setting, or so called "5-minute," epoxies are a poor choice for woodworking. They are generally low-strength adhesives, and once mixed

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they gel very quickly. The thickened adhesive resists wetting the wood, resulting in poor absorption and weak joints. Epoxies with a working life of 45 to 60 minutes are a better choice. Longer pot life allows for a leisurely glue-up and the adhesive remains "wet" long enough to insure proper penetration into the wood. I tested the gap-filling ability and bond strength of a typical quick-set epoxy (Duro 5-Minute Epoxy®) in the laboratory where I work. The results of the tests confirmed epoxy's gap-filling ability. There was no loss of bond strength even for a 1/16 inch crack. But, at 1450 psi, this quick-set epoxy proved to be much weaker than a typical slow-set epoxy (slow-set epoxies usually have shear strengths around 4000 psi).

Unmixed epoxies have very long shelf lives, but they will eventually go bad. If both parts are smooth and lump-free, the adhesive is okay to use. If either part is granular, it's time to buy new glue.

Urea formaldehyde and resorcinol formaldehyde glues — These are the most frequently used adhesives for bonding wood when strong, water-resistant bonds are required for the project. Resorcinol adhesives have high strength, exceptional solvent resistance, and when properly cured will withstand prolonged immersion in water. Urea formaldehyde adhesives, on the other hand, are not completely waterproof but slowly degrade in moist environments (releasing formaldehyde gas in the process); continuous immersion is not recommended. UF adhesives can, however, be used outdoors. An occasional soaking from a passing rainstorm will not seriously affect the strength of the adhesive bond.

Urea formaldehyde adhesives, sometimes called plastic resin glue, come as one-part powders. The powder is a precise mixture of dry resins and hardeners that if kept dry will remain storable indefinitely. Water is added in the shop to dissolve the chemicals and activate the adhesive. The pot life after mixing is relatively long for a thermosetting adhesive, but the viscosity of the activated glue slowly increases; after about an hour the adhesive is generally too thick to be usable. Once cured, UF adhesives produce structural bonds and the tan glue line is hardly noticeable on light colored woods. Decorative interior load-bearing beams and hardwood plywood paneling are often glued with UF adhesives. UF adhesives have poor gap-filling qualities, therefore the mating surfaces must be cut accurately and clamped firmly until the adhesive has set. Glue line squeeze-out can be removed with a damp rag before it has hardened or scraped and sanded after hardening. In general, a clamping time of 24 hours is needed to produce structural strength bonds.

The long open time of UF glues, about 20 minutes, is a real advantage in veneering operations. This open time allows for precise positioning and even repositioning of the veneer without loss in ultimate bond strength. Adhesive bleed-through, sometimes a problem with contact cements, can be avoided when using UF glues by coating only the surface to be veneered and not the veneer itself. Allow the adhesive to thicken for a few minutes before clamping. Any adhesive that does bleed through to the face side is easily sanded off and shouldn't cause any finishing problems.

When a completely waterproof glue line is needed for marine applications or severe weather conditions, a resorcinol formaldehyde adhesive should be used. Resorcinol adhesives come as two-part kits, one part containing the resorcinol resin dissolved in ethyl alcohol and the other containing powdered paraformaldehyde. The premeasured components are simply stirred together to activate the adhesive. Careful mixing of the two parts is necessary to avoid lumps in the adhesive. I've found it best to sift the powder into the liquid resin while constantly stirring the resin — an operation that sometimes takes three hands. RF adhesives produce mahogany colored glue lines that are a bit harder and more brittle than those produced by UF glues. The increased hardness makes cured RF glue squeeze-out more difficult to remove. Application procedures, clamping and cleanup (water in this case, too) are the same as urea formaldehyde glues.

Both adhesive systems release formaldehyde gas when in the liquid state and present a very real health threat to the user. The free formaldehyde generated during the gluing operation is highly reactive and easily combines with the proteins in the human body. Test results regarding the carcinogenic nature of formaldehyde gas are not conclusive, but it is known that many people are highly sensitive to this chemical. Even low concentrations of formaldehyde in the air can cause irritation to the nose and eyes and cause pounding headaches. Proper protective equipment must be worn when using these adhesives to prevent dangerous overexposure. Working in a well-ventilated shop will decrease the risk, but I consider heavy rubber gloves and a face mask rated for organic vapors to be minimum required protection no matter how good the ventilation.

Cyanoacrylate adhesives — At about $170 per pound, CA glues are definitely expensive, but since a drop or two is usually all that's needed the glue is fairly economical to use. These fast-setting glues are wonderful for repairing small cracks and tear-outs in wood — they have found popularity among wood carvers and turners for this reason. I've heard that some woodworkers even use cyanoacrylate adhesives to firm up the punky areas in spalted wood before turning or carving.

Cyanoacrylate adhesives come in two forms: a standard low viscosity liquid, and a gelled version for porous surfaces like wood. Both varieties cure to form colorless, water-resistant joints by reacting with the water vapor in the air. The cured bonds tend to be very brittle and can be easily broken by a sharp rap with a hammer. A common practice among avid users is to accelerate the cure by breathing on the wet adhesive before assembly. This action increases the humidity near the adhesive and starts the polymerization reaction. Liquid water should be avoided because it actually interferes with the bonding process, crystallizing the adhesive and turning it white.

Acidic woods like oak and walnut require special treatment. The acid content of these woods stabilizes the adhesive and inhibits the polymerization reaction. Special accelerators or surface activators can be sprayed on the joint to neutralize the acid but wiping the surfaces with ethyl alcohol will accomplish the same purpose —

ethyl alcohol is mildly basic and initiates the cure even on acidic substances.

CA glues smell pretty bad until they harden. The pungent vapors are extremely irritating to the eyes, but are relatively non-toxic. Low-odor formulations have been developed recently and are reported to have the same characteristics as regular cyanoacrylates without the smell (available from The Woodworkers Store, Rogers, Minnesota). No special protective equipment is needed when using these adhesives, except for common sense. The biggest drawback with cyanoacrylate adhesives is that they will glue things together that shouldn't be glued — like the cap to the bottle or your fingers to the board. Unsticking your fingers can be quite painful. Cured cyanoacrylates are very solvent resistant and dissolving the bond with common shop solvents is almost impossible. Special solvents are sold for dissolving the cured adhesive. Most are acetone-based as are most finger nail polish removers which are substantially cheaper.

Once opened, CA adhesives have a short shelf life of about six months. Storing the adhesive in your freezer will considerably extend its useful life (I've stored them for over two years in the freezer with no ill effects). Allow the glue to warm to room temperature and dry the container before opening the bottle.

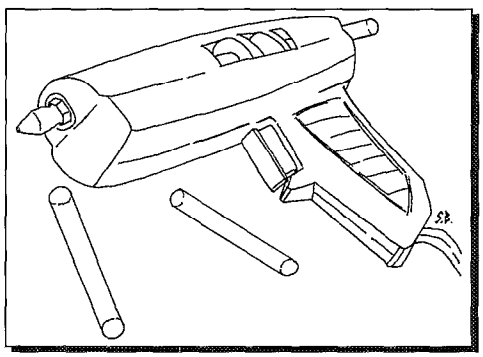

Figure 3

Specialty Adhesives

Hot-melt glues — These are sold as solid sticks that are dispensed hot (about 350 F) from an electrically heated glue gun. These adhesives set rapidly as they cool (15 to 20 seconds) to form thick, low-strength slightly rubbery glue lines. The poor penetrating properties and low strength coupled with the poor sandability of hot melt adhesives have relegated this adhesive to the unseen areas of our woodworking projects. I've found hot-melt glues to be a convenient way to attach glue blocks to furniture and for tacking the drawer bottoms in place during assembly. A few dabs of hot melt glue serve as a good temporary fastener for jigs and fixtures. The adhesive can be released by heating (a heat gun works well), and the residue is easily scraped from the wood. Edge-banding veneers pre-coated with hot-melt glue are used extensively in production furniture shops to cover the edges of plywood and particle-board. This same edge-banding is available to the home craftsman, too. An ordinary household iron is used to melt the adhesive and to "iron on" the edge-banding to plywood or particle-board shelving. Large thin sheets of hot-melt adhesive are available from The Woodworkers Store for bigger veneering projects. I've not used these hot-melt sheets for veneering but it seems like a good idea and is fairly economical at about $1 per square foot.

Adhesive Transfer Tape — An interesting adhesive I've used in my shop, Scotch Brand 934 Adhesive Transfer Tape®, manufactured by 3M, defies categorization into a neat adhesive niche. 3M has created a product that sticks things together like glue but applies like a tape by coating high performance tape adhesive onto a removable paper backing. To use this "glue" you apply the tape to one side of the joint, remove the paper liner and press the pieces together. The bonds are obviously non-structural but are sufficiently strong to keep the pieces from easily separating. I've used this adhesive/tape product for gluing metal to wood, plastic to wood and as a veneering adhesive on small wooden puzzles with good success. This tape is a handy adhesive to have in the shop for quick glue-ups of jigs and for stack-cutting pieces on the bandsaw. Finding it is sometimes a problem. I purchased my roll at a local office supply store but I've seen it in specialty mail order catalogs, too.

The Bonding Process

Three simple steps — The process of gluing boards together seems simple enough — most of us have done it hundreds of times. Only three steps are involved: preparation of the boards, applying the glue, and clamping. It's so simple we often take it for granted. Unfortunately, neglecting the basics during any one of the steps can lead to weak bonds and sometimes disaster. Paying attention to the details of the process is the key to producing consistently strong bonds with all types of wood. But before we discuss the actual bonding process, it's helpful to understand a little about the chemical make-up of wood and how the adhesive interacts with these components during the bonding process.

What is Wood? — Simply stated, wood is a complex mixture of organic chemicals and water. Some chemicals make up the structural elements of wood. Others are responsible for the wood smell, color, decay resistance and acid content. Ignoring the water, about 95 percent of what's left is cellulose, lignin, and hemicellulose. These compounds form the structural matrix of wood and give wood its characteristic strength, rigidity and elasticity. During the gluing process, the structural elements of the wood are linked together via an adhesive bond to form usable sized panels.

The remaining 5 percent of dry wood is composed of resins, tannins, essential oils, gums, coloring agents and sugars. Taken as a group this chemical mixture is broadly classified as "extractives." Extractives are not physically bound into the wood structure but can be extracted (hence the name) from the wood through the action of water or other suitable solvents. Extractives are more or less evenly distributed throughout the tree while it is alive. This condition rapidly changes once the tree is cut into lumber and dried. Capillary action caused by the escaping water during the drying process concentrates the extractive material at the surface of the board. Milling will remove most of the extractives from the surface of the rough lumber but they will accumulate again at the milled surface during storage. Extractives tend to make the

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Woodworking Adhesives And Their Uses

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board slightly oil — and water — repellent, preventing most adhesives from properly absorbing into the wood matrix. If the extractives are not removed before glue-up, these materials act like contaminants and will interfere with the adhesive bonding process. Fortunately, the normal shop practice of ripping the board to size and "truing" the edges before glue up usually removes most of the offending extractive material.

Adhesive Bonds: How They Cure — Once the glued up boards are in the clamps our job is done and the actual adhesive bonding process begins. (For the sake of this explanation we will assume the adhesive is a typical water-borne aliphatic yellow glue.) First the liquid adhesive is absorbed into the structural wood matrix. At this point the adhesive polymer molecules intermingle with the structural fibers of the wood and the water or solvent begins to evaporate. Next the polymer molecules coalesce (come together) surrounding the structural fibers and harden, mechanically interlocking the fibers. Additional locking forces in the form of electrical and quasi-chemical bonds (Van der Walls forces and hydrogen bonds) also develop within the adhesive/wood matrix. These weak chemical bonds are responsible for most of the holding power of the adhesives in use today. The thin layer of cured adhesive between the two surfaces acts like a bridge holding the boards together and freely transferring external stresses back and forth across the bond line.

The bonding process is pretty much the same for thermosetting adhesives (epoxy, urea formaldehyde, etc.) except additional chemical bonds are formed within the adhesive body as it sets. This accounts for the greater strength of the thermoset adhesives.

Three Steps to Good Glue Joints

Surface Preparation — No article about adhesives would be complete without a discussion of surface preparation and joint design. I don't claim to be an expert in this area but I will share with you some of the things I've found over the years to be important to the bonding process both in my laboratory and in my shop.

Joint design plays a critical role in successful gluing. Ill-fitted or sloppy joints will be weak regardless of the "gap filling ability" or strength of the adhesive. Careful attention to detail before glue up will be rewarded with the strongest, longest-lasting joints possible. Edge-gluing boards into larger panels is possibly the most frequent gluing activity in most woodworking shops. Matching grain patterns and color is important to the final appearance of the panel but proper edge-joining is critical to the physical integrity of the finished project. A sharp, well-tuned jointer or a long hand plane equipped with a fence are both perfect tools for the job. The planed edges of the board should be true and perfectly perpendicular to the face. Dry-fit the boards and inspect the joints before glue up. The joints should fit tight and be gap free when lightly forced together by hand pressure. Boards with bows, twists or crooks should be avoided if possible. Distorted boards usually put unequal stresses on a dried glue line that may ultimately cause the joint to fail. Dull jointer knives introduce another problem: they tend to crush and glaze the wood fibers instead of cutting the fibers cleanly. Glazed and crushed wood fibers resist wetting. This prevents the adhesive from properly absorbing into the wood, resulting in weak bonds. A simple water drop test can be used to detect glazed or otherwise contaminated surfaces before they interfere with bonding. Place a drop of water on the surface to be glued. If the water beads up and is still beaded after about 30 seconds then the wood will likely not be wetted by the adhesive. Additional surface preparation will be necessary before glue-up.

Dense woods like hard maple and lignum vitae or highly resinous woods like teak and rosewood require special care during the preparation steps to insure adequate strength in the finished glue joint. Generally as the density (weight per volume) of a wood species increases the ability to absorb adhesive decreases. Over-clamping dense woods can lead to starved glue lines and weak joints. Resinous woods pose a slightly different problem. The resin content at the glue line may be so high that the wood surface is hydrophobic (water repellent) and completely blocks adhesive absorption into the wood. The water drop test can detect this condition in time to prevent disaster. A common practice among woodworkers is to wipe the joint with lacquer thinner or alcohol in an attempt to remove the excess resins. This practice usually works but can often worsen the problem. Capillary action caused by the evaporating solvent can "pull" more resin to the surface and recontaminate the freshly cleaned area. I think a better strategy in this situation is to switch to a less oil-sensitive adhesive like epoxy or resorcinol/formaldehyde and only glue freshly milled boards.

Adhesive Spreading — Woodworkers spend a lot of time talking about the proper way to apply adhesives. Should both sides of the joint be covered with adhesive before clamping or is it sufficient to coat only one side of the joint and let it transfer to the other during the clamping operation? I prefer spreading a thin layer of adhesive on both sides of the glue line and here's why. This practice insures that the proper amount of adhesive will be absorbed into the wood on each side of the glue line producing the strongest possible joint. If the glue is applied to only one side then clamped, the adhesive may be squeezed from the joint before it has a chance to absorb into the mating surface. Actually, it may be something of a mute point. Modern adhesives will produce sufficiently strong bonds with either method provided the joints are cut correctly and fit tight.

Regardless if you are a one-sider or a two-sider, the actual method used to apply the liquid adhesive to the joint surfaces can affect ultimate bond strength. It's imperative the adhesive be spread evenly over the entire bonding surface. Areas that haven't been coated with glue will not bond. I have two glue applicators that satisfy most of the gluing needs in my shop: a stiff parts-cleaning brush (I purchased mine at a local auto parts store) for tenons, dovetails and other irregularly shaped gluing operations, and a hard rubber veneer roller for edge-gluing solid stock. I like the way the roller works, it's easy, fast and the entire

surface is automatically coated with the proper amount of adhesive. The roller should be made of rubber; hard plastic rollers tend to skid over the top of the adhesive instead of spreading it out evenly.

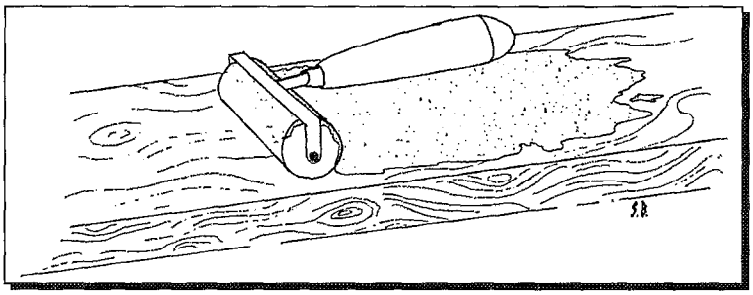

Figure 4 — An artist's 2 1/2" brayer used for applying glue.

Scrap wood, disposable paint brushes or small sticks work well as applicators for two-part thermoset adhesives. These adhesives are hard to clean up and it is easier to just toss an inexpensive applicator than try to clean a reusable one. Fingers don't make good applicators for any type of adhesive. It's hard to get an even coating of adhesive with your fingers and besides, you are more likely to contaminate some other part of the project with adhesive residue. As Ian Kirby pointed out in his article "Gluing Up" (*FWW*#31) "You need fingers for other things and the grease and dirt you add to the glue won't help adhesion."

Clamping — Several good articles dealing with the procedures of gluing and clamping have appeared in *Fine Woodworking* over the years. Ian Kirby's previously mentioned article is one of them, another is "Edge Gluing Boards" (*FWW*# 79) by Christian Becksvort. Both contain excellent guidance into the proper methods of clamping and should be reviewed by all who wish to clamp boards properly. Still, I think a brief mention of clamping basics is in order here.

The object of clamping is to hold the pieces in position until the adhesive has set, not to correct sloppily milled joints or warped boards. Dry-fitting the boards before glue up will give you a good indication of both the number of clamps needed and where to place them. Small gaps and cracks can't always be avoided but if they can be closed with slight hand pressure, they will probably cause no problems. If excessive clamping pressure is needed to close a joint during the dry fitting stage the joint should probably be re-cut. Joints that are forced together by external clamping pressure tend to spring apart once the pressure is removed putting high stress on the glue line. Surprisingly little clamping pressure is needed to achieve good bonding when the joints are tight and properly milled. Excessive pressure is definitely a judgment call, but it may be more prudent to rework questionable joints than to risk joint failure in the future.

Drying time (minimum clamping time) and curing time of an adhesive are often confused. Drying time is the average time, under normal conditions, that a perfectly mated joint must remain undisturbed before the assembly can be handled. Curing time, on the other hand, is the length of time necessary for the maximum bond strength of the adhesive to develop. Most adhesives take several days or longer to fully cure. Extending the clamping time beyond the minimum stated on the package is particularly important for joints where the mating surfaces are less than perfect. Gluing cupped and bowed boards falls into this category as do any joints extra clamping pressure to force them closed. The extra clamping time allows the adhesive to cure more fully and minimizes the chance of joint failure.

Over-clamping is another problem we hear about in gluing circles. Excessive glue squeeze-out is probably a better description. In theory, very high clamping pressure will force too much adhesive from the glue line, starving the joint and resulting in glue line failure. This theory has been around for years and is accepted as gospel in the adhesive industry. A friend of mine asked about it recently and I spouted off the theory. His response was, "How do you know?" and I had to admit that I didn't know for sure. Since crow doesn't taste very good, I decided to find out for myself. I designed a quick unscientific experiment to get some insight into the over-clamping question and to see if it really is a big problem.

I selected a straight-grain hard maple board, trued on one face and both edges, then surfaced it to 1/4 inch thick (my testing apparatus dictated the 1/4 inch thickness). The board was then crosscut into six equal pieces. Dap Weldwood Carpenters Adhesive® (an aliphatic resin glue) was spread evenly on both joining surfaces. Pair #1 was rubbed together with hand pressure and allowed to cure without clamping. Pair #2 was clamped with just enough pressure to produce a moderate glue line squeeze-out. Pair #3 was clamped and over-tightened to the point where the boards started to buckle and the edges under the clamp faces were crushed. All assemblies were allowed to dry overnight before testing. The next morning four samples were crosscut from the center of each assembly and were tested for bond strength with a standard tensile testing machine (this machine accurately measures the force needed to pull two adhesively bonded objects apart).

The results were quite revealing. The force necessary to separate the unclamped samples averaged 1700 psi, not unusual for this type of adhesive. The moderately clamped samples were again unsurprising; pressures greater than 2600 psi were needed to pull these samples apart. It's worth noting here that in the moderately clamped samples the wood sheared before the glue line failed. The over-clamped samples scored a respectable 2175 psi. This was much higher than I expected, well within the acceptable bond strength range, but substantially lower than the moderately clamped samples. I'm not sure what to make of this data; perhaps over-clamping isn't so bad after all. Moderate pressure still seems to make the most sense if for no other reason than to avoid those pain-in-the-neck clamp marks on the edges of the panels. The clamping test results may have been different if the adhesive had been placed only on one side of the joint. Looks like another experiment is in order.

Chris Minick is a product development chemist and amateur woodworker (who just built his first guitar) in Stillwater, Minnesota. He has admitted to having a "soft spot" for people who build and repair musical instruments, and to that we owe his willingness to let us use this article.

Lost Intervals of The Temperament

By Daniel Levitan, RPT
Contributing Editor

The following article is my last as a contributing editor of the* Journal.** ***Having run out of things to say, I'm going to pass the baton along. Before I take my leave, though, I want to say that it has been a tremendous pleasure to write for this publication, a pleasure I highly recommend to anyone contemplating putting down in black and white some of their thoughts about piano work. Many thanks to everyone who has taken the time to respond to my articles, whether by mail or in person, and special thanks to Steve Brady, who invited me to become a contributing editor and who has been a tremendous help throughout.

"Let us come in, let us come in, into your house so gay."
—Malvina Reynolds

The topic of this month's article is, I think, singularly appropriate to this April issue, my last, because it neatly parallels my first article for the *Journal,* in December of 1993. In that article I discussed a much-neglected temperament interval, the 9:8 major second. The major second is often overlooked when we are working in the temperament, yet at times it proves to be of great value in fixing problem spots or in polishing an already good temperament. I believe one reason the major second has gained little currency in the temperament is that it does not seem to be a musical interval in the same sense as fourths, fifths, thirds, and sixths, intervals which form the foundation of Western harmony. However, in looking at Western music as it was and is actually written and performed, we find that all the intervals, including such dissonances as the seconds, minor as well as major, their octave inverses the major and minor sevenths, and the tritone (the diminished fifth or augmented fourth) have always been very much a part of the fabric of music. The exact tuning of these intervals, therefore, is as crucial to the performance of Western music of all periods as is the tuning of the more consonant ones.

We all know that it if we tune a temperament solely by fourths and fifths we cannot achieve the same degree of perfection in thirds and sixths that we can if we check them as we progress through the temperament. Similarly, unless we check seconds, sevenths, and tritones as we tune, we can't guarantee that these important musical intervals will be well in tune—and we can't have that, now can we?

The Beat Generation

Another reason the tritone and the seconds and sevenths may be routinely ignored in temperament tuning is that they are usually thought of as rapidly beating intervals, and tuners in our era rely to a greater extent than in previous eras on beat rates. It was, after all, the codification and widespread dissemination of the beat rates of equally tempered intervals around a hundred years ago that first enabled tuners to achieve the levels of accuracy that we take for granted today. It's easy to forget how remarkable these levels of accuracy are. Psychologists know that the human ear is not capable of discriminating a pitch difference of less than four cents between two consecutive pitches—the difference between A-440 and A-441 — yet, using beats, we modern piano tuners routinely make with confidence discriminations an order of magnitude finer than that. Our forebears, able practitioners of an ancient art unfettered by a slavish obeisance to the systematic pulsation of intervals, were, ironically, much more likely than we to attend to the nuances of dissonances, and to not ignore, as we have done, those combinations of tones that fall outside the current paradigm of normative quantization.

Fifths and fourths, we know, beat slowly; thirds and sixths beat more rapidly; and so we assume that seconds, sevenths, and tritones must beat even more rapidly. It is true that equally tempered seconds, sevenths, and tritones do beat quite rapidly at their lowest levels of coincident partials. As an example, the 8:7 major second, F3-G3, beats at about 25 beats per second. The next level of coincident partials of the same interval, however, the 9:8 major second, beats at only 3.5 beats per second—more slowly than any third or sixth having F3 as its lower note. To hear these slow beats, it is not possible simply to play the interval—it must be ghosted at the level of its coincident partial, G6. Similarly, it is entirely possible to coax beats out of the other, dissonant, temperament intervals that are slow enough to be useful. By doing so, we bring all the intervals of the temperament into our family of intervals. Not only does this allow us to directly test these important intervals; it also gives us the powerful capability of checking virtually any note of the temperament against any other note.

In this article we'll look at ways to check, using beats, these "lost" temperament intervals, focusing on the minor second and the tritone. The major second has already been covered in my earlier article; and, since a temperament octave encompasses only two major sevenths and three minor sevenths, these intervals have limited usefulness in the temperament. On the other hand, there are twelve semitones and seven tritones in a temperament octave, and they make extremely useful links between the more common temperament intervals—the fifths, fourths, thirds, and sixths. Having a command of the tritone, for example, enables us to subdivide the temperament octave directly into two equal halves — to tune, for example, B3 directly from F3 and F4. With this keystone in place, the

rest of the temperament falls into place much more easily.

Downbeats...

Almost any interval will beat slow enough to be useful if it is played low enough on the keyboard. Beat rates roughly halve for each octave an interval descends, and this is one reason why there is such a mind-boggling array of obscure tests available in the low bass. The semitone and the tritone both beat at reasonable levels just an octave below the usual temperament area. Try playing semitones in the octave between F2 and F3—you will hear distinct, countable beats from about 5 bps for F2-F#2 up to about 10 bps for E3-F3. These beats actually occur at the level of the first partial; the fundamental of F2, at roughly 87 Hz, beats five times a second against the fundamental of F#2, at roughly 92 Hz.

Next try playing tritones in this range; especially if ghosted, their beats are quite easy to count. F2-B2 beats at the 7:5 level at only about 6 bps (the coincident partial is D#5); B2-F3, at about 9 bps (coincident partial, A5). If one were to set a temperament between F2 and F3, therefore, it would be a fairly simple matter to use the semitone and the tritone in this way as comfortably beating temperament intervals. Above F3, though, these beats of these intervals become too rapid to count easily. In order to use them, we must find other ways of making them produce comfortable beat rates.

...and Upbeats

We'll begin with the semitone. In the temperament, at most of its levels of coincident partials the semitone beats quite rapidly. At the 18:17 level, however, the semitone—a wide interval at this level—beats at a comfortable 1.8 bps at F3-F#3, increasing to 3.5 bps for E4-F4. Almost all pianos, except the most godforsaken spinets, are capable of producing audible partials well past the 18th; the problem, of course, is eliciting them without at the same time eliciting neighboring partials whose rapid beating will mask the partial we want to hear. It's difficult to ghost the semitone at the 18:17 level in the usual way, by silently depressing the keys and striking the note corresponding to the appropriate coincident partial, for two reasons. First, the high proportion of impact noise in the high treble tends to shock other partials into motion as well. Second, the appropriate coincident partials for the semitones in the upper part of the temperament octave lie outside the range of the piano. In order to get clean beats from semitones in the temperament at the 18:17 level, in other words, we need to ghost using a purer and higher tone than a piano can provide.

The purest tone is the sine wave. It's possible to use a tone generator to create a sine wave for ghosting at the necessary pitch, but carrying and setting one up at each tuning is not really practical. Members of the flute family, though, have a tone that is essentially a sine wave. The fundamental note of the ordinary flute is middle C (really D, but most flutes have key extensions down to B or B flat), which corresponds to the two-foot C of a pipe organ. The flute's upper range, unfortunately, lies below the register we need to ghost semitones in the temperament at the 18:17 level. The piccolo, half as long as, and sounding an octave higher than, the flute, also has too low a range; but there is a still smaller member of the flute family, the piccolino — essentially a keyed fife — that is again half as long at about six inches, and sounds an octave higher still. Fortunately, its purest register lies in the ideal range for ghosting the semitones of the temperament.

Piccolinos were developed in the latter half of the 19th century, and they became quite popular—especially as a double for the xylophone — in this country during the heyday of vaudeville. As a result, today it is not usually that difficult to find an inexpensive used one. I picked up mine, in perfect shape, at a pawnshop for only $45. It fits neatly into my tool kit next to my six-inch rule, and, best of all, it never needs a change of batteries!

I've found that, with a minimum of practice, it's fairly easy to produce a chromatic range of notes on the piccolino corresponding to the highest octave, plus a fourth, of notes in the piano. If the piano you are tuning has a working sostenuto, use it to lift the two dampers of the appropriate semitone and play on your piccolino the pitch of the coincident partial, four octaves and a minor second above the upper note of the semitone. If there is no sostenuto, it is almost as easy to use the elbow of the left arm to depress the appropriate keys as you play. Play loudly; as soon as you stop playing, you will hear a clear beat in the semitone at that same pitch.

"... unless we check seconds, sevenths, and tritones as we tune, we can't guarantee that these important musical intervals will be well in tune — and we can't have that, now can we?"

And the Beat Goes On

As we have seen, at its first level of coincident partials, 7:5, the tritone beats rapidly in the temperament area, F3-B3, for example, beats wide at 12 beats a second at this level, and B3-F4 at 17.5. The 17:12 tritone, however — a narrow interval — beats at a more comfortable rate in the temperament area, 5 bps for F3-B3 and 7 bps for B3-F4. The piccolino can be used in the same way as for the semitone to elicit the appropriate beats from the tritone. The coincident partial is three octaves and a fifth above the upper note of the tritone.

It's more difficult to use the piccolino for the tritone if no sostenuto is available, though, because of the awkwardness of depressing the two more separated notes of the tritone with the elbows. There is, though, an alternate method which actually works

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even better. Rather than relying on the beats of the upper partials, this method uses the difference tone produced by the beating between the first partials of the two notes of the interval.

Earlier we saw how the two fundamentals of a semitone beat against each other — in fact, any two pitches which differ from each other beat when sounded together. If the beating is rapid enough, the ear hears the beat not as succession of pulses but as a separate tone whose frequency in Hz is the same as the beat rate of the interval. Such tones are known as difference tones. Difference tones are produced by the fundamentals of tritones in the temperament area. For example, the fundamental frequency of F3 is about 174 Hz; of B3, about 247; and of F4, about 349 Hz. Here is a general formula for finding the difference in frequency (in other words, the frequency of the difference tone) between the fundamentals of the two notes of an interval. Where F(l) is the frequency in Hz of the lower note, F(u) is the frequency of the upper note, F(d) is the frequency of the difference tone, K is a constant for steel wire, and M(m) is the make and model of the piano, then:

$$F(d) * M(m) = \{K[\{F(u)^2/F(u)\} - F(l)]\} * M(m) / K$$

Using the formula, we can see that when the tritone F3-B4 is sounded, a difference tone is created at about 73 bps. Similarly, the tritone B3-F4 creates a difference tone at about 102 bps. (By the way, since they are dependent upon the frequencies of the only very slightly inharmonic first partials of the component notes of the intervals, the frequencies of these difference tones are virtually unaffected by inharmonicity.)

The pitches of these difference tones lie in the range of the piano between D2 (73.4 Hz) and G#2 (103.8 Hz). When sounded against notes in that range of the piano, the difference tones produced by the temperament tritones will beat against these notes. By sounding two adjacent tritones against the same note in the bass their beat rates can be compared, and the relative widths of the two tritones exactly inferred.

I suggest the following procedure:

F2, at 87.3 Hz, makes a convenient reference note against which all the tritones of a temperament between F3 and F4 will beat. As the tritones are played ascending chromatically, the beating between the tritones and F2 will progress from about 14 bps for F3-B3, slow to close to zero for G#3-D4, and speed back up to about 15 bps for B3-F4.

The beats will appear to sound at about the pitch of the reference note in the bass, so I recommend playing that note first to draw the attention of your ear to that register. Then sound the tritone in the temperament. The louder you play the notes, the easier it will be to identify the beats.

The beating between the difference tones of the tritones and F2 is quite pronounced, but it occurs at such low frequencies that it is often easier to perceive at first as a tactile sensation in the case of the piano. By placing the flat of your hand against a resonant area of the case — the spine of a grand, or the side of a vertical just above the keybed — and playing the notes in question — again, at a relatively high volume — you should be able to detect the beats quite clearly.

Unfortunately, your two hands will already be occupied in sounding the temperament tritones and the reference note in the bass. The most convenient way around this difficulty is to play the reference note in the bass using your toes instead of your fingers. Of course, to avoid any damage to the keytop you will want to remove your shoe, and I suggest you make sure your sock is pure cotton. Most socks these days have nylon or some other synthetic reinforcing both the heel and the toe, and these materials can scratch some keytops. You can get a wide variety of all-cotton socks from the Nativel Natural Fibers catalogue (item 476A-E; 440 Nativel Way, Leinad, MN 56789).

Once you have found the beat rate by touch, you should then be able to hear it as well. I have found it helpful to shake the head from side to side at the same rate as the beat in question; it also increases the beat's audibility to let the jaw drop slightly and open the mouth. Be careful, though, if your saliva is acidic; it may darken an ivory keytop. If the pH of your mouth tests below 5.0, I suggest avoiding any risk by first using an over-the-counter antacid.

"Having a command of the tritone, for example, enables us to subdivide the temperament octave directly into two equal halves — to tune, for example, B3 directly from F3 and F4. With this keystone in place, the rest of the temperament falls into place much more easily."

And Then, Beat It

Once you have learned to test all the temperament intervals, you will soon come to have much greater confidence in the accuracy of all your temperament intervals, and therefore of your tunings as a whole. Not only that—serenading the piano with your little fife, then pounding the piano with hands and feet, slack-jawed as you twitch your head back and forth — I guarantee all this will make an impression on your clients that will not soon be forgotten!

Thanks for listening — and happy tuning! — **D.L.**

What's New? 1996 NAMM Show Review

By Steve Brady, RPT
Journal Editor

*In keeping with our resolution to highlight industry trends and news of product innovations which we deem to be of interest to piano technicians in general, I present this review of the January, 1996, winter NAMM show in Anaheim, California. See also Randy Potter's article in this issue — **S.B.***

Perhaps the most important general observation a piano technician can make about the NAMM show is that it quickly puts the music industry — and our place within it — into perspective. The piano displays are large; some individual makers display as many pianos as we have on display from all makers at our annual convention exhibit hall. As large as the piano displays are, however, they represent only a small fraction of the show and the music industry as a whole (more on this in Randy Potter's article). As the number of piano makers (and the number of new pianos sold) decreases each year, pianos and piano tuning seem to be turning into a boutique industry.

Here in my home town of Seattle, I've noticed that the coffee industry, which must be about as old as the piano industry, is undergoing a tremendous boom in popularity. Two blocks from my home, we now have no fewer than four different espresso shops. Only two years ago the same corner had only a bakery, which also sold coffee. Accompanying this astonishing development is a similar boom in bagel shops. The bagel must have been around even longer than the piano. If it's possible for two such mundane and ancient comestibles to re-invent themselves in such a dramatic way, grabbing shares of discretionary income once considered unthinkable, couldn't this happen for the piano as well? I believe it could, but not without some creative thinking. At the NAMM show, I saw abundant evidence of creative thinking.

Consolidation

One of the primary trends noticeable to this observer is the continuing consolidation of makers within the industry, along with consolidation and reorganization of individual product lines to maximize appeal to consumers in a swiftly changing market. Partnerships with Chinese piano companies and expansion into Chinese markets also mark this trend.

Baldwin Piano & Organ Company has now emerged as the largest North-American piano maker. Baldwin has completely re-vamped its product lines, with streamlined offerings in neat categories: the Baldwin name is reserved for the firm's top-of-the line instruments, both grand and vertical; the Chickering grands, which have replaced the Baldwin model C and model B grands (and improved on them in the process), are in the middle of the line; and the Wurlitzer line of grands and verticals which are made for Baldwin in Korea by Young Chang.

In yet another example of how fast things are changing in the piano industry, Kimball announced — as I was completing this article — that they plan to cease assembling and selling pianos, period. See their press release in "Industry News." Kimball, a major rival of Baldwin in recent years, had previously ceased production of grand pianos and had turned over vertical piano "technical work," meaning production of strung backs and actions, to Baldwin. Such was the arrangement in January when I spoke to Roger Weisensteiner at the NAMM show. Now, Kimball will only produce cabinets for other piano makers.

Young Chang continues to operate a new piano factory in China, now producing pianos for the Chinese market only. According to Phil Glenn, RPT, National Service Manager at Young Chang America, the Chinese plant may eventually produce a small upright for Young Chang to market in the U.S. Glenn says that Young Chang is redesigning its grand piano capo bar system. Complaints about the difficulty of tuning Young Chang grands with zinc alloy capo bar terminations have led the company to return to a brass termination. The pianos with the brass terminations should appear in the U.S. by the time this issue of the *Journal* is published.

Kawai is yet another piano manufacturer which has entered a partnership with a Chinese piano company (see report in this issue's "Industry News"). In addition, Kawai has completely revamped its grand piano line in a move similar to Yamaha's last year. The venerable KG and GS lines have been phased out and all new grands now bear the "RX" designation.

At this writing, the new RX line consists of five basic models. The 5'5" RX1 is the smallest grand in the lineup, followed by the RX2 at 5'10", the RX3 at 6'1", the RX5 at 6'6", and the RX6 at 7'.

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According to Ray Chandler, RPT, Kawai's Concert and Artist Manager, a 7'6" RX7 will appear later this year.

"Acoustic" Actions In Digital Pianos

Both Kawai and Yamaha displayed digital pianos with "acoustic" action mechanisms. Kawai's "acoustic"-actioned digital piano features a working vertical piano action, sans hammers. The configuration of the case is vertical, and the instrument has 11 voices from which to choose, including piano, harpsichord, pipe organ, jazz organ, vibes, strings, bass, and more. The sound emanates from an array of 10 speakers, powered by a 160-watt amplifier. Other features include 32-note polyphony, a disk drive, a 2-track recorder, a transposer, and six historical temperaments. Chandler said that the 'Heritage 1000' retails for about $5400. According to Chandler, Kawai's "next generation" in this category will use a grand action.

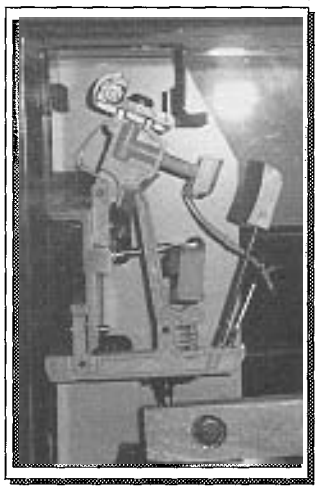

Photo 1 — Kawai "acoustic" action for digital piano.

Yamaha's brand-new entry in this new market niche dedicates 32 megabytes of memory for digital replication of only one voice (a CFIII concert grand sampled on 88 notes at different dynamic levels). Once adjusted for proper volume and reverb, the sound I heard through the headphones seemed very realistic to me. More impressive than that, however, was the quality of pedaling and key release. This was the first digital piano I've personally encountered which allows the pianist to half-pedal. LaRoy Edwards, RPT, of Yamaha explained that the pedal incorporates eight different levels of "damping" rather than a simple "on-off" switch as we find in most digital pianos. The grand hammer action (well, the hammers are actually small weights at the ends of the shanks) replicates the feel and touch of a real piano action, and the damping upon key release is graduated continuously rather than "on-off." The Yamaha GT1 is expected to retail for $8,000 to $10,000.

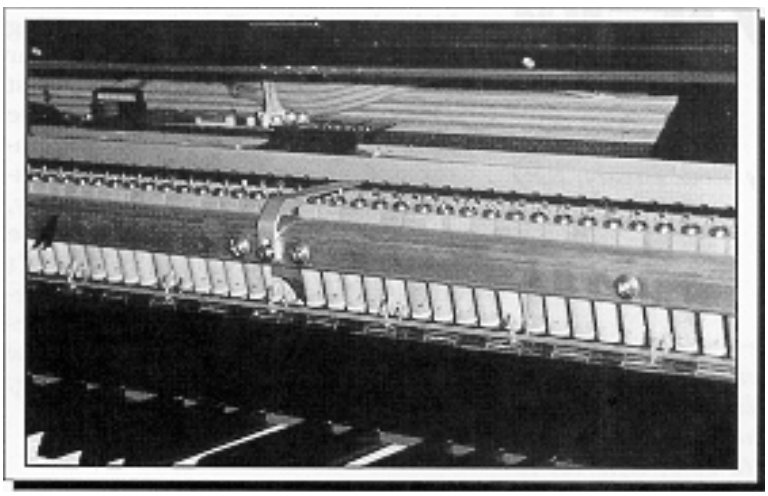

Photo 2 — Yamaha GT-1 digital piano with "acoustic" grand action.

So, What Else Is News?

Mason & Hamlin continues to function under court protection with approval from creditors, according to managing partner Wolf Flippin. Along with Peter Murphy, Flippin acquired the rights to Mason & Hamlin and Falcone when Bernard Greer decided to liquidate the company last year. They began by moving their rebuilding operation, Premier Piano Co., to the former shoe factory where Greer and Lloyd Meyer had been building Mason & Hamlin and Falcone pianos. Says Flippin, "I've found it's easier to manufacture pianos than to restore pianos." He also indicated that Renner action parts and Kluge keyboards would continue to be used in the new Mason & Hamlin pianos. For the time being, production will concentrate upon the Mason & Hamlin models A (5'8") and BB (7'), while Falcone grands (6'1", 7'4" and 9') will be available by special order, according to Flippin.

After the first day of the NAMM show, Flippin reported having received orders for at least 50% of his planned production of 100 to 150 pianos in 1996. The staff has grown from the 15 employees of Premier Piano to a total now of 25, and Flippin expects to employ 35-45 by the end of this year. Most of the added employees are former employees of the company, says Flippin, and he adds that he is now looking for technicians skilled in tuning, regulation and voicing for work in the factory.

Steinway's Gary Green reported a new grand action innovation patented by Scott Jones and others. Although details are sketchy at this point, the new improvement apparently has the jack escaping from the backside of the knuckle, rather than from the front. Steinway is currently testing the action on an unmarked concert grand in the Steinway Hall basement, to get unsolicited feedback from artists, according to Green.

Steinway has also released a CD-ROM factory tour for use on home computers. The CD is beautifully produced by G2G Productions, and the factory tour, although far from comprehensive, includes information in the form of written and spoken text together with numerous still photos and some video footage. In one

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video, you can actually watch the rim laminations being put into place on the rim press, and the clamps being tightened down.You can either take the tour from beginning to end, or jump around from one area to another at will

Story & Clark, now owned by QRS (the piano roll company), displayed a brand new grand piano which is being built in Seneca, Pennsylvania. The new "Hampton" grand features a solid, jointed rim similar to those found on many European grands, especially before the turn of the century, and is available with different leg styles. The 5'4" Hampton on display at the NAMM show was difficult to evaluate because it was sorely out of tune. A company representative explained that the piano had been completed just in time for the show.

Photo 3 — An assortment of legs is available with the Story & Clark "Hampton" grand.

QRS also introduced a portable MIDI player piano device, the "Portable Playola." Similar in concept to the "Vorsetzer" units available in the distant past, this new, smaller device sits atop the keyboard of any piano and plays the keys by means of solenoid-controlled "fingers." The unit is controlled by prerecorded CDs, and MIDI systems are available which provide orchestral background. The systems sell wholesale to piano technicians for $2,700 to $3,100, and would retail to clients for about $4,000.

Seiler Piano Company had a 52" model "Concert SMR" upright on display. The SMR stands for "Super Magnet Repetition," a feature which incorporates two magnets on each note, one on the keyboard side of the jack and the other on the underside of the catcher shank. The similar poles of the magnets are brought close together when the jack escapes, causing the magnets to repel each other and the jack to return quickly under the hammer butt. Just how this magnet action is superior to jack springs alone was not explained, but it's sure to be a good selling point.

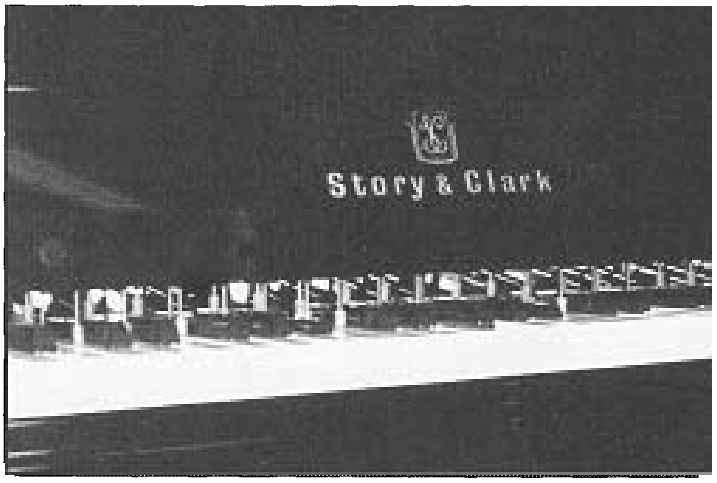

Photo 4 — QRS/Story & Clark "Portable Playola" playing a piano keyboard.

Photo 5 — Seiler's "Super Magnet Repetition" action. Magnets are dark attachments to catcher shank and jack.

Suppliers at the Show

Those technicians who are wondering what happened to Ford Piano Supply in New York City will be interested to know that the business has been purchased by Macy Blackman, Jenny Lee Sheldon, and Carl Demler of Beethoven Piano Company. Blackman, a former student of John Ford, says the supply business has moved from its old location to Demler's properties in Manhattan. Blackman also stated that John Ford is not currently running a pickle factory in Hungary, as some reports had indicated, but that John is actually running a tuning pin and bridle strap factory — in Hungary.

Dampp-Chaser was at the show with two of its newest innovations. The "Smart Heater Bar" for humidifier units has sensors that allow it to turn itself off and turn on a red indicator light whenever there is no water at the tops of the pads. Installed next to the normal amber light, which goes on when water is low, the red light will signal the piano user to call a technician. The red light would go on only when 1) there is no water left in the tank, or 2) the pads are no longer effective. In either event, the bar would shut itself off to avoid overdrying the piano. The new Ultra V humidity control system includes five dehumidifiers, one humidistat, one

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humidifier tank, with low water light and fill tubes, and a mylar shield to seal the back of the piano. The system provides control on both sides of the soundboard. According to Dampp-Chaser President Bob Mair, initial reports on this system have been excellent. "While the standard 5PS does a good job," says Mair, "the Ultra V is a significant improvement." For $10, Dampp-Chaser also offers a video tape featuring Bob Anderson, RPT, on installation procedures.

They Said It Couldn't Be Done

Electronics continue to be the wave of the future in music. We're all familiar with MIDI keyboards, digital pianos and synthesizers, etc., but one item which I thought would be interesting to piano tuners is the achievement of real-time just intonation for electronic keyboards. Justonic Tuning, Inc., of Vancouver, BC, demonstrated a working system which makes it possible to play a standard keyboard in just intonation! The heart of the system is a computer program which instantly retunes intervals as they are played, so that each and every interval is tuned pure, or just. How does the computer decide what chord is actually being played? There are two options. In manual (or is it "pedual?") mode, the player presses a foot pedal on the provided one-octave pedal board. The pedal indicates to the computer what the root of the chord is, and the program takes it from there. In "auto-detect" mode, a computer algorithm determines what the root is, and tunes the intervals based on that determination. Although it is possible to fool the computer with certain harmonic combinations, it seemed to handle the more common chord structures pretty well.

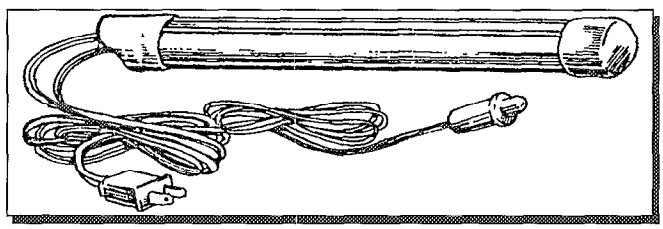

Figure 1 — Dampp-Chaser "Smart Heater Bar."

Justonic has entered a partnership with Virtual DSP Corporation of Everett, Washington, and announced a line of products including modular synthesizers and computer software and peripherals. According to Bill Gannon and Rex Weyler of Justonic, the aim of their company is not necessarily to build keyboard instruments, but to license other manufacturers to incorporate the Justonic just intonation algorithm in keyboards they manufacture.

Photo 6 — Macy Blackman and Jenny Lee Sheldon of Beethoven Piano Supply Company.

Sales Trends

Most of the piano exhibitors I spoke to felt that sales in 1995 were pretty similar to sales in 1994 — that is, not great, but holding fairly steady. A few claimed that sales had increased over the past year; for example, Earl Matzkin of Geneva International Corporation, importers of Petrof pianos, cited a 28 percent increase in sales. "The increase would have been larger if we'd had more product," Matzkin said. Samick also reported an unspecified increase in piano sales in 1995 over 1994. Some exhibitors reported an increase in the proportion of vertical piano sales to grand piano sales, while others, like Kent Webb of Baldwin, said that demand for grand pianos exceeded available production capacity.

The piano industry continues to be a dynamic one. Well-managed midline companies such as Baldwin, Kimball, and the Japanese, Korean and German firms, continue to adjust to the changing market and do what it takes to remain profitable. A few legendary smaller companies continue to burnish their images as makers of handmade instruments for the connoisseur, while the upstart Chinese and Russian piano makers continue to push the low-cost envelope, in some cases forging alliances with long-established companies. Let us hope that all these strategies will, in the long run, benefit the consumer, and that the piano industry will experience a 21st-century renaissance. Coffee, anyone?

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Blown Away By the NAMM Show! or ... Do Piano Technicians Have a Future?

By Randy Potter, RPT
Portland Chapter

I have been considering attending the North American Music Merchants (NAMM) Show in Anaheim for about the last 10 years. This year circumstances were such that I decided to make the trip. Held in January each year, thousands and thousands of performing artists, music store owners, dealers, buyers and onlookers, crowd into the spacious convention center to see about 2,000, give or take several hundred, manufacturers, suppliers, music merchants and service providers show off their stuff. And I am not referring just to "products," but also to the many, many shows, exhibitions and demonstrations that took place all week.

In this article I will focus on my thoughts and perceptions about the show and its offerings and, perhaps most important, how it relates to us and our industry — piano manufacturing and piano service. First, I should say that I was absolutely blown away by what I saw and heard!

Many Piano Manufacturers

I realized in my discussions with the other technicians and factory personnel I met there, that the large contingent and presence of manufacturers at NAMM was normal. As the week progressed, I saw the reason: piano manufacturers come to NAMM to sell pianos! Every maker had all, or most all, of their sales force present — and plenty of tables, chairs and sharp pencils. Several even had a half-dozen or more private, soundproof sales rooms! (Some even provided sandwiches and drinks for their people and clients.) As the week progressed, the initial "looking" turned to sitting down with store owners or buyers who were becoming new franchisees, or existing dealers who were ordering pianos for the coming year. With earnest looks on their faces, and order pads in their hands, they performed their raison d'etre; selling pianos! And since these are not the kind of activities that take place at PTG conventions, there is little incentive for the manufacturers to put on this kind of show, and the great expense it requires, for us.

Many Musical Options

And, it was not just piano manufacturers. There were displays of every type in every facet of music expression. There were five convention halls, each at least twice the size of the exhibit halls we use for our Annual PTG Convention each July. Smaller instrument makers filled most of one hall, with more guitars, strings, makers, hand drums, wood and bamboo wind instruments, and more, than I even knew existed. Smaller software companies were also in that hall, including a half dozen places offering to advertise our services on the Internet, more offering CD production services or equipment, cassette and DAT reproducing equipment, and more. Other halls had dozens and dozens of makers of every sort of instrument, from hand-made guitar and wind instrument shops like Breedlove Guitars to the larger companies like Fender, Blessing, and so on. Others displayed every brand and model of sound reinforcement equipment, including amps, stands, microphones, and every sort of device known to man — even two who were offering to install MIDI interfaces in accordions!

Perspective Check

It only took a few minutes to begin to realize that contrary to what I previously thought, we — the piano industry as a whole — are only a very, very small part of what is called "the music trade." Of the 70 listings in the PIANOS section of the NAMM Show Directory's Product Category Listings, only half had anything to do with pianos, and only 25 of those were manufacturers - and that out of over 1,200 brand listings! Jim Schmitt, PTG Trade Relations Chair, brought it into perspective when he said, "When you take a look at the incredible amount of companies and products vying for the discretionary dollar, and the huge numbers of persons in the other areas, we do not have the luxury of making the mistakes of the past as it relates to trade relations. The manufacturer is going to have to do the job they do better when it comes to presentation, as does the dealer, as does the technician providing in-store and after-sale service. The sheer dynamic of what was available at the NAMM Show meant that the piano only held a fraction of the choices available for music making. Individuals in the past who bought pianos may not have purchased those pianos had they had the same choices the consumer has

today. But now our consumers do have those choices, and so interest in the piano, wherever it is found, needs to be supported and cultivated in any, and every, way we can stretch our imagination to do it." Jim, by the way, puts feet to his words, as he is the catalyst for the SPELLS Program in Oregon.

I had another perception adjustment Saturday evening, while having a discussion with Frank Mazurco, production manager at the Steinway Factory, over at their display at the Doubletree Inn. Jim had commented to Frank to the effect that what was happening at the low end of the spectrum, in the $3,000 market, was of little concern to Steinway, but that he was curious as to what they (Steinway) were thinking about the new, lower priced pianos entering the marketplace today. Frank responded that Jim's perception was incorrect, and that Steinway was very interested in the other end of the spectrum, and would do everything that was within their abilities to encourage and assist it! "Our studies show that 75 percent of our customers are not first time buyers; they had another piano first. Steinway's customers today are the entry level purchasers of 15 years ago. If there is a drop in the market today, for whatever reason, whether it be an economic slump or a change of focus in the music industry, we won't see that today - but we will see it 15 years from now. We know that most people are not going to buy Steinway as their first piano, so whether or not they are buying a Steinway this year, we hope they are going to buy a piano."

Observation of my own children, in our own home, tells me that when they are listening to tape decks, watching the TV or doing something on the computer — they are not playing the piano. They both love the piano, and they both play it daily. Even though we have a piano (some of us have two or three), most of us also have TVs, radios, stereos, CDs and computers, which both we and our children use. But when piano purchasers of the 1910s and 1920s considered "diversions" in their lives, they had far fewer choices than we and our children have today. If they had the vast number of options available then that we do today, would they have made the same choices? It's not very likely.

The point to all this? We, as piano technicians, need to realize that while many, many people are hooked on music making, they are not all as convinced as we are that it should be on, or even start with, the piano. In addition to the various other types of instruments people use, the silicon age has brought in not only plastic keyboards (fodder for another article) and MIDI sound capabilities, but computer programs that allow people to learn music, and even make music, without having an instrument at all. What this means to us, and our industry, is that we need to be — or become — pro-active. We do not have the luxury of sitting around waiting for business to come to us. It is not a given, anymore, that people will buy pianos, or if they do buy, that it will be made of wood and steel. When a dealer or salesman insults them and they leave the store, it is not necessarily to go to another piano store. And when a tuner insults them or their piano in the home, not only may you not be called back for the next service — they might decide to sell it and purchase an instrument that does not require our services. Further, we ought to be involved in our community, promoting the piano and its use to teachers, both piano and school, to school children, and encouraging the local dealers who sell pianos to our soon-to-be clients. Just as Frank Mazurco pointed out that many of Steinway's customers in 15 years are the entry level buyers this year, our tuning clients are those same buyers — regardless of the quality of piano they are able to select. Our regulating clients in five, 10 or 20 years from now are those same people, and if they are turned away from a piano purchase for some reason this year, we piano technicians don't lose a tuning — we lose 20, 40 or 100 tunings during the life of the piano, a couple of regulations, many minor repairs along the way, maybe a major overhaul or rebuild, and our industry suppliers, like Dampp-Chaser, lose the opportunity to ever provide products for the consumer's piano.

Bright Future

And lest you think all this new found knowledge has given me a negative perspective on our industry, or on our place as piano technicians, I will point out some serious upside to all this. For example, I see a host of piano companies entering the market place — the opposite of what we have been seeing in recent years. Yes, Kimball closed their plant in Mexico, but the plant was purchased and moved, lock, stock and barrel, to China, where it is again making pianos. And, if I have my figures right, Young Chang recently invested $40 million to build a plant in China, which is capable of building 100,000 pianos a year. Also, Yamaha recently purchased half of the Pearl River factory, and though I was told this was to produce pianos only for the Asian market, I have also been told by dealers here that they are also seeing increased quality in the pianos they are receiving from that plant. On the home front, Mason & Hamlin has been bought out of bankruptcy by piano technician-rebuilders, and they are very optimistic about their future. Baldwin is introducing new models and updated technology in their pianos. Charles Walter is growing each year. Steinway is strong. Am I worried about the high number of plastic piano-shaped things being sold today? No, not in the slightest. In 1986, if I have my figures correct, new piano sales were down to some 78,000, while keyboards were up over 5 million. The result? Many kids whose parents never would have bought a piano did buy an inexpensive keyboard, instead, found that the kid had musical ability they had not seen, gave them lessons, and ended up buying a piano. Many of those same kids are getting out of college and looking at buying their own piano soon. And new piano sales, as a whole, are up some 60 percent over 1986.

On the other hand, a decent piano has a life of 50 to 100 years, and a decent electronic keyboard has a life of only five to 10 years. And since a piano will likely receive service, at some level, throughout its life span, yes, I see an excellent future for piano technicians.

The Mechanics & Strength Of Wood & Wood Structures Part 1 — Basic Mechanics

By Delwin D. Fandrich, RPT
Contributing Editor

Introduction

If it weren't for troublesome stuff like strings and hammers we wouldn't need to concern ourselves with technicalities like the mechanics of load-bearing structures and mechanical linkages and levers or with boring subjects like the strength and mechanical characteristics of wood. As it is, since strings, hammers and much more are necessary if we're to have pianos and make music from them, we do have to know something about the materials they are made from and the forces acting on their various parts if we're to understand how they work.

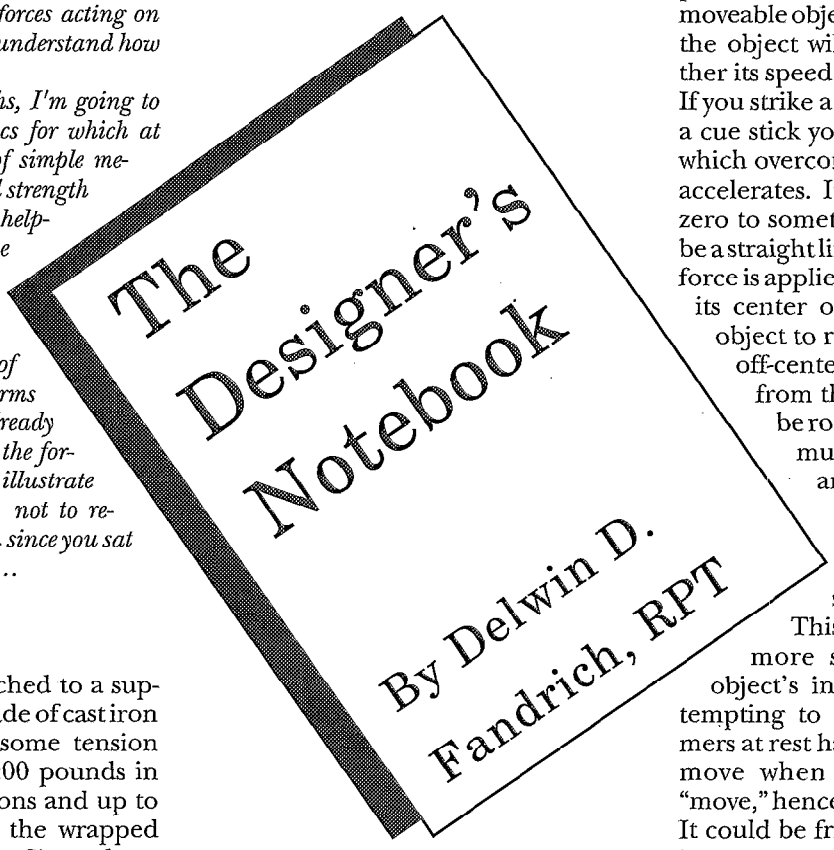
Over the next few months, I'm going to discuss several different topics for which at least some basic knowledge of simple mechanics and the structure and strength characteristics of wood will be helpful. Since we need to speak the same language, there will be a few technical terms. There will also be a few simple formulas, but don't be afraid of them; most of the technical terms are words you're probably already somewhat familiar with and the formulas are only included to illustrate relationships and principles, not to remind you of how long it's been since you sat through high school algebra....

Basic Mechanics

Piano strings are attached to a supporting plate — usually made of cast iron — and are stretched to some tension between about 150 and 200 pounds in the tenor and treble sections and up to 350 or more pounds for the wrapped strings in the bass section. Since there are about 220 to 240 of these strings there is generally somewhere between 35,000 and 45,000 pounds of string tension that needs to be supported by the plate.

A piano hammer having a mass of between four and twelve grams is attached to a hammer shank that is 5.8 mm (7/32" in most U.S. built pianos) in diameter and is accelerated by a force acting through a system of levers to a maximum velocity of somewhere between 6 and 9 meters per second (or approximately 20 and 30 feet per second) depending on the piano and the particular note being played.

Like it or not, there is an exceedingly complex system of forces and resistances to those forces present in the piano. When a piano is performing brilliantly, it is because all of the various forces are controlled and working as intended and every part of the piano is doing the job it was designed to do. If, however, some of these forces are not controlled and are not being used efficiently then some part or component of the piano will not be able to do its job properly. Understanding the mechanical forces in the piano and the physical structures designed to control and use them should help us figure out how to cope with them when they are not as intended. While the entire structure and mechanics of the piano can be quite imposing, understanding the whole will be a little less imposing if we break it down to its simplest elements and look at them one at a time. We'll start with forces and loads.



Forces and Loads

The most fundamental concept to deal with is ***force***. Forces, which are also referred to as loads, have magnitude, direction and identifiable points of application. If a single force is applied to a moveable object with enough magnitude, the object will accelerate, changing either its speed or its direction of motion. If you strike a pool ball dead center with a cue stick you apply a force to the ball which overcomes its inertia and the ball accelerates. Its speed is changed from zero to something and its direction will be a straight line away from the cue. If the force is applied to a point not in line with its center of gravity it will cause the object to rotate. If you strike the ball off-center, it will still accelerate away from the cue, but now it will also be rotating around a central axis much like the earth rotates around its axis.

Forces have magnitude and direction but they can only exist if there is something to resist them. This resistance can have one or more sources. It could be an object's inertia resisting a force attempting to accelerate it; piano hammers at rest have mass and don't want to move when the hammershank says "move," hence, the hammershank bends. It could be friction resisting a force trying to move an object along some surface; a tight key bushing rubbing against a key pin will have friction and will resist the force trying to move the key, either up or down. It could be gravity resisting a force trying to lift it — again the hammer, which has mass that is affected by

gravity. The force trying to lift it toward the strings will have to overcome the force of gravity as well as accelerate the hammer's mass. Or it could be the stored energy of a spring resisting a force trying to compress it. The jack spring is always exerting a force against the jack, whether the jack is in motion or not.

Forces acting on a given object rarely occur singly. More typically there will be several forces that are distributed at different points on an object according to the way its masses and resistances are arranged even though only one force may have originally been applied to a single point. Forces are measured in ounces, pounds and tons.[1]

In the piano it is often necessary to differentiate between ***long-term forces*** and ***short-term*** forces. The force exerted against the bridge and soundboard assembly by the down force of the string plane (i.e., the string's downbearing) is a long-term force. The force transferred through the jack to the knuckle and hammershank when a note is being played is a short-term force. We'll look into the effect of this short-term force on the various action parts a bit more in a later article.

When forces are not distributed evenly against a body it will have a tendency to distort by bending or twisting. The effect of this bending or twisting is called the ***moment*** of force. Moments are measured in units of torque. In the U.S. this is typically foot-pounds or inch-pounds. When a tuning hammer is placed on a tuning pin and force is applied in such a way as to turn the tuning pin in the pinblock there is a bending moment in the tuning hammer and a twisting moment in the tuning pin.

Stress

Forces and moments cause actual physical deformities in the objects to the which they are applied. Even a massive and perfectly "rigid" cast-iron plate will twist and warp when 220-odd strings are attached to it and stretched to pitch tension. These deformities are always accompanied by an internal condition called ***stress***. Stress is measured in force per unit area; the units used in the U.S. are generally pounds per square inch. The amount of stress produced by a force depends on the magnitude of the force and the shape and geometry of the object. It doesn't matter what type of material the object is made of. The actual direction and magnitude of an object's physical deformation resulting from an applied force is very much dependent on the properties of the material it is made from, of course. You may or may not be able to see any physical deformation resulting from an applied force or load, but it is always present.

There are three types of stress to consider in pianos. Forces acting in-line but in opposite directions from one another produce ***tensile stresses***. The most obvious example of this in the piano is the piano string itself which — at pitch — is under fairly high tension. The tensile stress on piano wire is typically between about 100,000 and 225,000 pounds per square inch depending on where it falls in the scale.

Forces acting in-line but towards each other produce ***compressive stresses***. These cause objects to compress or shorten along the direction of the force. There are many parts of the piano that are under compression, but one of the clearest examples is that portion of the jack between the jack center-pin and the hammershank knuckle — nearly pure, straight in-line compression.

Forces that are acting away from one another or toward one another but which are not in-line with each other produce ***shear stresses***. Shear stresses cause objects to distort diagonally. Shear stresses exist in many of the working parts of the piano; all levers and structural beams have shear stresses in them. And there are a lot of levers and beams in the piano. There are also other less obvious components that are affected by shear stresses such as the belly rail where there will be a down force from the soundboard against the soundboard liner and an opposing upforce from the belly rail. These forces are opposing but not in-line with each other. Another obvious example would be the shear stresses found within a cantilevered bass bridge.

The Effects of Stress

Up to a certain point, most materials are ***elastic***. This means that they will deform under stress but, as long as the stress is kept below a certain limit, they will recover their original shape when the stress is removed. This limit is called the ***elastic limit*** of the material. Materials that are stressed beyond their elastic limit will not return to their original shape and they will usually lose at least some of their strength. They will retain at least some of the deformation that resulted from the stress. Music wire that has been removed from a piano will have permanent kinks in it where it passed through an agraffe, under a V-bar or through a set of bridge pins. At these points the wire has been subjected to stress that has exceeded its elastic limit, but it has not reached its breaking point.

How materials act at their elastic limit varies depending on the ductility of the material. ***Ductile*** materials will yield or bend — some part of the bend will be permanent — but not break when they are deformed beyond their elastic limit. Music wire is made of a type of steel that is fairly ductile. We can bend it around tuning pins, hitch pins, through agraffes, etc., without much danger of it breaking. ***Brittle*** materials will break after very little permanent deformation. Piano plates are cast using a type of iron that is quite brittle.

Most of the time, wood acts as a brittle material. It will bend up to a certain point, but then breaks catastrophically. It is somewhat more ductile when it is hot, or fairly moist or wet, but this doesn't do us much good since we usually go to some lengths to keep pianos reasonably cool and dry.[2]

Long-term Effects of Stress

Materials react somewhat differently to long-term stress than they do to short-term stress. Short-term stresses that come and go quickly will leave very little, if any, evidence of their passing. Long-term stresses, on the other hand, may well cause some permanent deformation even though they may not stress a material even close to its elastic limit. Deformation caused by long-term stresses is called ***creep***. Creep is the gradual and permanent deformation of a material under stress. Most metals do not suffer from appreciable creep — cast iron especially has excellent creep resistance. Wood is very susceptible to bending creep — hot or wet wood, especially so.

Fatigue is the failure of a material when it is subjected to repeated tensile stresses even though the magnitude of those stresses is well below its elastic limit. Fatigue failure is caused by the growth of a maze of tiny cracks at a point of stress concentration. The development of these cracks is generally very slow until they reach a certain critical size at which point they grow spontaneously during the next stress cycle and the part fails. Many metals are particularly susceptible to fatigue failure; piano strings sometimes fail due to fatigue failure, usually at the V-bar. The brass action parts used in some older actions are susceptible to fatigue failure.

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During normal use they are subjected to repeated stresses, which starts a maze of cracks that continues to grow until the part fails catastrophically under a seemingly light blow. Wood, along with most laminated composites and fiber-reinforced plastics, is particularly good at resisting the effects of fatigue.

The duration of the expected load is one of the main criteria to be considered when choosing an appropriate material for any part. A mechanical structure can be loaded briefly to a level that would destroy it if the load were to remain for a long time. An example of this is the hammershank. The temporary load acting on the wood fork of the hammershank creates a stress that would be sufficient to break the wood around the felt bushing if it were to remain for very long. But, because of the very short duration of the load involved, the system works quite reliably.

Load-carrying Structures

Basically, load-carrying structures can be divided into two classes: ***tension members*** and ***compression members***. Some structures, such as a load-carrying beam, will contain both. Stiffness is not an indicator of a material's tensile strength. Tension members may be rigid, such as a steel beam used to hold the center of a suspension bridge span (not all suspension bridges are built like the *Golden Gate*), or they may be flexible like a piece of rope or a piano string. Different materials vary in their ability to cope with tension stress. Music wire has very high resistance to tension stress while the iron used in piano plates has particularly poor resistance to tensile stress. Wood, also, is very weak in tension and has very poor long and short term resistance to tensile stress. We'll look at this quality of wood more specifically in later articles dealing with actions and soundboards.

Compression members must be rigid. A flexible object (or a rigid object that is too small in cross-section) will fail to resist a compression force by simply bending or buckling under a compressive load even though that load may not be great enough to otherwise damage the material. To eliminate buckling, compressive members often need to be much larger than would otherwise be absolutely necessary. For example, a set of three hard maple piano legs about 5 mm (0.2") square should be able to support the weight of a typical grand piano if we could just ignore the small problem of their buckling. And indeed, over the years many manufacturers have explored the limits of just how small the legs can be made and still hold up a piano — usually giving new meaning to the musical term "vibrato!"

A simple beam will have internal tensile stress, compressive stress and shear stress (See Figure 1) resulting from the bending movements caused by one or more forces acting on it at various points. Many of the beams we are concerned with in the piano are simple straight (or nearly straight) beams that are supported in their centers and loaded at their ends. The piano key is one of the best examples of a simple beam we can find in the piano.

When a simple beam has a force or a combination of forces applied to it, it will bend. The material on the concave side will be pushed together by compressive stress, the material on the convex side will be stretched apart by tensile stress. Both of these stresses diminish toward the center of the beam until they reach zero at the neutral axis. At the neutral axis there is neither tensile nor compressive stress. The length along the neutral axis will be exactly the same length as the length of the beam before it was bent. The convex side will be longer and the concave side will be shorter.

Beams are also subject to shear stresses. Unlike the compressive and tensile stresses, shear stress remains relatively constant throughout the vertical section of the beam. It drops off abruptly to zero at the faces of the beam and abruptly changes direction at the center, but its magnitude is fairly constant. It is the ability of the beam to carry shear stresses that allows the outer faces to do most of the work of resisting the compression and tension bending stresses, hence the development of the I-beam. When a wood beam fails, the failure will usually start on the convex side — the side under tension.

The Strength of a Simple Beam

Figure 2-A is a drawing of a simple beam that is supported at both ends and

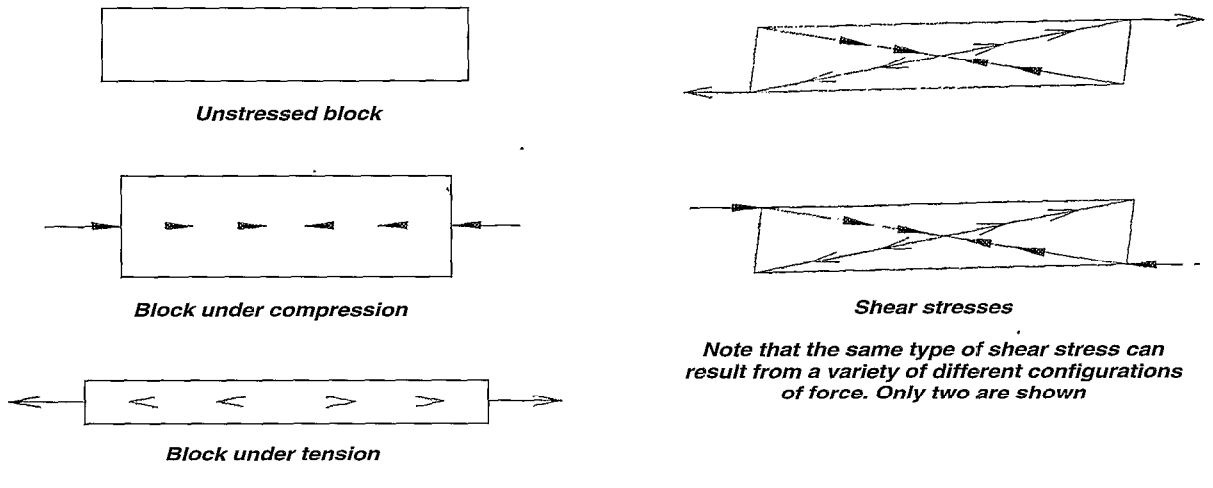


Figure 1
Stresses and their effect on rectangular objects

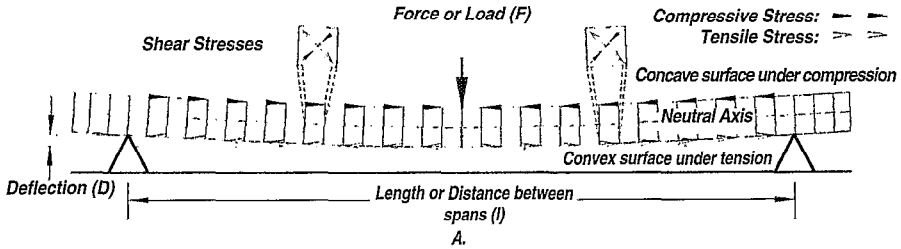
loaded in the center. It is rectangular in cross-section. With a load applied to the center, the beam will bend. How much it will bend can be determined by the formula $d = {}^{Fl^3}/_{4Ewh^3}$ where:

d = the ***deflection*** of the beam,
F = the ***force*** or ***load*** applied to the beam,
l = the ***length*** or the ***distance*** between spans,
E = the ***modulus*** of elasticity,
w = the ***width*** of the beam, and
h = the ***height***, or depth, of the beam.

Unfortunately, there are very few simple end-supported beams that are exactly center-loaded in the piano, however, looking at the formula will still show us a lot about how the actual beams that are found in the piano work.

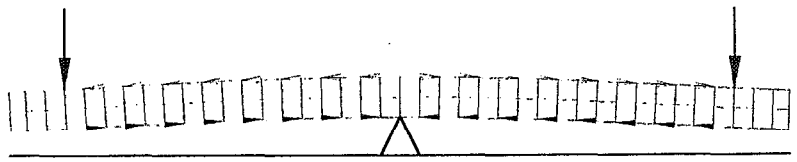
Analyzing the formula shows that the deflection of this simple beam increases in direct proportion with the load and with the cube of its length, and it decreases inversely with the beam's width and with the cube of its height. This tells us that if we made a particular beam twice as wide we would reduce its deflection by one-half with the same load. It would also be twice as heavy. Or we could make it twice has high. Doing this also would double its weight, but its deflection under the same load would be one-eighth that of the original beam. As well, if we could make the beam one-half as long we would decrease its deflection under the same load to one-eighth that of the original beam.

Look now at Figure 2-B and see what happens when we turn the whole assembly over. Now the supports are above the beam and the load is pushing up from the bottom. Next, let's change the supports into loads and change the load into a support (Figure 2-C). Since we can change things pretty easily on paper, let's move the support a bit to the left in the drawing. Looking at this beam, we see that it is a relatively tall and long beam and it might tend to be a bit tipsy, so let's put a pin through a slot in the center of the beam to stabilize it (Figure 2-D). By now our beam should be familiar. Hang on to this thought; we'll be back to it in a month or two.

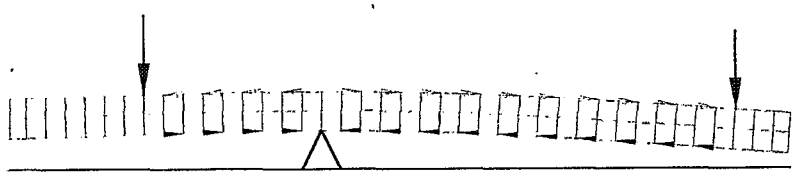


A.
A simple end-supported, center-loaded beam.

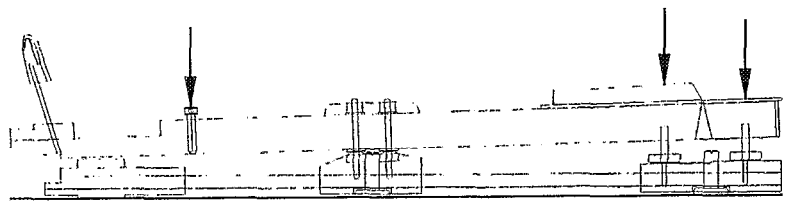
When a "downforce" is applied to the simple beam illustrated above, it creates a bending movement which causes the beam to bend. The tensile and compressive bending stresses developed by the bending moment cause the material on the concave side of the neutral axis to compress — it becomes shorter — and the material on the convex side to stretch — it becomes longer. The bending moment, and the compressive and tensile stress, varies with the horizontal position on the beam. In the simple beam shown, the bending moment along with compressive and tensile stress is maximum at the center and diminishes to zero over the supports. At an horizontal point on the beam, compressive and tensile stress diminishes to zero at the neutral axis.
The shear stress causes the material within the beam to distort diagonally. Unlike the compressive and tensile stress, shear stress does not vary with either its horizontal or vertical position on the beam. Shear stress drops off to zero abruptly at the faces of the beam and beyond the supports. Otherwise its magnitude is fairly consistant throughout the beam, though it changes direction at the neutral axis.



B.
There is now a single support which has been moved to the center of the beam and two forces are applied — one to each end of the beam. These downforces are now in the same locations as the supports were in originally.
The beam has now become an end-loaded, center-support beam. Stresses in this beam have the same magnitude as those in the beam illustrated in Figure 2-A, but their directions are inverted.



C.
The support has been moved off-center and the loads have been moved. Since our beam is no longer center-supported, the standard formula for beam deflection under load no longer applies exactly, but the principle is still the same. The deflection of the beam under load is still related to the cube of its height.



D.
With some embellishments, our beam has now become a piano key.

Figure 2.
Stresses in Simple Beams.

Summary

While this doesn't begin to cover the complexities of all of the different forces and their effects on objects of widely varying shapes and materials, it should at least allow us to speak the same language in the next few articles as I get into how piano actions and soundboards work. Each of these concepts, taken by itself, is fairly uncomplicated.

Next month we'll look at wood a bit more specifically and then, with any luck, move into an analysis of piano actions. There we will see why and how the principles discussed in this article contribute to and limit the tone performance and power of the piano. So stay tuned.

Notes

1) Alas, this is true only in the U.S. It looks as if it will remain true until we, the people, decide it is time to join the industrial nations of the world — our leaders haven't the courage. Even the nation that invented the ridiculous system of measurements we insist on using has wisely abandoned it!

When I began to actively design pianos for a living, it quickly became apparent that the metric system of mea-

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surement was a much more convenient and reasonable method of indicating distances. This was particularly so since I also needed to communicate with, and exchange drawings and specifications with, people and companies in other countries, most of whom had never found it necessary to deal with the fatuity of inches, feet, yards, rods and miles. So, rather than struggle with the inevitable, I switched. I found the change-over to be relatively painless as long as I made no attempt to convert back and forth between the two systems. To make my technical lifer easier, I established my ***metric rule***: I don't convert. I now design pianos and parts of pianos using the metric system of measurement exclusively. If someone in a U.S. company needs to work in the English system for some inexplicable reason, they must do the conversion themselves. I should point out that this almost never happens these days.

However, since I was working for an American company at the time I began this practice, it did lead to some interesting situations. On one occasion I turned in a scale stick chart all nicely dimensioned in millimeters as part of an order for an action and keyset I needed for a piano I had designed and was preparing to build. A couple of days later, when I looked in to check on the progress of my order, I found a member of the engineering staff carefully converting all of my metric dimensions into inches and fractions of an inch (down to 1/128"!) in preparation to sending the order on to the action maker. The action maker, of course, was not located in the U.S. So, once the action maker received the order a member of their engineering staff would have to just as carefully convert all of those numbers back into the metric measurements they worked with. To the best of my knowledge, the order did indeed go the action maker with inch/fraction dimensions. Well, go figure....!

In case you hadn't noticed by now, in my articles all distance dimensions are given in metric units of measurements — usually in millimeters. I've not decided to do this with measurements of mass and density yet for a variety of reasons I'll not go into here. When I remember to do so I've also been providing the approximate English equivalent, although in deference to my "***metric rule***," I'm thinking of discontinuing this practice. The metric system of units and measurements is really very simple — it's the conversion from one system to the other that drives us all nuts!

2) This is basically what happens when we heat wood to bend it. We lower the elastic limit of the wood by heating it. Then we bend it beyond its elastic limit and allow the wood to cool. Once cool it retains some part of the bend that is actually between its original shape and the maximum amount of the bend we put in it while it was heated. Unfortunately the wood will have also lost some of its strength in the process.

Troubleshooting Piano Problems — Part 3

By Ernie Juhn, RPT
Long Island Nassau Chapter

A Curious Case

The piano is an upright of Asian make (Kayasacheng). The instrument is fine; all is well — except — there is a slight buzzing sound on certain notes. It is there most of the time, but the strange phenomenon is that the notes which excite this little buzz vary. One up, one down, always in the middle of the keyboard. Often the buzz goes away when the sustain pedal is used, but not always and not reliably.

So far we have hardly any clues except that it is not always the exact same note that excites it, and another variable: the sustain pedal. The logical approach is to move the sustain pedal rod by hand without using the pedal. No change. So we know that it has nothing to do with the pedal. Next, move the damper lifter rod up and down by hand. Ah, now it does not do it. We check the pins and (plastic) dowels on the metal pedal rod; they are tight. Although it does not seem logical, lubricate both pins which fit into a rubber grommet at the top (action end) and felt-bushed metal pedal lever (bottom). The vibration is back — intermittently. What now? I will put an end to your suspense. More logic: it does not do it when moved by hand but it does it ... when moved by pedal rod! Check the pedal rod! I did and believe it or not (remember these pianos have tubular pedal rods), I found an extra pin inside the rod! You know the cure....

Illegitimate Complaints

It is not infrequent that we have to deal with problems that really are no problems. I am speaking of complaints about "things" that customers hear or feel but which are really not legitimate complaints. Before I go into specifics, let me make a statement. No matter how illegitimate it may sound to us — the customer hears, feels or, imagines something and it is up to us to fix (or successfully) explain it. Do not forget that no matter what, if you succeed in doing that, you have a faithful customer to keep forever! Old or new customer... no difference. Old customers will remain yours — and new customers will never let you go. Now for some ***real*** examples. — On a vertical piano, the complaint is "the left pedal doesn't do anything". Here is my way of dealing with it (provided that it is really working). I first remove the front board so the action is visible. I then step on the left pedal to show the customer that "something is moving" and say it ***is*** working! Then I explain that if the hammer moves only about half of its way - it has less power — and therefore there is less volume. Mind you, I haven't played a note yet. This is the point where I make sure that I made myself clear. Only then do I play a chord(!) with and without the pedal depressed (It is up to you to cheat or not to cheat lightly...).

Next we have the case of the ringing treble. As we all know, pianos have about 65 to 67 dampers and after that, no dampers at all. Most customers accept this and are happy. Some, however, may not accept it. There is always someone who will point out the marked difference from a muted note to an unmuted one. In fact, some manufacturers have started cutting the last damper felt in such a way that it only mutes part of the last unison, making the transition less noticeable. How do we deal with that complaint? It has been my practice to burden the customer as little as possible with theoretical talk. The reason is simply that I've found that most of them just don't want to bother listening to it. So, in the case of the ringing treble dampers I simply explain that the shorter the strings, the less sound they produce, and the manufacturers compensate for this by letting them ring a little longer. Naturally, that is a rather simple way out and does not always work. If I come across a customer who tells me that "the piano teacher said that his/her piano has dampers on all 88 notes" the problem becomes a little more complicated. Don't forget that the student sees the teacher once or twice a week but the piano tuner is lucky to have contact with the customer once or twice a year. Consequently, just due to the law of averages, the tuner/tech's credibility is at a disadvantage. My last resort is to ask if the customer has a friendly neighbor who owns a piano — any kind of piano. If lucky, the answer is yes and we can go and prove the point.

"In The Dark"

There are some cases where the customer clearly hears something, but we cannot. I am speaking of a legitimate complaint, where we know that the customer is sincere and yet we just don't hear it. First, let us recognize that this is a very ***real*** problem. Even those of us whose hearing is excellent can experience it. You may remember in one of my previous articles I mentioned that it is possible for some of us to react in various ways to different frequencies. So how ***do*** we handle such a situation? Depending on who we are dealing with, it may or may not be practical to explain the above to the customer. The result in either case should be that we use the customer as an indicator. For instance, in order to track down a buzz originating somewhere on the soundboard or a bridge, have the customer play the offending key or keys, while you push or touch various parts of the soundboard or bridge and ask the customer to point out when a change occurs. It is important to say "a change" rather than "if it goes away." By finding the location on the board, bridge or whatever we are working on, it should be possible to pin down the problem.

Interpretation

The call is to a console piano. The complaint: "My piano goes out of tune as soon as it is tuned." The tuner: me (when I was young, long ago). I came

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My Personal Taste In Well Temperament

By Daniel Ressl

From Owen Jorgensen's book, *Tuning*, pages 417-424, we find that Jean Jousse published a bearing plan which is suitable for both well and equal temperaments in 1832. By the 1880s this bearing plan had become common practice.

Jousse did not include beat frequency numbers in his instructions, Owen Jorgensen supplied the appropriate beat rate for equal temperament and remarked that "when using Jousse's second bearing plan for well temperament, one is free to do anything according to one's personal taste."

I prefer classical harmonic balance in which the major third C-E is the one and only smallest major third because it represents no alteration (no sharps or flats in the C major key signature), the major third C#-E# is the one and only largest major third because it represents the ultimate alteration (seven sharps in the C-sharp major key signature), and the remaining major thirds change their sizes from smallest to largest in the order in which major keys increase in sharps and in flats. I prefer a maximum eighteen cents width in the widest major third to avoid shocking the ear when performing music containing many flats and sharps. I prefer the minimum possible width in the C-E major third to produce the greatest possible contrast of harmonic color, since the basis of musical art is balanced contrast. A pure E-E octave only has room for forty-one cents width total in the three major thirds E-G#, A-b flat-C, and CE. Now, when E-G# and A-b flat-C both occupy as much as possible of the E-E octave, which is nearly seventeen cents each, to separate their color from the largest eighteen-cent width of C#-E#, nearly seven cents remains. The preferred minimum width possible in these circumstances is nearly seven cents, in the C-E major third. I prefer a maximum of two beats per second in any of the fifths or fourths in the bearings, so that the illusion of purity in fifths can be maintained as the tuning is completed by octaves beyond the bearings. I prefer only two beat rates in the fourths and fifths tempered in the bearings, to simplify laying the bearings. I prefer easily counted beat rates in the fourths and fifths, and dependable test intervals to keep the tempering accurate as the bearings proceed. I prefer that the final fifth Ab-Eb works out nearly pure on paper in theory, so that the circle of fifths may be completed without wild beatings, in the real world.

These preferences outline my personal taste regarding Jousse's bearing plan. The flexibility of this bearing plan to completely accommodate my personal taste on all of the above points reflects Jousse's genius.

Well Temperament, F33 to E44

C40 Tune middle C in with a tuning fork. Ab 24 and the tuning fork beating at the same speed as Ab 24-C40 proves that C40 matches the fork.

G35 Temper G35-C40 $1^1/_2$ BPS wide. $1^1/_2$ BPS is easy to count, as every second count of 3 BPS.

D42 Temper G35-D42 $1^1/_2$ BPS narrow.

A37 Temper A37-D42 $1^1/_2$ BPS wide, A37-C40 nearly 8 BPS proves that the tempering is accurate to this point.

E44 Temper A37-E44 $1^1/_2$ BPS narrow. Check C40-E44 nearly 5 BPS, and G35-E44 nearly 6 BPS. Decimal point figures on beat rates are merely guides to help compare one beat rate a little closer or further from another. They are not meant for inhuman precision! C40-E44 5.2, G35—E44 5.8. Check the mellow chord shading of G35-C40-E44.

B39 Temper B39-E44 $^1/_2$ BPS wide. $^1/_2$ BPS is easy to count, as every second count of 1 BPS. Check C40-E44 5.2, G35-B39 5.3, G35-E44 5.8. Check the mild chord shading of G35-B39-D42.

F# 34 Temper F# 34-B39 $^1/_2$ BPS wide. D30-F#34 slightly slower than D30-B39 proves that the fourth is wide. Check the increasingly bright shading of F#34-A37-D42. G35-C40-E44 mellow, G35-B39-D42 mild, F#34-A37-D42 bright.

C# 41 Temper F#34-C#41 $^1/_2$ BPS narrow. A25-C#41 slightly slower than A25-F#34 proves that this fifth is narrow. G35-C40-E44 mellow, G35-B39-D42 mild, F#34-A37-D42 bright, A37-C#41-E44 brighter.

G# 36 Temper G#36-C#41 $^1/_2$ BPS wide. E32-G#36 slightly slower than E32-C#41 proves that this fourth is wide, Ab36-C40 nearly 10 BPS proves that the tempering is accurate to this point. Check the chord shadings G35-C40-E44 mellow, G35-B39-D42 mild, F#34-A37-D42 bright, A37-C#41-E44 brighter, G#36-B39-E44 brilliant.

F33 Temper F33-C40 $^1/_2$ BPS narrow. Ab24-C40 slightly slower than Ab24-F33 proves that the fifth is narrow. Check F33-A37 4.6, C40-E44 5.2. G35-C40-E44 mellow, F33-A37-C40 mild. F33-A37 4.6, C40-E44 5.2, G35-E44 5.8, F33-D42 6.1

Bb 38 Temper F33-Bb38 $^1/_2$ BPS wide, Db29-F33 slightly slower than Db29-Bb 38 proves that the fourth is wide. Check C40-E44 5.2, F33-D42 6.1, Bb38-D42 7.3, A37-C40 8.2. Check chord shadings G35-C40-E44 mellow, F33-A37-C40 mild, F33-Bb 38-D42 bright.

Eb 43 Temper Bb38-Eb 43 $^1/_2$ BPS wide. Gb34-Bb38 slightly slower than Gb34-Eb43 proves that this fourth is wide. Check that the fifth G#36-D#43 is nearly pure.

Continued on Next Page

B27-D#43 should beat almost the same as B27-G#36. Check chord shadings G35-C40-E44 mellow, F33-A37-C40 mild, F33-Bb38-D42 bright, G35-Bb38-Eb43 brighter, and Ab36-C40-Eb43 brilliant.

This completes the bearing section from F to E.

Table One
Temperament Cents Values For Electronic Tuning Aids

F33	-0.3	B39	-5.7
F#34	-5.0	C40	0
G35	-1.4	C# 41	-4.6
G#36	-3.7	D42	-3.8
A37	-4.8	Eb 43	-2.0
Bb38	-1.0	E44	-6.8

Table Two
Harmonic Balance Cents Widths of Major Thirds

Increasing Sharps		Increasing Flats	
C-E	6.9	C-E	6.9
G-B	9.3	F-A	9.2
D-F#	12.5	Bb-D	10.9
A-C#	13.9	Eb-G	14.4
E-G#	16.8	Ab-C	17.4
B-D#	17.4	Db-F	18.0
F#-A#	17.6		
C#-E#	18.0		

Troubleshooting Piano Problems — Part 3

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to the house and found the piano fairly well tuned. What now? I tuned it again, thinking that I must be dealing with a very critical customer. I did my best: checked, double-checked, and went over everything again: I found nothing unusual, did not believe that the tuning pins were loose, nothing. I called the customer and asked her to try the piano; she did, found it to be fine and said, "but that is always the case. When it is tuned it is okay and as soon as the tuner leaves the house it goes out of tune." The customer paid and I left. As soon as I got home the phone rang. "It did it again," I heard the familiar voice say. Being a conscientious person, I went over right away and was anxious to see what I would find. I found nothing. The piano was as well (or as badly) tuned as I left it. I did not give up, went over everything even more thoroughly and when I was satisfied that all was fine, again my customer checked everything and found the piano to be satisfactory. When I got home, you guessed it, my lady was on the phone again with the same story. Mind you, I did not think that she was doing that on purpose. I was convinced that something was indeed going on, but what?

Suddenly I had an idea, I asked here if she was in the room where the piano was and she said no. I then asked her ***not*** to go into that room and wait for me, I would be right over (luckily it was not far from home). I went, and how simple it was! Here is what happened. The young lady had a decorative silver plate with all kinds of little chains on it, hanging on the wall above the piano. Knowing that I would have to open the piano in order to tune it, she removed that plate before my arrival and after I left replaced it again. The thing rattled! She called it out of tune.... Of course, it also rattled for all other tuners. By the way, when this young lady called me initially, she wanted to know whether I tuned "by ear or by machine."

The most difficult problems to solve seem to be those involving tone quality complaints. It is amazing how many different ways people use to describe the same kind of situation. The most common one I know of would be the famous "buzz." Among other interpretations, this multi-talented annoyance can often be found to be nothing but a high pitched harmonic, generally caused by unusually hard hammers. As we all know, the human ear recognizes sound (tones) within a certain range. If the harmonic (produced by this hard hammer) exceeds the upper limit of sound (tone) recognition, it manifests itself as a buzz. So far, no problem. If we take into account the fact that the harder the hammer, the more of these "harmonics" it will produce, we have more to think about but we can still deal with the problem fairly well (by manipulating the hammer, for example).

Let me just add one more ingredient. With most people another rather disturbing rule applies, namely that the upper frequency limit of sound recognition diminishes with age. Now it is not so simple anymore, is it? Think of the possible variations. For instance: the customer hears better than the tuner — or vice versa. In the customer's family only the young child hears well but the parents are complaining, and so forth.

Let us sort out the ways this can be dealt with. The most important thing is that the technician hears it, right? Well, there is a silver lining somewhere. One small secret I did not mention: volume makes a difference! The louder it is, the easier it is to hear this "buzz-tone." So whether it is you (the tuner) who suffers that "frequency limitation," or one of the customer's family members, you can apply this knowledge and hopefully solve the problem. As in most of these examples, diagnosing is the fun part of troubleshooting — fixing it is boring.

Behold The Upright

By Don Valley, RPT, M.M.

Springs, Rails, & Other Things

"The subject of installing springs causes many technicians to squirm because it is often perceived as being a tedious, unnecessary, and unrewarding task. Maybe tedious to some, but hardly unnecessary or unrewarding! Neglecting such could compare with having the drums turned for a new brake job on your car and reinstalling the same brake shoes."

Before delving into the spring areas, there is the matter of hammer rail cloth and action bracket bushings. The hammer rail cloth should always be replaced, if for no other reason than the new appearance of the material. However, the necessity is usually evidenced by packing that results in a lot of noise as hammers return and the cupping worn into the cloth. Remove the cloth as well as any cardboard strips and scrape all glue off. This is also the time to remove the felt blocks glued to the bottom side of the rail for proper positioning of the hammer rail. Many rails are sheathed with a metal covering. For cosmetic reasons, polish this well and lacquer coat if it is brass. Nickel needs no coating. After you have cut your cloth to the proper length, simply run a heavy bead of glue on the rail so that it will attach the lower half of the cloth. Place the top edge of the cloth flush with the top edge of the rail. You are deliberately leaving the top area of the cloth unglued so, if needed for hammer travel adjustment, you can place shims between the cloth and the rail.

Bush the holes in the action brackets where the hangers are located. The worn cloth is often a source of bothersome clicks. This does not need to be glued in place. The method of fitting keeps the cloth in place. Use either of two ways to determine the correct width of the bushing cloth. 1) Use the existing one as a sample. 2) Measure the hole diameter and multiply by 3 1/7. Once you have cut a strip to width, cut one end to a point that will reach through the hole. Pull the strip through until about 1/2" is left. Fold this end back to the post. Hold it in place with one finger while you pull snug on the strip. This causes it to seat into position (Photo 1). Then take a razor blade and cut the strip flush with the opposite side of the action bracket. Remember there are two directions for these hangers to feed. Usually the bass end feeds from right to left, the other three feeding in the opposite direction. Feed the bushing cloth in the direction just specified. Otherwise, when you install the rail, the hanger ends will drive the bushing out. They must be inserted on the side of the fold you have made.

The three springs of the action are the jack spring, the hammer butt spring and the damper spring. The jack spring serves to return the jack quickly back under the butt for assisting repetition. The hammer butt spring serves to keep the hammers from bouncing as they rebound from their impact. The damper flange spring keeps adequate damper pressure on the string for precise damping as well as keeping the damper lever from flopping back and forth as the spoon throws the lever on hard, quick blows.

Why replace the springs? Metal stress is a prime factor. All three types of springs suffer fatigue over the years, causing them to be easily broken. When rebuilding the action, as a matter of course, the springs should be replaced or, if feasible, reformed back to proper tension. The jack spring was discussed in the article on wippens, since it belongs to the wippen mechanism. The hammer butt springs will often be found corroded, weak or kinked, or just plain old. The damper flange spring will often be found with extreme bends in it, and usually in the wrong place. Just the fact of replacement is not enough; the springs need to be tensioned in order to even out the touch, reducing resistance to precise evenness.

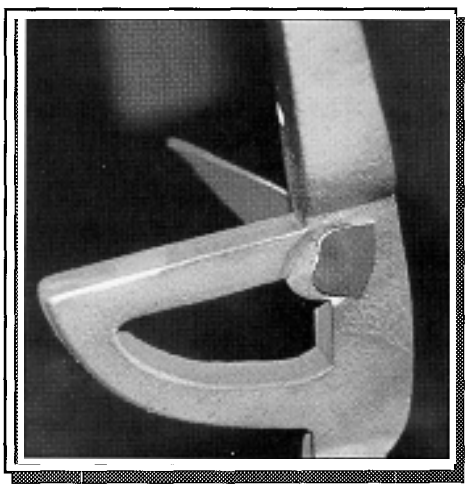

Photo 1

Replacing hammer butt springs—First, remove the felt from the back of the rail and then scrape away any glue. Remove all the odd springs from the rail using small flat-faced pliers. Two passes may be necessary as these springs, if brittle, tend to break at the coil. Grip the coil; then, with the pliers pull straight out from the rail. This will pull the tail through the hole(s). If it breaks at the coil, make a second pass gripping the coil or broken tip and work the pliers against the wood rather than pulling as in the first pass. Be certain to scrape away any excess glue that might hinder the installation of the new springs.

With the rail clean and your new springs ready, you can do this quite quickly in gang fashion. One section at a

time, rather than one spring at a time. You will need a retaining rod and it is very simple to make. Take a heavy wire coat hanger from your supply—not the lighter type that shirts are hung on because the diameter is too small. It must be very straight and about 18-20 inches in length. As your rail is laid out in front of you on your bench, take note that there are three divisions of springs. You will need to start with the left section, working that section from right to left (Photo 2). The

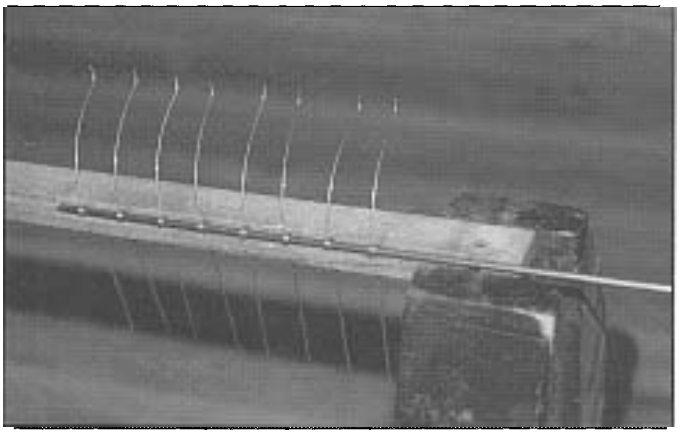

Photo 2

same with the middle section, and so on with the right section. Your rail will need to be held up off the bench. I find an easy way to do this is to take two Jorgensen clamps, one at each end, standing them on their butt end and clamping the rail firmly. Now, insert the tail of your first spring; insert the end of the retaining rod into the coil. Proceed to the next spring, sliding the rod end through the coil. You are not doing anything with the tails at this point. Proceed in this manner until you have completed the entire section. The rod is to stabilize the coils for shape and position.

Now with those little pliers: depending of the style of rail you are working with, either pull the tail through the second hole or pull the tail into the slit made for it (Photo 3). As you pull, keep the direction of the spring perpendicular to the length of the rail. You may need to press the tail into that slit or press the turn of the tail that went back through the second hole. With flush-cutting center pin nippers, cut the tails off flush with the wood, especially with the double hole type. With the slit, it is best to cut the tail off to proper length first so it can be compressed in place. Once finished here, remove the rod and continue the same procedure with the remaining two sections. When all sections have been completed, run a generous bead of glue over the exposed parts of the tails and let it dry overnight. Once the glue is dry, finish it off with new spring rail felt for a new look and new feel.

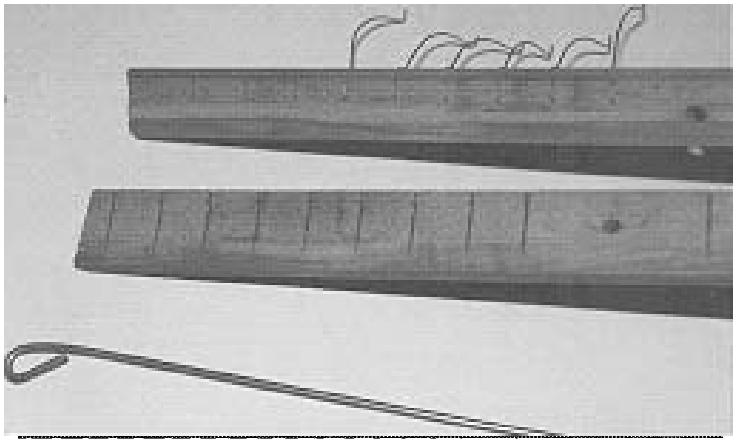

Photo 3

At this point, some adjustment is necessary because you now have a new spring rail with springs pointing upward at about the one o'clock position. They should be generally regulated to about the four o'clock position (Figure 1). The most important point to remember when adjusting springs is to adjust them ***at the coil***, not along the shank. Here is where the word ***never*** comes in: never, never bend the wire along the length of the shank. It weakens the spring and produces kinks that actually get in the way of other parts of action movement. This is where the finger touch comes in, in combination with a very simple tool to insert in each coil while using the index finger to pressure back the spring (Photo 4). This tool keeps the coil, under pressure, from working sideways as well as getting out of round. It is nothing more than a hammer shank with a hole drilled in one end to receive a 6d finish nail. Once the nail is in the shank, at about the one-inch point, make a 90-degree bend. With your string cutters, cut that bend to a length of about 1/2" or a little less. This makes a handy tool for both these springs and the damper flange spring. Insert it through a coil. With your index finger, pressure the new spring, wrapping it farther around the tool until the spring now stays at the four o'clock position. Of course, the assumption is that the spring rail is in the same position as it is placed when in the action. If you do not regulate the springs in this manner, you will find you have no consistency of control when you place the ends into the butt groove. They will lean to the side and do all kinds of funny things.

New springs from standard supply houses are not always the same length as those you are replacing. So be prepared to plug the existing holes for mounting screws and redrill higher or lower in the rail to make adequate adjustment for correct positioning into the groove felt.

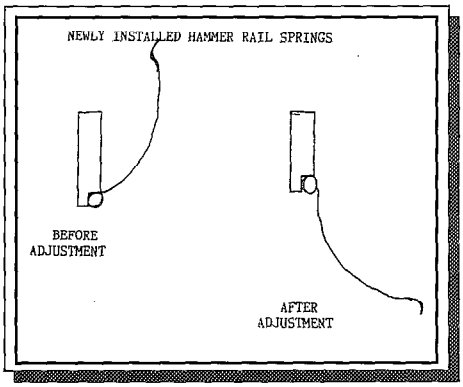

Figure 1

As far back as I can recall, I can never remember anyone addressing spring regulation except for the butterfly spring in the grand. It seems to be one of the big fears, equating in intensity with the bending of those butterfly types, bending spoons, and adjusting upright dampers. Although care must be taken, rest assured that — with new springs — if you go too far, you can always reverse it!

The Jack Springs: Little is done to regulate them. However, when you have not replaced them with new springs, they may be weak, requiring a little more "snap". Simply unseat the top coil and lift, thereby expanding the coil. Careful! Too much will cause it to buckle and be worse than before.

The Hammer Butt Springs: Perhaps you have found the existing springs' tensile enough not to require replacement;

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Behold The Upright

Continued from Previous Page

they just are not applying enough pressure to the hammer butt. Leave the spring bender in your drawer of discarded worthless tools. Insert the end of the single spring tool into the coil and apply the index finger near the coil. Using firm pressure, work along the shank of the wire unwrapping a little of the coil and leaving the spring end at the 4 o'clock position.

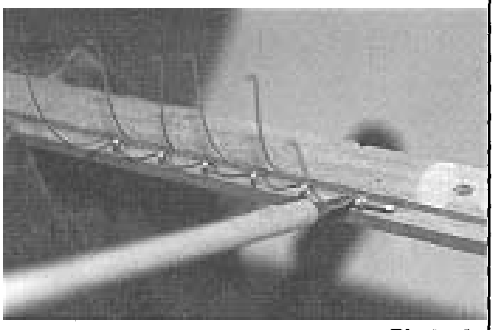

Photo 4

The Damper Flange Spring: Leave the metal bending tools in the drawer. To put more tension on the spring, the coil needs to be expanded. This is done by pushing the spring away from you, laying it down alongside the damper lever to horizontal and then releasing it (Photo 5).You must be certain to hold the flange downward as far as it will go. If you find the damper spring is putting too much pressure on the damper, perform the opposite tactic by pulling back away from the groove a little.

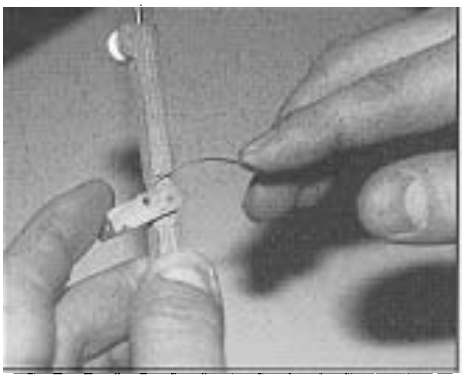

Photo 5

These regulations are general ballpark. Effective changes can be made while the action is in the piano. Here is where some of the tools are effective because they can reach in areas where fingers are too massive. However, it is better to keep removing the action and adjusting the tension than to kink the wires and cause other problems. Your client will be very pleased with the results.

We look forward to finishing the action area next time with some incidental items as well as rebuilding the regulating button rail — possibly even making a new one.

PACE
Professionals Advance through Continuing Education

LESSON PLAN

Technical Lesson #30

Grand Regulation - Part 12: Adjusting Repetition Springs

By Bill Spurlock, RPT
Sacramento Valley Chapter

This monthly lesson plan is designed to provide step-by-step instruction in essential skills. Chapters are encouraged to use this material as the basis for special Associate meetings, or for their regular meeting program, preferably in a hands-on format. This method allows the written information to be transformed into an actual skill for each member participating.

In Brief

This lesson will cover adjustment of the repetition spring in the grand action. Particular attention will be given to proper methods of adjusting the butterfly type springs, which are adjusted by loosening or tightening the spring coil, rather than with an adjusting screw.

Getting Started

In order to pursue any serious study of piano technology, one must obtain basic resources. Catalogs from several piano supply houses, both large and small, are essential. Besides offering the necessary supplies, their pictures and item descriptions are valuable sources of information. Piano manufacturers' service manuals are also essential sources of valuable information. Most are available at no cost. Most important to participating in this Lesson Plan series are the PTG Exam Source Books, both the tuning and technical versions. Articles in these books will serve as reference material for the lessons.

Hands-on Session Setup

To teach this lesson in a hands-on format, you will need one or more grand pianos in good condition. New pianos in a dealership are probably best, since most regulation adjustments will be close but uniformity of repetition spring strength will typically have some room for improvement. Action models can also be used for this lesson.

Estimated Lesson Time

Approximately one hour. Participants should each take a turn at adjusting springs on an octave or so.

Tools & materials participants must bring

For this lesson, participants should obtain the following tools:

- Hart Spring tool or equivalent (available from most supply houses)
- Small flat-blade screwdriver for screw-type spring adjustments
- Selection of general regulating tools

Assigned Prior Reading for Participants

PTG Technical Exam Source Book, pg. II.17; July/1994 *PT Journal*, pgs. 34-35.

General Instructions

Repetition spring function: As a note is played, the jack and repetition lever disengage from the knuckle near the bottom of the key stroke. Before that note can be played again, the jack must first return under the knuckle. If the key is allowed to return all the way to rest between blows, the jack will easily return under the knuckle with no help from the repetition lever. For the fastest repetition, however, the jack needs to get back under the knuckle and begin driving the hammer upward again before the key returns all the way to rest. The repetition spring makes this possible, by providing a separating force between the hammershank and the wippen. As soon as the hammer rebounds more than about 1/8" from the string, the knuckle contacts the repetition lever (which was briefly disengaged by the drop screw). The knuckle depresses the repetition lever (and with it the repetition spring) until the hammer tail is caught or slowed by the backcheck: As soon as downward pressure on the key is released, the backcheck releases the hammer tail, allowing the repetition lever to push the wippen and key away from the shank. As it does, the jack can return under the knuckle.

When regulating, we test repetition spring strength by placing the hammer in check, then releasing pressure on the key very slowly and watching for the spring to push the hammer upwards toward the string. While judging the speed of hammer rise is useful for adjustment purposes, in most actual playing conditions the hammer never rises like this. Instead, as soon as downward pressure on the key is released, the hammershank, wippen and key all begin to fall. However, the repetition spring helps speed up the return of the wippen and key compared to the fall of the hammershank, allowing the jack top to drop below the knuckle and reset for a repeat blow.

Types of springs: There are several different spring designs. The two most common are the butterfly type (Photos 1-3) and the screw adjustment type (Photo 4). Think of the butterfly type as an open safety pin — two arms with a coil in the middle. The top arm bears against the repetition lever, while the lower arm engages the jack, serving as the jack spring. When the note is played, both arms of the spring are pinched together—the lower arm by the jack tripping and the upper arm as the repetition lever is depressed.

It is important to remember that the coil is the main spring element. In other words, while the arms of the spring will flex slightly, their force is concentrated at the coil, and it is the coil that determines the force applied by the arms. Spring strength should only be adjusted by strengthening or weakening the

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coil, as explained later, never by bending the arms of the spring. Bending the arms changes their relationship (contact point and angle) to the repetition lever or jack. Strengthening

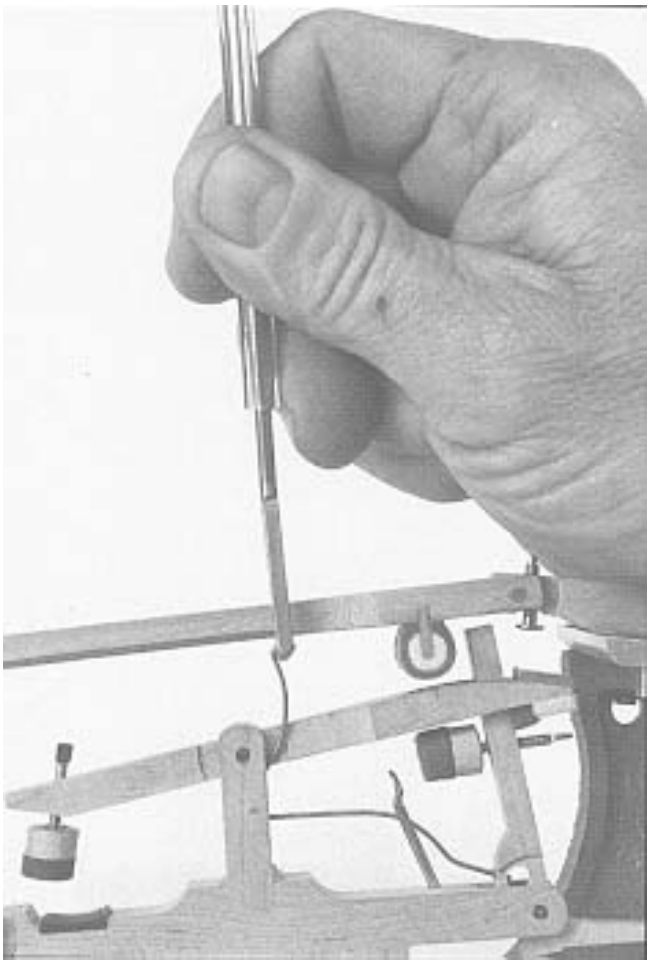


Photo 1 — To increase the strength of a butterfly spring, disengage the spring and use the spring tool to lift up, opening the spring coil wider.

or weakening the coil changes spring strength while maintaining consistent spring shape and leverage from note to note. Thus, avoid spring-adjusting tools that are designed to bend the upper arm of the spring. These usually have a slot intended to grab the spring for purposes of making a bend in the wire.

A variation of the butterfly spring incorporates a combination adjusting screw and spring seat at the upper end of the spring. For these, coarse adjustment is done just as with the standard butterfly spring, then the screw is used for fine adjustment or periodic touch-up.

The Schwander wippen shown in photo 4 is an example of a screw adjustment spring. This spring serves as both repetition lever spring and jack spring, and is simply adjusted by turning a screw that bears against the short tail of the spring. There are many other designs, some with separate jack springs.

Prerequisites to spring adjustment: Spring strength is judged by placing the hammer in check, releasing pressure on the key very slowly, then watching the speed of hammer rise. Several factors affect how fast the hammer appears to rise when using this test, so for consistent spring adjustment we must make sure the following adjustments are correct first:

- No excessive action friction: Key bushings, key balance pin holes, wippen centers and hammershank centers must be free. Repetition lever pinning can also make adjustment difficult if either very loose or very tight.
- No rubbing parts: Make sure no adjacent knuckles, hammers or keys are rubbing.
- Knuckle lubrication: Knuckles should be lubricated with a suitable dry lubricant (talc, Teflon, etc.). Never use any oily or greasy lubricant on knuckles.
- Clean, lubricated spring groove in the repetition lever: The end of the butterfly spring seats in a groove in the underside of the repetition lever. On older pianos, this groove may be contaminated with a hardened mixture of grease and dirt, preventing the spring from sliding freely in the groove.
- Hammer checking: Since we judge spring strength by watching the hammers rise from checking position, all hammers must check at the same height in order to make a consistent comparison from note to note; i.e., all hammers should start their rise from the same height.
- Drop: Since hammer rise stops when the repetition lever contacts the drop screw, drop must be correct and consistent to allow a consistent comparison from note to note; i.e. all hammers should end their rise at the same height.

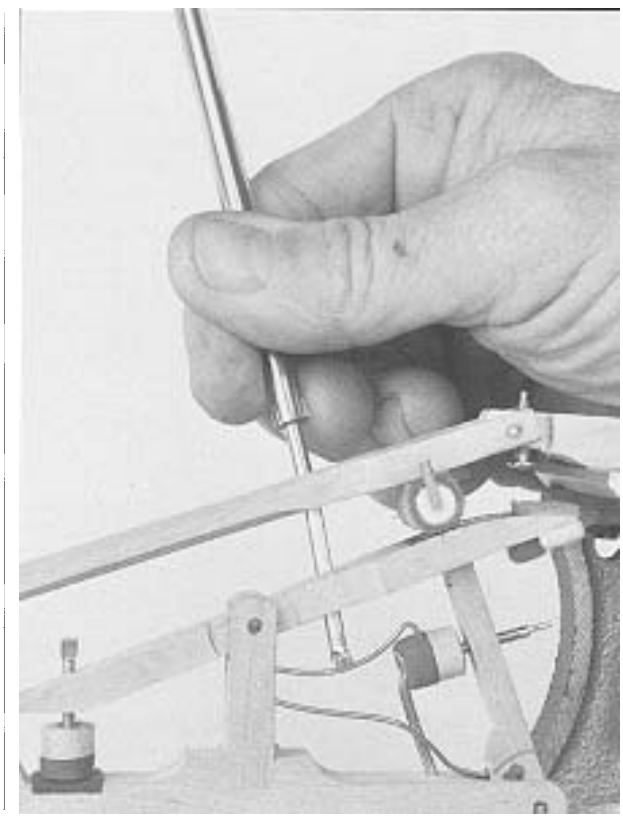


Photo 2 — To weaken a butterfly spring, use the spring tool to push down on the upper spring arm, closing the spring coil.

Adjusting procedures: Slide the action out onto a keybed action support (shown in Lesson 28), or place it on a table. Play a key to put its hammer in check, then release pressure on the key very slowly, just until the backcheck releases the hammer.

Do not release the key further as the hammer rises, as this will greatly affect the observed speed of hammer rise.

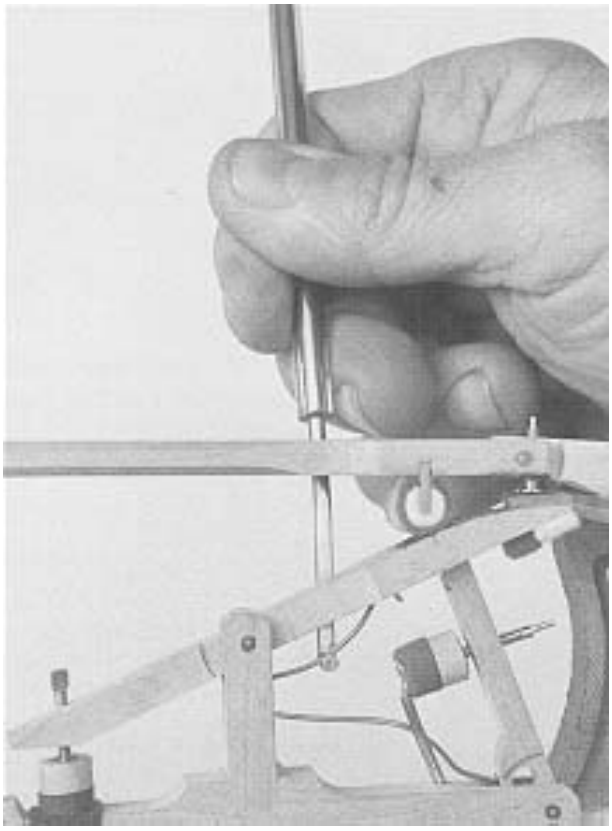


Photo 3 — When a spring is very slightly too strong, it is sometimes possible to make a very fine adjustment by rubbing the underside of the upper spring arm with the tool. Use this procedure cautiously — do not flatten the curve of the spring.

Bass hammers should rise positively, without hesitation, all the way up until the repetition lever is stopped by the drop screw. The hammer should not rise so fast that it bounces visibly at the top of its travel, and there should be no objectionable "bump" felt in the key as the repetition lever stops against the drop screw. Tenor hammers, being lighter, can rise slightly faster without the drop screw causing an obvious bump feeling in the key. Tenor hammers may appear to bounce very slightly at the top of their rise. Treble hammers are much lighter, and can be adjusted to rise quite quickly and even show a noticeable bounce at the top of their rise, without causing an objectionable bump in the key. A general rule is to have each hammer rise as fast as possible without bouncing into the string or causing an objectionable bump feeling in the key.

To strengthen a butterfly spring, insert the spring tool between adjacent wippens and "feel" the groove of the tool onto the spring. Push down and to the side to dislodge the spring from its groove in the repetition lever. Strengthen the spring coil by lifting the end of the spring upwards and very slightly back, as shown in Photo 1. Do not bend the top spring arm around the repetition lever support post, as this will alter its shape. Use the tool to slip the spring back into the groove in the underside of the repetition lever, and recheck.

If this method did not strengthen the spring enough, use a second tool to prevent the bottom spring arm from rising while you pull up on the top arm as before. This will magnify the effect. If you only need to strengthen the spring very slightly, try just bringing the end of the spring up between two wippens and replacing it without lifting the end. This usually has a significant effect if you have just previously weakened the spring.

To weaken a butterfly spring, engage the top arm of the spring with the tool and push down, as shown in Photo 2. Adjustment is a trial and error process, and requires practice to master. If the spring needs only very slight weakening, you can rub the underside of the spring lightly while it is still in place, as shown in Photo 3. Use this method sparingly—do not flatten the curve of the spring. If it does not effect a change, go back to the method in Photo 2.

Springs with screw type adjustments are self explanatory, with one exception. The screw normally provides an adequate range of adjustment. However, if you have to run the screw all the way down or back it out quite far, this is an indication of a problem in the action or a damaged spring. Check for rubbing parts, tight action centers, or oily contamination on the knuckle. If friction is not the problem, you will have to strengthen or weaken the spring as follows: Unpin the repetition lever from its support post and free the end of the spring from its silk cord. With the repetition lever removed, manually pull the ends of the spring together or apart to make a gross adjustment of the spring coil. Reinstall and fine-adjust using the screw.

Exercises

If pianos are available, every participant should adjust an octave or so of repetition springs. If models are used, participants should try their hand at each model in order to gain some experience with different designs.

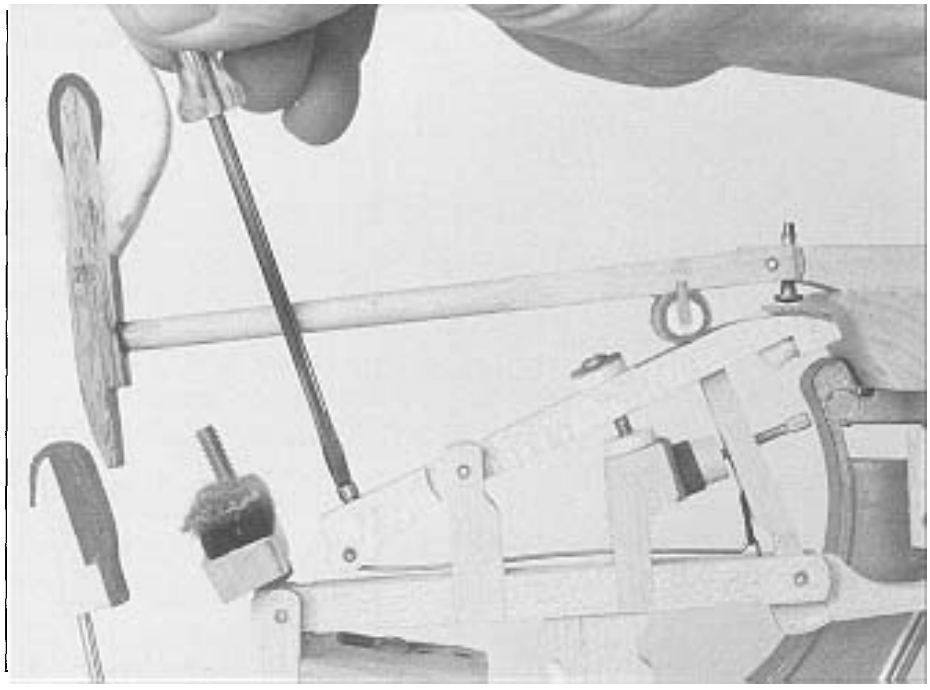
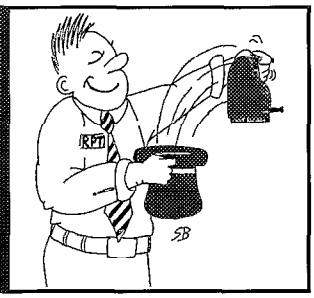


Photo 4 — Adjusting a Schwander type repetition spring.

Grand Illusions ...

The Page for Serious Cases



Mr. Piano Guy

Dear Readers: **We here at Mr. Piano Guy enterprises are constantly striving to do our best to help *you*, the piano tuner-technicians. In order to help us assess *your* needs and therefore serve *you* better, we would appreciate it if you would take a few moments to complete and return the following questionnaire.**

Mr. Piano Guy Tuner Needs Survey

1. How long have you been tuning pianos?
   ___ Less than one year (an eager beaver rookie).
   ___ 2-5 years (but I think I know it all).
   ___ 10-20 years (but it feels more like 50).
   ___ Over 50 years (I think — but at my age there's a lot I don't remember).
2. How much do you earn annually from tuning?
   ___ Under $5,000 (I checked the first answer above).
   ___ $5,000 - $10,000 (about average for a tuner in Des Moines, Iowa).
   ___ $30,000 - $50,000 (but I'm thinking about raising my prices).
   ___ Over $200,000 (about average for a tuner in L.A.)
3. Would you like to earn more?
   ___ Yes (go to question 4)
   ___ No (throw this survey in the trash and go watch *Brady Bunch* reruns).
4. Do you spend a lot of time in hardware stores, wandering the aisles and poking through stuff?
   ___ Yes
   ___ No
5. Do you enjoy buying tools, gadgets and interesting new devices?
   ___ Yes
   ___ No
6. Do you have VISA, Mastercard, or American Express?
   ___ Yes
   ___ No

If you answered yes on questions 4, 5 and 6, please focus your gaze on a spot across the room and answer the following:

7. Are you focusing on a spot across the room?
   ___ Yes
8. That's good. Keep staring at the spot.
   ___ Yes
9. You are getting drowsy.
   ___ Yes
10. You feel relaxed
    ___ Yes
11. Your arms feel heavy
    ___ Yes
12. Your eyelids are getting heavy
    ___ Yes
13. Your eyelids are so heavy, you want to close them. It's all right, go ahead.
    ___ Yes
14. You really enjoy Mr. Piano Guy's column.
    ___ Yes
15. You enjoy reading about all the new tools, products and labor saving devices he offers, all at exorbitant but affordable prices.
    ___ Yes
16. You want these items.
    ___ Yes
17. Very much.
    ___ Yes
18. When you hear the words "thank you," you will wake up. Every month you will read this column, then get your credit card, call Mr. Piano Guy's toll-free order number, and ask him to please, please, please send you all his wonderful products.
    ___ Yes

Thank You **for completing this survey. By taking the time to fill this out and send it in to Mr. Piano Guy Enterprises, you will help us to serve *you* better.**

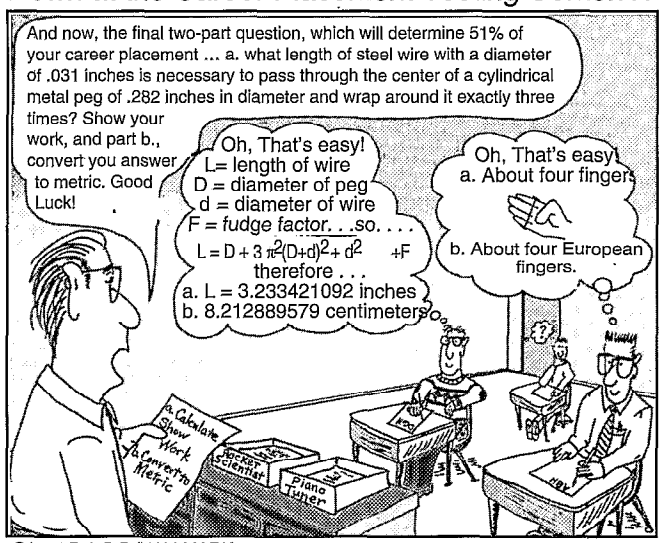
Announcing...

Mr. Piano Guy Enterprises is proud to announce this month the offering of a new line of pianos for you to foist ... make that **sell** ... to a willing public. Place your orders right now for "Gra-Market®" brand pianos, imported especially from Asia for our unsuspecting public. "Gra-Market®" brand pianos are for lovers of the Asian sound who want authentic pianos made in Asia for Asia, not made for the bourgeois American market. And, we can guarantee that you will have regular repair and voicing work for years to come when you sell your clients one of the these lovely vintage instruments. Call today for information and franchise details.

PIANOMAN Adventures

by Alan Hallmark

Down at the Career Placement Testing Center...



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

The Piano Page — What Is It?

By Ron Berry, RPT
Electronic Communications Committee

Electronic communication, the Internet, and the World Wide Web are growing at a terrific speed. Technologies undergo radical change in a matter of months in the computer industry, very unlike the piano industry. PTG is taking advantage of this technology with the Piano Page. The Piano Page went on-line in April of 1995 and has been expanding ever since. The Piano Page is designed for piano owners and players to give them some of our information about piano service.

The World Wide Web is different from conventional advertising because you have to make the effort to go to the page, the information does not just come to you. While this may mean that it is distributed to fewer people, it also means that it is going to people who are really looking for that information.

What information is available on the Piano Page? The front page is basically a table of contents of the other pages, of which there are now more than 200. The first page has the following information: (See Figure)

- *What's New on the Piano Page*
- *Coming Events in the Piano Industry*
- *Piano Service & Technical Information*
- *The Piano Industry*
- *Buying a Piano*
- *Piano Images*
- *Usenet Groups and Mailing Lists*
- *Other Music Resources*
- *Internet Resources*

The thing that has made the Web so attractive is its ability to display text and graphics together, and its ability to create links to other information. This allows us to make an attractive page where you can click with a mouse on text or pictures to get another page of information. This information can be on the same computer, or in New Zealand. This interactive ability keeps people interested longer as they move around the information. It also means that the information needs to be presented differently. Most printed material is written to be read sequentially. Web page information needs to be in small sections with links and cross references so people can read it in whatever order they choose.

Let's look at what information is available on the Piano Page.

What's New

This page tells frequent visitors what has changed since their last visit so they can find new information easily. It has hot links to the new information so they can jump right from "What's New" to where the new information is. Also by using small graphics that say "new" we can highlight new links that may not be mentioned in the What's New Page.

Coming Events

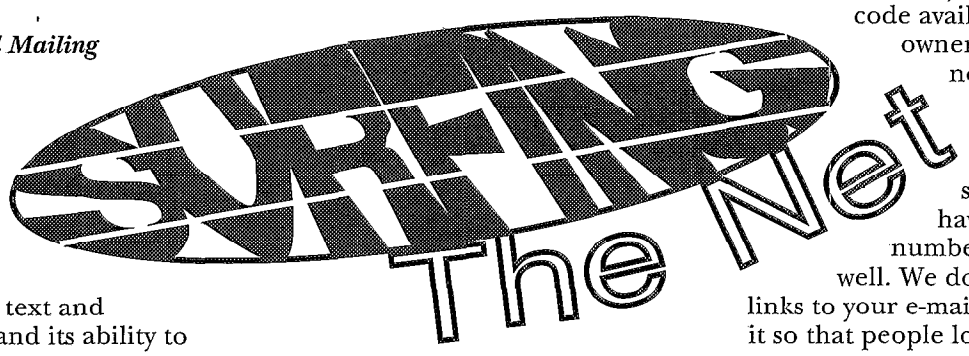
Currently, this includes information about all the PTG seminars coming up plus a few other industry events. It would be nice to have information about teacher organizations and other industry events, but gathering all that information has been a challenge.

Technical Information

This section includes all the PTG technical bulletins and brochures. In the Basic Piano Care brochure, when it mentions finish care or regulation, there is a link to the technical bulletin on that subject. There are links to the U.S. Patent Office where you can search for piano patents in 1994 and 1995. There is a link to the archives of the Pianotech mailing list. This is a list of 280-plus technicians around the world who discuss everything about pianos. David Parkhurst has created a page that gives you a word search capability for those archives.

There is a link to a page created by Daniel Russell on the non-linear characteristics of piano hammers. Daniel was given a grant by the PTG Foundation to help with this research while he was at the Northern Illinois University. At present the information is in a PostScript file, which is a Macintosh format, but he says he is working on presenting it as a standard Web page.

We now have the complete list of RPTs sorted by state and then zip code available for piano owners. It currently does not include phone numbers, but after the dues are all in those of you who so indicated will have your phone numbers included as well. We do currently have links to your e-mail address if we have it so that people looking can mail



right to you from your listing on the Piano Page if their software allows it. This is like having a listing in an International Yellow Pages for free!

The Piano Industry

The Piano Page is obviously heavy with PTG information, but we are attempting to make this a starting point for information on the whole piano industry. There are pages about PTG itself, a description of the RPT and Associate members, the *Journal* (including a link to the home office's e-mail address to subscribe), and the brochure, "Why Should I Become a Member of PTG." We have a page about the PTG Foundation and a list of technicians' organizations in other countries. We recently added a link to the Acoustical Society of America.

For teachers, we have links to the National Federation of Music Clubs, Music Teachers National Association (MTNA), Tippecanoe Piano Teachers Network (Lafayette, Ind.), and some individual teachers pages. There is a link to a large site called the Piano Education Page, which is sponsored by the West Mesa Music Teachers Association in New Mexico.

For dealers we have only one link currently, to the National Association of Music Merchants (NAMM).

We have a list of piano manufacturers and include links to Baldwin, Yamaha, and Young Chang who present information on the Internet. The Young Chang page is a large site with lots of good information. See the December 1995 issue of the *Journal* for information about that page.

Buying A Piano

We wanted to provide helpful information about purchasing pianos. The best resource we found is The Piano Book by Larry Fine. Larry's book has a Web page that shows the table of contents and gives excerpts from the book. It also allows you to order the book on-line. The Pierce Piano Atlas now has a page for that book as well. Perhaps we can add some of our own text about purchasing pianos.

Piano Images

I have hopes of creating a virtual piano museum with images of interesting pianos. Currently we have photos from the Bösendorfer catalog with pianos in front of interesting sites in Vienna. We have a photo of a Kawai grand with a clear acrylic case taken at the Indianapolis Children's Museum. There are links to sites that sell artwork that features pianos, and some other photos and art that are available on the Net. If you have any interesting pictures of pianos that are not copyrighted that we could add, please contact me at ronberry@iquest.net, or at 6520 Parker Lane, Indianapolis, IN 46220-2259.

" http://www.prairienet.org/arts/ptg/homepage.html "

Usenet and Mailing Lists

There are a number of mailing lists and bulletin board type areas related to pianos, keyboards, organs, and music. This section includes instructions for contacting these resources.

Other Music Resources

There is a huge wealth of information on the Net about music. This page consists of links to information about music, classical music, MIDI files, and Meta lists (which are indices of other lists). There are sites that offer music for sale which can be downloaded and printed.

Internet Resources

Every page has the obligatory links to other helpful Internet sites. These include Prairienet, which gives us the computer space and Internet presence for free. There are several search pages which will help you look up anything you want. Some provide a table of contents to the Internet as well for browsing what is out there in cyberspace. Yahoo is one of the most useful of these because it doesn't search as deeply as some of the others. Lycos is a robot that goes around the Net looking for Web pages. A search on the word "piano" on Lycos offered more than 8,000 site links, but many of these are personal pages where someone mentions liking to play the piano.

The Piano Page is getting great response. The main page now has a counter which notes every time someone accesses it. We have been running around 6,000 hits a month on the main page. This may include people returning to the home page each time, and it includes all the technicians looking themselves up. But still it is a lot of exposure for free. And remember that all these people who access it are actually looking for information on pianos. All this is done at no cost to PTG. I put together the page using PTG printed materials and some original text with pictures and links from anywhere I find them on the net. This page is constantly under construction as are most Web pages. We need to keep adding information to keep attracting people to the site again. The information is physically located on a computer at Prairienet. Prairienet is located in Champaign, Ill., and thanks to Ron Torrella, RPT, we have free access there since we are an information provider and it makes their site more valuable to the public.

How Do I Get to the Piano Page?

To get to the Piano Page you need to have access to the World Wide Web, either through an Internet provider or one of the commercial services. Once you are running your Web browser you need to type in this address as the URL (Uniform Resource Locator): "http://www.prairienet.org/arts/ptg/homepage.html" That's it. Then you will be clicking your way through cyberspace finding out about pianos.

This is all just the beginning of what will happen with computers connected together. There are now secure sites that use encryption technology so you can send credit card numbers to purchase goods over the Internet. I find it ironic and fascinating to mix the old technology of pianos with the new technology of the Internet.

Help Teachers, Clients, and Build Your Business With a Piano Teacher Survey

By RPTs Fern Henry and Bill Spurlock

Piano teachers can be some of our best allies in promoting piano use, as well as in growing our own businesses. Clients often ask us for teacher referrals, and invariably the students with satisfactory teachers tend to enjoy, and service, their pianos more. Likewise, piano students often ask their teachers to suggest a piano technician, and the satisfied teacher can be a continuous source of new tuning clients for the skilled technician.

Many technicians carry a simple list of teachers' names in order to answer the frequent question from clients: "Do you happen to know of any piano teachers?" Unfortunately, answering this question can often add several minutes to a service call, as we try to match the needs of the client with the right teacher. This same conversation is then repeated over and over with other clients. To solve this problem, we devised the teacher survey form shown here, and mailed it to all area teachers to fill out and return. Carried in an attractive binder, these forms provide clients with basic information on all area teachers. Now our clients can browse the forms while we tune, circling teachers that interest them on a separate name list which we provide. This saves us time, provides more information to the client, showcases the teachers more thoroughly, and enhances our reputations as providers of complete piano service. This article will describe how you can make up your own teacher survey book, either individually or as a chapter project.

Assembling a List of Teachers

Make a list of every area piano teacher you can find. Some will be your clients, others may not. Even though some teachers may use another technician, it is still appropriate to include them in your survey. Your goal should be to offer your clients the widest choices. And by including even teachers who use a competing technician, you enhance your reputation in the music community at large without in any way infringing upon another technician's client base.

Entering the teachers' names, addresses and phone numbers into a computer database makes it simple to print separate teacher lists for each community you service. This data can also be easily merged into the form letter introducing the survey to the teachers (Figure 1) and the survey form (Figure 2). Our survey form and letter can be copied or modified to suit your preference.

Mailing the Survey

In larger cities chapters might consider doing the survey as a group project. That is, one set of surveys could be mailed out to all area teachers, then duplicated by the chapter and distributed to all RPT members, who would then make up their own binders. This avoids having teachers bombarded with multiple forms from many chapter members. The cover letter to teachers could also include a list of chapter RPTs and a copy of the PTG brochure, "The Special Care and Maintenance of the Teaching Piano." In our rural area there are few other technicians, so we did the survey as an independent project. Either way, this project is an effective way to increase awareness of PTG and the RPT standard among teachers.

Include a self-addressed stamped envelope with each form to encourage response, then follow up after a week or so with a phone call to any teachers who have not returned their forms.

Making Your Survey Binder

A binder with a clear vinyl sleeve over the cover makes it simple to create an attractive reference book; just print up a nice title page on your letterhead and slip it into the sleeve. Inside pockets provide storage for lists of teachers in each community and other literature. Use labelled dividers to separate the survey forms for each community, or sort the forms by zip code so clients can easily find teachers closest to them.

Other information can also be included in the binder. Articles on the benefits of playing the piano, PTG technical bulletins, and brochures showing benches, lamps, and finish care products are all useful inclusions. Once clients have finished reading the survey forms, they often browse the rest of the binder like a catalog. The binder then becomes a showcase for your business and the services you can provide.

Using the Teacher Survey Binder

There's usually an opportunity for a little casual conversation with the client just before starting to tune. This is a great time to find out which family member is playing the piano and whether they are taking lessons. If the customer is looking for a teacher, they will invariably ask us for teacher suggestions at this point. This provides the perfect opportunity to offer them the chance to browse the surveys while we tune. We bring the binder in

Your Letterhead

As Fall approaches, we are in the process of updating our files on local piano teachers. Many of our tuning clients ask us for referrals for teachers, and we want to be sure we have accurate information to provide.

Would you please take time to complete the enclosed questionnaire and return it in the stamped envelope we have provided? We want to be able to refer those clients best suited to your teaching methods and specialties. All the questionnaires will be compiled into a booklet which we will carry and make available for clients to browse.

Thank you in advance for taking time to share this information. We look forward to many years of working together to promote piano participation in our community.

Sincerely,

Figure 1: Form letter introducing the survey to teachers.

from the car, hand the client a teacher list to keep for reference, and point out the surveys for their area.

We have gotten extremely positive response to this system. Clients really appreciate that we've saved them a lot of research. Teachers appreciate the referrals that come their way as well. And we are thankful that we can now give the clients more information in much less time. If you're looking for a simple way to establish a more professional profile, give the teacher survey book a try!

Piano Teacher Survey Form

Are you currently accepting students?
- ☐ Yes, I have slots available
- ☐ Yes, but only on a waiting list
- ☐ No, I am not taking new students at this time

What age range of students do you teach?
- ☐ Children only
- ☐ All ages
- ☐ Adults only
- ☐ Minimum age to enroll ____

Do you accept students at all skill levels?
- ☐ Beginners only
- ☐ Intermediate and advanced only
- ☐ Advanced only
- ☐ All levels

What styles of music do you emphasize?
- ☐ Classical
- ☐ Popular songs
- ☐ Method books

What makes your teaching style different? For instance, do you teach the Suzuki method, use computers to teach theory, teach composition, travel to the home to teach, etc.?

What is your musical training and/or background? Do you perform?

Where is your teaching studio and what type of piano do you use for lessons?

Please use the remaining space or the reverse side to add any other information you wish to share.

(Please make any necessary corrections to address & phone information below)

Name: _____

Address: _____

Phone: _____ **Date:** _____

Figure 2

Kawai In Agreement With Beijing Piano

Hamamatsu, Japan-based Kawai Musical Instrument Manufacturing Company Ltd. has recently entered into a production agreement with Beijing Xing Hai Musical Instruments Corporation Limited. The Chinese company, also known as Beijing Piano, has begun to manufacture upright pianos for distribution by Kawai to southeast Asian countries. Pianos built by Beijing Piano will be marketed under the brand name "Linden."

Beijing Piano, headquartered in Beijing, is the second largest piano manufacturer in China. The company currently produces about 30,000 pianos each year for the China market. The new agreement with Kawai calls for Beijing Piano to reach a production target of approximately 250 pianos per month for Kawai by the end of 1996. Kawai will supply some of the piano action parts, including hammers, to the Beijing operation.

"This agreement is designed to help Kawai remain competitive in the highly price-sensitive southeast Asian market," said Jun Ando, executive vice-president of Kawai America Corporation. "Since Kawai America already has piano manufacturing facilities in the United States, we have no plans to import Linden pianos to the U.S. market."

Once this agreement is successfully underway, Kawai Japan has further plans to establish a joint venture in which Kawai and Beijing Piano would combine technology and resources to build pianos for the China market.

Walter Piano Moves To New Plant

Walter Piano, the last family-owned piano manufacturing company in the United States, has relocated into a modern 100,000 square foot factory in Elkhart, Ind. The modern facility is on one level and includes areas for administration as well as a company product showroom. The new building, which Walter Piano owns, replaces a leased facility spread out over four floors. Since moving in July, 1995, company management reports that production efficiencies have improved dramatically. Walter Piano has 40 employees and will commence shipment of grand pianos this year. For more information, write or call: Walter Piano, 25416 CR6, Elkhart, IN 46514. Tel: 219-266-0615; Fax: 219-266-0889.

Kimball To Discontinue Domestic Wholesale Piano Sales, Assembly

The Kimball International, Inc. board of directors recently approved the company's intentions to cease domestic piano operations and formally align those capacities into the contract furniture and cabinets group.

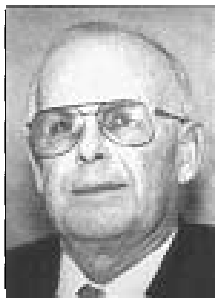
Kimball indicated that domestic piano sales and assembly will be gradually phased out in the coming months. Employee redeployment and dealership support will be at the forefront during the transition. All ongoing commitments will be honored as the company strives to maximize asset utilization and minimize go-forward contingencies.

"Our Piano Group has done a commendable job in

Continued on Next Page

Duncan puts Experience to Work for PTG

Teaching is nothing new for David Duncan, RPT, and Southeast Regional Vice President of the Piano Technicians Guild.



David Duncan, RPT, SE RVP

A retired teacher, David has continued to put his educational experience to work for PTG.

In early March Duncan spent a couple of days visiting the Atlanta, Ga., and Birmingham, Ala., chapters, attending meetings, meeting new people, "politicking for long-range planning and PTG" and presenting technicals.

His latest technical is entitled "Prefect Pitch? No Way — Thank Goodness!" subtitled, "The Tuner's Best Friend."

David said perfect pitch, "is a nebulous thing. Nobody really has it, and if they did, they probably couldn't listen to pianos."

In his current technical, Duncan concentrates on the unisons, which most people notice first when they hear an out-of-tune piano.

David has been teaching a variety of technicals on and off since joining the Piano Technicians Guild more than 19 years ago while directing high school band in his adopted hometown of High Point, N.C.

Like many piano tuners, David Duncan got into the piano business to earn some extra income. The extra income he earned while teaching has since turned into a family business for David, who, along with his son, Stephen, and their wives, operate Duncan Piano Service, Inc. in High Point. David's wife, Jane, handles customer relations and scheduling while Stephen's wife, Renée, takes care of the books.

Duncan Piano Service has grown to the point where David and his son finally had to drop the University of North Carolina School of Music in Greensboro as clients because of the demands of servicing their private customers.

Unlike some tuner/technicians, David enjoys the challenges of concert tunings. Duncan played oboe with the Norfolk Symphony for a season and for three seasons with the Winston-Salem Symphony, and his enjoyment of concerts and concertos has translated into a taste for concert tuning.

After receiving his degree in music education from Shenandoah University and his masters in music education from Appalachia State University, David, a certified band director, served a four-year stint in the Air Force before returning to High Point, where he taught for 26 years before retiring 14 years ago.

While David is an aural tuner, a Strobo Tuner initially attracted his interest in the piano tuning business. The school had one of the units, and David took the manual home to study.

He received his early training through a correspondence course by Aubrey Willis. "Some people would laugh at that," David said, "but he was a gifted teacher. The course was very informative, especially if you had a background in music.

"I got a lot from it and was able to pass the Craftsman test," he added.

While he passed the Craftsman test shortly after joining PTG, he wanted the challenge and has also taken and passed the current Registered Piano Technician's test.

As the PTG Southeast RVP, he said he will continue to work to encourage Associates to take the RPT exams and upgrade their status as well as seeking to set up more sites for testing in the region.

While he hopes to see the number of testing sites grow, he also sees growth possibilities if the PTG adopts and positively uses the proposed long-range plan.

The current decline in new piano sales will mean more tuner/technicians will have to concentrate their efforts on servicing and maintaining the existing base of pianos, but with millions of pianos already out there he sees no decline in work for tuners, he said.

"While we don't like to see a decline in piano sales," David said, "It's not a panic situation for us."

Industry News

Continued from Previous Page

'right sizing' themselves to parallel the dramatic decline in the domestic piano market over the last 15 years," said John B. Habig, senior executive vice president, operations officer, Kimball International, Inc. "Since the industry's peak in the late 1970s, our West Baden and French Lick, Ind., business units have continuously refocused their strategies to a variety of furniture-related and contract electronics manufacturing capabilities, including piano cabinets themselves. We remain committed as a high value cabinet supplier to the piano market. As part of the realignment, the West Baden facility will be renamed Springs Valley Manufacturing."

The company anticipates establishing a reserve for discontinuing the piano product line in the current fiscal year. A charge, expected to range between nine cents and 11 cents per Class B share, will be recorded in March to cover the incremental costs related to exiting this product line.

"This realignment is a direct result of the domestic piano market's evaporation to less then 25 percent of its peak volume levels," said Douglas A. Habig, president and chief executive officer, Kimball International, Inc. "The Piano Group's evolvement into a viable contract supplier is a testament to their flexibility and willingness to redirect their core competencies. Realizing pianos have been a large part of our company's heritage, sensitivities to employees, community, customers and suppliers have complicated our shorter term "fixes" over the past few years. This strategic repositioning will now allow us to eliminate the financial underperformance experienced in this division as they become better linked with our overall corporate business plan. It is consistent with our longer term pursuit of growing Share Owner return."

Kimball International, Inc. is a diversified furniture and electronics manufacturer with fiscal year 1995 Sales of $900 million. Headquartered in Jasper, Indiana, the company's Class B common stock is traded on the NASDAQ National Market under the symbol KBALB.

Some of these items were excerpted, with permission, from* Music Trades Magazine *by Larry Fine, RPT.

Set Your Sights on Dearborn

If you have not already made plans to attend the Dearborn Convention and Institute, I would encourage you to do so. The camaraderie and the socializing with technicians from the many different areas of the country and world, in itself, is an exciting experience. There is kind of a warmth in renewing friendships and acquaintances and making new ones. Some enjoy just getting away for a while, relaxing by the pool or eating out at some quaint restaurant, and yet others thrive on the political aspects, taking part in council and working toward enhancing our organization.

Institute Director Paul Olsen in the lobby of the Hyatt Regency Dearborn, site of the 1996 PTG Convention and Technical Intstitue. Photo courtesy of Paul Olsen.

There is plenty to do in Dearborn with a 200-shop mall directly across the street from the Hyatt. Greenfield Village and the Henry Ford Museum along with the Motown Museum and Greek Town are all something to behold. These are just some of the enjoyable activities found in this charming area, and they are only the frosting on the cake.

Our main focus is on education and without a doubt the Annual PTG Convention and Institute is an educational haven for piano technicians. There are many areas of interest ranging from business to health-related topics, but a large segment of classes will fall under the category of "Rebuilding and Shop."

"The Complete Sharpening Shop" is a complete sharpening class taught by Keith Bowman, who has more than 25 year's experience in woodworking. This is an opportunity to see a variety of grinding, honing, stripping and polishing equipment and to try out both commercially made and home-made jigs and a variety of sharpening abrasives.

Mark Bisso from Pianotek is conducting a hands-on class on key bushing. This will be a unique opportunity to learn time and labor saving tips from key repair professionals. All tools and supplies will be provided for use during the class.

"Grand Action Restoration" will help answer such questions as when do we recondition or when do we replace parts on a grand action? What are some of the optimum ways to solve action problems? Willis and David Snyder, a renowned rebuilding team, will take us through repairs in grand actions ranging from worn parts to geometry problems.

"Noisy Pedals" tend to rank second only to "Sticky Keys" in the customer complaint department. Ken Hannah of the Twin Cities Chapter will take us through the many pedal problems and lead us along a logical step-by-step diagnosis and repair in his class, ***"Lyres: Keep it Quiet."***

Rick Baldassin will be back with his class ***"New Parts on Old Frames."*** This class will include special demonstrations on the world's largest piano action model, designed for a grand piano approximately 8' high, 12' wide and 22' long. Rick will show how to choose the correct action parts for a job and he will be assisted by Mr. Genger, who is the Managing Director of the Louis Renner Company in Stuttgart, Germany.

"Piano Shop Trade Secrets and Other Helpful Hints" is a new class which will focus on showing special jigs, fixtures and techniques to speed and improve work in the shop. John Hartman

Continued on Next Page

PTG Institute & Convention and Henry Ford

Dearborn is the home of the Ford Motor Company. From the Hyatt, you will be able to see the Ford International Headquarters, known as the "Glass House." The property on which the Hyatt stands is owned by Ford and is leased to the Hyatt Regency Hotels.

Henry Ford was born in 1863 on a farm just north of the Ford Motor Headquarters. His mother died when he was 12. He helped on the family farm in the summer. In the winter he attended a one-room school. Watches and clocks fascinated Henry Ford. As a boy he spent most of his free time repairing and tinkering with time pieces. Many times he worked without pay just for the chance to learn about machinery.

At the age of 10 Ford walked to Detroit and became an apprentice to a mechanic for $2.50 a week. At night he worked for a watchmaker for four hours, making $2.00 a week.

At 21 he went back to his father's farm. He married Clara Bryant. He seemed to settle down, but two years later he went back to Detroit and got a job as a night engineer for the Detroit Edison Company.

Continued on Next Page

Photo courtesy of PTG Secretary-Treasurer Jim Coleman Jr.

Classes Scheduled for Dearborn

The following is a list of classes scheduled to be taught at the Technicial Institute during the 1996 PTG Convention at Dearborn, Mich., this July. The usual disclaimers apply to this listing, and classes and subject matter are subject to change.

Approximate level of material and presentation:

(E) Everyone (I) Intermediate
(B) Basic (A) Advanced

Business Classes

(E) 50 Ways to Make More Money Now! *— Bruce Genck, Genck Cases*

Beginners or pros—this loaded, rapid fire class will give you 50 shots to bullseye your bottom line $. Easy to implement ideas for the field, shop, and office. Take aim and start increasing your income immediately! (What's unique?) Lots of information in a short period of time.

(E) Business Cents and Nonsense: If You Did Not Earn $60K... *— Randy Potter, Randy Potter School*

This class will help technicians determine what kind of income they might expect to be able to earn, given their training, experience and location — plus the things they can do to (re)structure their business for both their own, and their client's benefits.

(E) Business — Expansion & Diversification *— Webb Phillips and Ruth Brown, Webb Phillips and Assoc.*

PTG Institute & Convention and Henry Ford

Continued from Previous Page

In a little shed behind his home he built his first car. Over the rear axle it had a two-cylinder engine that developed four horsepower. It also had a single seat fitted in a boxlike body, an electric bell for a horn, and a steering lever instead of a wheel. You can see a duplicate of this car in the hotel lobby.

In 1896 a horseless carriage chugged along the streets of Detroit, with crowds gathering whenever it appeared. Terrified horses ran at its approach. The police tried to curb this nuisance by forcing its driver, Henry Ford, to get a license. That car was the first of many millions produced by the automotive pioneer.

In 1899 Ford helped organize the Detroit Automobile Company, which built cars to order. But Ford had a dream to build cars in quantity and making it affordable for the average person. His partners objected to the idea and Ford withdrew from the company.

Raising $28,000 in 1903 from 11 stockholders, he organized the Ford Motor Company. One of the investors put just $2,500 into Ford's venture. The investor earned more than $5,000,000 in dividends, and received more than $30,000,000 when he sold all of his holding to Ford in 1919.

Ford's objective was to make every part that went into the automobile. He acquired iron and coal mines, forests, mills, and factories to produce and shape the steel and alloys, his fuel, wood, glass, and leather. He built railroads, steamship lines and an airplane freight service in order to transport his products.

Mass production was Ford's main idea, and he replaced men with machines wherever possible. Ford revolutionized industry with a moving assembly line in 1913. Each man was given only one task, conveyers brought the job to the man and he repeatedly did the same job until it became automatic. In 1914 Ford established an eight-hour day with a minimum wage of $5.00 a day and a five-day work week.

Today the Ford Motor Company is the second largest car manufacturer in the world. In 1903 the Ford Model T was the most successful car ever made. Not until 1950, when the Volkswagen Beetle outsold the Model T, was there another "universal car" designed and priced for the public.

Many of the places mentioned in this article can be seen at the Greenfield Village and the Henry Ford Museum. Henry Ford's birthplace, the shed where he built his first car, and part of the assembly line are displayed.

Next month: Greenfield Village and the Henry Ford Museum.

See you in Dearborn in July!

— Richard Bittner, RPT

Set Your Sights On Dearborn

Continued from Previous Page

promises to make this a fun class that you won't want to miss, particularly if you do shop work.

All of this and we have not even mentioned the ***"Rebuilding Seminar,"*** which will be eight class periods of rebuilding, ranging from fixtures and jigs to putting in soundboards. This will be a convention you don't want to miss so take advantage and if you have not already done so, send in your registration today.

— Paul Olsen
Institute Director

Associates' Seminar: A New Path to RPT Status

A special seminar designed to address the educational needs of Associate members of PTG has been announced by South Central Regional Vice President Jack Wyatt.

"This entire seminar will be an excellent opportunity for Associates to sharpen their existing skills and learn new ones, not only to pass the RPT exams but to render quality service to the piano-owning public," Wyatt said. The seminar will be conducted May 11-12 as a pilot project for the South Central Region, he said.

Classes will be Saturday and Sunday morning in the Best Western Inn in Garland, Texas. The hotel is located at LBJ Freeway and Centerville Road in suburban Dallas. Registration will be limited to 25, and fees are $55 for PTG members and $85 for non-members.

"We'll have first-class instructors, the best instructors from the South Central Region. For the quality of instruction, the registration fee is about the lowest that can be offered anywhere," Wyatt said. Topics to be covered include:

- Vertical regulation
- Flange rebushing
- Hammer filing
- Tuning
- Grand regulation
- Key bushing
- Shank replacement
- Pedal repair and adjustment
- Customer relations
- String replacement and repair.

For more information, contact SCRVP Jack Wyatt at (214) 278-9312 (daytime) or (214) 276-2243 (evenings).

Finding qualified help — Training — Keeping Control — Presenting yourself as a company. Scheduling — Who — When — Where you can get qualified business help.

(E) The Cost of Being in Business — *Vivian Brooks, Connecticut Chapter*

How to figure your cost per hour to be in business.

(E) Piano Technician Software Review — *Ron Berry, Indianapolis Chapter*

A "before you buy" class comparing and contrasting software specifically designed for piano technicians.

(E) They Plan Vacations Don't They? — *Jim Bryant, Northeast Florida Chapter*

Business Planning; not simple, but easy; complex, but not difficult. Make it your most used tool and collect the dividends and rewards.

Special Business Class

(E) The Ultimate in Time Management: Ford Time Management — *Ford's Fairlane Training and Development Center*

Set a new professional and personal direction by learning techniques that help you take control of your daily activities in this half-day workshop. This workshop is for people who need a time organizing tool to help them prioritize and manage their work schedules and daily activities. You will learn how to use the Ford Time Planner with Franklin Quest inserts to communicate, organize, prioritize, manage time and daily activities, and reduce stress. Participants will receive the Ford Time Planner and a one year supply of Franklin Quest insert materials valued at more than $60.

NOTE: This class requires pre-registration and a fee of $60.00 for materials and supplies. Register by calling Sandy at the Home Office at 816-753-7747 to secure a spot. This class is limited to 40 participants.

Health Classes

(E) Avoiding Aches and Pains: An Ergonomic Approach to Piano Technology — *John Foy, Central North Carolina Chapter*

Piano technology is hard work. Chronic pain, however, does not have to be our reward for success. This class will examine the sources of muscular injury in our profession and provide guidelines for avoiding injury. We will also look at various means to recovery and sources of treatment from the health care community.

(E) The Ear, Hearing Loss and Related Auditory Disorders Affecting Job Performance — *Dr. Michael LaRouere and Paulette Daniels*

How the ear works, types of hearing loss and how hearing loss affects job performance will be discussed. What can be done to prevent hearing loss and what can be done to correct hearing loss will be presented. Individual hearing tests will be offered to each participant.

(E) Safety & Shop Organization: "A Healthy Shop is a Happy Shop" — *Shawn Hoar, Connecticut Chapter*

Practical and common tips for the technician and rebuilder. Equipment and ideas for comfort and safety. What to use and where to get it!

In—Home Service & Repairs Classes

(E) Dealing With Friction — *Richard Bittner, Detroit—Windsor, MI Chapter*

We will discuss and demonstrate the different methods to correct the friction problems in the piano. Reaming, burnishing, easing and lubricating will be explained.

(I) The Full-Service Approach to Piano Maintenance — *Steve Brady, Seattle, WA Chapter*

A practical method for approaching each "tuning" with the whole piano in mind. First half includes slide show and lecture. Second half consists of live demonstration of a typical full-service session.

(I) Hospital For Hopeless Pianos — *Gary Neie, Northern Central Louisiana Chapter*

Hospital for Hopeless Pianos will cover many in-home repairs that are required whenever the customer calls you to "tune the piano." This class of "limited hands-on" repairs will cover a multitude of repairs like, loose tuning pins, loose ribs, loose soundboards, piano rattles, loose hammer felts, broken keys, broken hammer shanks, and much more. Bring your writing pad and pencil so that you can remember some of these valuable tips. Neie will assist you in this fast class in using different glues and adhesives in your everyday work. You will also learn to do the difficult jobs with ease and proficiency. You will return home with the ability to add dollars to your piano tuning income — to "work smarter-not harder."

(E) The Noise Clinic — *Ernie Juhn, Long Island—Nassau, NY Chapter*

A study of noises that plague tuner-technicians since the beginning of (piano) time. I will try to supply some proven solutions. The first step is diagnosing, next comes interpretation and finally the solution. The class covers complaints about noises which happen only some times, noises only heard by certain people, and even "illegitimate" complaints. All these and more are covered in this fast moving and humorous class. Ernie is returning as an Institute Instructor after having been engaged in other activities for over almost two decades.

(E) Practical Piano Prep — *Nick Gravagne and Richard Davenport*

Many piano customers would gladly Agree to one or two days of your work if you could clearly explain WHY the work is necessary and exactly what the cost will be. Prepared Customer Forms specifically geared to prepping will not only convince your customer that you are routinely engaged in this kind of work, but will also generate confidence in your skill and professionalism.

What does it take to "bring a piano up?" Practical grand piano prepping, or EVERYDAY PIANO PREPPING, is a concept which borrows techniques from high-level concert prepping. But, for the average customer, what are the absolute "musts" of the job, and what items can be ignored or put off to a future date? Learn to "read" a piano quickly with the aid of check lists (which will be handed out). Voicing is one aspect of prepping which will receive particular attention. Of real value will be the on-site prepping of a grand piano. Come and see Nick and Richard demonstrate the many tools and techniques required to carry out the typical prepping job.

(E) Regulating the Fandrich Action — *Darrell Fandrich, Seattle, WA Chapter*

This will be a "hands-on" regulation class. Action models and regulating tools will be provided for use in the class and every student will receive a regulation manual to keep. Students will also be able to work on the action in a piano.

(E) Repairing Chipped Ivories — *Steve Brady, Seattle, WA Chapter*

This class examines different methods for repairing chipped ivories. Included are dental lite-cure, epoxy, and acrylic fillings, with slide show and live demonstrations.

(E) Selling, Installation & Expectations of Humidity Control — *Bob Mair, Dampp-Chaser Electronics*

The first portion of this class provides a discussion of sales techniques used by the most successful sellers of humidity control systems. It contains what they feel is important to the piano owner and

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Classes Scheduled for Dearborn

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how they convey this message. The second portion is a demonstration of a full system installed in a grand piano. Class is concluded with what you can and can't expect from a humidity control system and common misconceptions discussion.

(BI) Seven Keys to New Piano Prep — *Philip Glenn, Young Chang America*

The main emphasis will be on dealer piano preparation and how to do quality work in a reasonable amount of time, for a reasonable price. Tips and techniques to save time on verticals and grands.

(E) Short-Cuts to Efficient Piano Service — *Ben McKlveen, Cincinnati, OH Chapter*

Complete piano service requires the mastery of a great many skills, among them, tuning, regulating, repairing, voicing and some business skills to make it all work. Much of what we learn in Piano Technology is taught in step-by-step textbook fashion. This class is designed to help you eliminate unnecessary or redundant activity and get the work done efficiently. In addition, there will be suggestions for tools and materials that can be used to save time and effort, and still provide high quality piano service.

(E) Springs in the Upright Action — *Donald Valley, Western Carolinas Chapter*

A New Topic! Springs are there to assist in areas unneeded in the grand. Just replacement is enough — tension regulation for consistent resistance and freedom gives predictable touch response. Lots of demo and hands-on for efficient replacement technicians and a resultant even touch weight.

(I) Steinway Grand Dampers — Secrets within the System — *Scott Jones, Steinway & Sons*

Steinway grand piano incorporates damper systems which has required little in the way of design change for over 100 years. See what makes this system so durable, and how simple regulating secrets can end those persistent "damper headaches."

(E) Vertical Regulation and Troubleshooting — *Dean Garten, Samick Music Corp.*

The first half of the class will focus on the proper procedures and tools used to adjust key regulation points in vertical pianos. Types of lubricants and how to use them will also be covered. The second half will address the troubleshooting process; logically track down and correct problems without entering "Panic Mode." Find out how to involve the manufacturer in this process and increase customer confidence in your abilities and expertise! Class participation in this portion of the class is encouraged.

(E) Wood Finish Repairs as an Added Value — *Keith Libby, St. Paul, MN*

This course will cover a variety of wood repairs that technicians can effect in the course of their job to add value to their services. Common problems that exist on pianos will be examined and explained from the perspective of a veteran "Touch-Up" person.

Piano Design, Construction & Materials Classes

(A) Analyzing the Backcheck Area of the Grand Piano — *Ken Sloane, Cleveland, OH*

The class looks at the position and size of the backcheck and how changing those variables affects checking. Also, look at the shape of the hammer tail and how changing that affects checking. Action models will be used and different parts interchanged to determine critical components of checking.

(E) Changing the Way Pianos Feel — *David Stanwood, Boston, MA Chapter*

The piano will play and sound its very best when the mass, leverage, and friction of the action are in harmony with each other. Learn the basics of how to identify and correct problems associated with these building blocks of action design from quick fixes to advanced concepts.

(A) Custom Keyboard Replacement for Piano Rebuilds — *Bob Marinelli, Pianotek Supply Company*

Do you know when keys should be repaired and recovered, and when they should be replaced? This perplexing question will be answered with examples of keys that would cost more in time and money to be repaired than they would cost to be replaced. This class will cover the keyboard manufacturing process, the need for keyboard replacement, and installation techniques. It will also address the importance of the key to action relationship and how custom key adjustments can actually improve the entire mechanism.

(A) Grand Piano Plate Action Relationships — *Alan Vincent, Geneva International*

This class will focus on the relationship of the grand piano plate action, how changes in the plate location affect the action, how to correct mislocated plates and how actions are built to the plate in the factory.

(E) Piano Making — Yesterday and Today at Bluthner's — *Ingbert Bluthner, Julius Bluthner Pianos*

Construction principals in the past shown on various parts of the piano and their today's construction.

(E) The State of the Piano Industry — *Kent Webb, Baldwin*

What's happening at Baldwin? How does it affect the entire industry? Big changes have occurred in the last decade in every piano manufacturer around the world. One of the most knowledgeable insiders in the country, and on the international scene, will present his view of the current state of our trade.

(E) Statistical Techniques in Manufacturing — *Gary Conte, Boston Piano Company*

This class is a light overview of how manufacturers use statistical techniques to improve the quality of their product. This class will show how appreciating variation can result in improvements in the design and manufacture of action center pinning.

(IA) Strings — From Pin to Pin — *Del Fandrich, Puget Sound, WA Chapter*

In this class we will examine piano strings from the tuning pin to the hitch pin and back again. We will discuss "tuned" duplex strings, "un-tuned" duplex strings, back strings, front strings and speaking strings. Along the way, we'll encounter V-bars, agraffes, pressure bars, and counter-bearing bars. We'll meet tuning pins, bridge pins and hitch pins. We'll also pass stringing felt and stringing braid. We'll even cross a few bridges getting there. We'll even examine stringing scales, hammer strike points, downbearing and anything else we can think of that has anything to do with piano strings.

(A) Touchweight Analysis with the New Touchweight Metrology — *David Stanwood, Boston, MA Chapter*

Hands-on analysis of the weight, leverage, and friction components of the grand piano action. Students will survey an action by taking upweight, downweight, up strike weight, down strike weight, key ratio, wippen weight, key friction, and front weight measurements. The raw data will be processed and placed on analysis charts and posted for viewing and discussion by all. *(CLASS LIMIT 20 — Sign up in PTG Institute*

Office — Stutz—Bearcat)

(A) The New Touchweight Metrology — Charting a Course for the Future — *David Stanwood, Boston, MA Chapter*

There has been a long felt need to know more about why pianos feel the way they do. This exciting new measurement system answers the need by finally making it possible to identify each of the individual components that makes the piano "feel" the way it does. After a description of the New Metrology, the class will view the analysis charts from student data taken in "Touchweight Analysis with the New Touchweight Metrology." Discussion will center on how the numbers on the charts relate to the feel of the piano.

Rebuilding & Shop Classes

(I) Bridging the Gap — *Walt Connell, Dallas, TX Chapter*

Recapping the bridge on a top quality grand is an easy decision to reach. What do you do when the quality of the piano does not justify this expense? Or the customer simply cannot afford a full cap? This class will show cost-effective repairs to salvage the old cap plus demonstrate how to do a partial cap that is appropriate. The class will be aimed at people who are doing restringing jobs and are ready to take the next step towards doing a more complete rebuild. Repairs using a variety of glues and veneers will be covered as well as the more conventional approaches of partial capping and repinning. Special emphasis will be placed on simplicity of tools and supplies as well as tips and techniques that will help a novice avoid trouble when doing their first job.

(E) The Complete Sharpening Shop — *Keith Bowman, So. Central Pennsylvania*

Your cutting tools feel sharp but you aren't getting the control or accuracy you need. Why? Your Japanese chisel has just been made razor sharp, but the edge failed on your first cut. What happened? When grinding an edge, why should frequent quenching be avoided? With over 25 years of experience in woodworking, Keith will demonstrate the most effective way to sharpen, flatten or reshape just about any cutting tool you use. This is your opportunity to see a variety of grinding, honing, stripping and polishing equipment. Try out both commercially made and homemade jigs, and a variety of sharpening abrasives. From the physics of severing wood fibers to the final polish, this class will give you the technique, equipment selection, safety and confidence you need to do your best work. Challenges: Bring a sharpening problem with you to class!

(E) Fundamentals of Key Rebushing — *Mark Bisso, Pianotek Supply Company*

Class members will learn fundamental concepts and techniques of all aspects of key rebushing. This will be an informal hands-on class focusing on bushing removal, felt selection and stripping, mortise and minor key repair, adhesives, glue pot maintenance, and bushing installation. This is a unique opportunity to learn time and labor saving tips from key repair professionals. All tools and supplies will be provided for use during the class.

(I) Grand Action Restoration — *Willis & David Snyder, Reading—, PA Chapter*

A comprehensive evaluation of the multiple aspects involved in the restoration of the performance capabilities of the grand action. Topics will include: 1) basic repairs (when to recondition or replace parts) that form the foundation of good action work; 2) action geometry (learn how to solve action problems); 3) fundamentals of touch and tone from the action perspective.

(E) "The Harmonious Beautiful"—Restoring the Piano Cabinet — *Sylvester and Julia Czajkowski, Chicago, IL Chapter*

Topics will include: Cabinet repairs, step-by-step complete refinishing, reconditioning of old finishes, custom finishes—as well as treatment of soundboard, plate and hardware, chronology of various finishing methods and materials will be traced. This class is unique in its "wholistic" approach to piano restoration, calling for a familiarity on the part of the restorer with all aspects of piano refinishing and rebuilding.

(E) Lyres: Keep It Quiet — *Ken Hannah, Twin Cities, MN Chapter*

"Noisy Pedals" tend to rank second only to "Sticky Keys" in the customer complaint department. This class will explore various methods of in-home trap work service as well as more extensive shop repairs. We'll take a close look at rebushing, regluing, repinning, remounting, relubricating, replacing, and any other "re" we can think of. If this doesn't solve the noise problem, there are also techniques to encourage the customer to play louder.

(AI) New Parts on Old Frames — *Rick Baldassin, Renner USA*

Many different action designs have been produced over the years, and manufacturers have often changed their action dimensions. In this class, Rick will teach you how to choose the correct action parts for the job, including assembling a "Universal Wippen" if no exact replacements are available. The class will include special demonstrations on the world's largest piano action model, designed for a grand piano approximately 8' high, 12' wide and 22" long.

(E) Piano Shop Trade Secrets and Other Helpful Hints — *John Hartman, New York City Chapter*

This is a fun, fast passed class focusing on special jigs, fixtures and techniques to speed and improve work in the shop. A broad range of topics will be covered, most related to grand action repairs and regulating, everything from felt cutting jigs and key leveling to boring hammers and eliminating false beats. The designing and rebuilding of custom jigs to solve difficult problems will be discussed. Everyone will leave this class with several new ideas to improve their work.

(BI) Shop Tested Grand Hammer Replacement — *John Hartman, New York City, Chapter*

Every piano technician needs the skill to hang a set of hammers accurately and efficiently either as part of routine maintenance on newer grands or as part of a complete rebuilding. The skills and techniques of hammer hanging are constantly in demand. This class is designed to get you up to speed by demonstrating the techniques and principles needed to get through the job. Everything you need to know, from evaluating the need for hammer replacement in the home or hall to hammer selection, gluing and final fitting, will be covered.

Tuning Classes

(AE) Aural Tuning Techniques — *Virgil Smith, Chicago, Il Chapter*

This class will include a discussion and demonstration of the four tuning techniques that enable both visual and aural tuners doing a tuning superior to the capability of the machine alone. I will also explain and demonstrate how to strike the note when tuning hard enough to equalize string tension, but still hear the beats clearly and avoid physical problems.

(B) Basics in Tuning—(Even Beginners Welcome) — *Jim Coleman, Sr., Phoenix, AZ Chapter*

Unison tuning — the most critical octaves — how to gauge and control

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stretch temperament—foolproof, self-adjustive.

(B) Basics in Tuning with the Sanderson Accu-Tuner — *Dr. Al Sanderson, Inventronics*

Getting started with the Sanderson Accu-Tuner. Functions of all the keys, display windows and tuning lights. Tuning from piano memory, both factory-installed tunings and customized FAC tunings. Using the automatic pitch-raise calculator for speed and accuracy. Aural tests for electronic tuners.

(A) The Digital—Aural Tuner — *Dean Reyburn, Reyburn Piano Services*

Are aural and visual tunings two sides of the same coin? See Steve Fairchild's Aural Tuning Emulator! Do historical temperaments without hysteria. Find out how MIDI can link your PC or Mac to the Accu-Tuner.

(I) Inharmonicity—Theory and Practice —*Dan Levitan, New York City Chapter*

Through visual models and aural demonstrations at the piano, this class will clarify inharmonicity theory and its practical consequences on piano tuning.

(I) Let the Piano Tell You! —*Jack Stebbins, Western Massachusetts Chapter*

The chief difficulty in tuning a temperament is how much or how little to temper each interval. Wouldn't it be great if there were a simple way to get each piano to tell you what beat speeds it would allow you to use? There is a way! It's straightforward. Come find out.

(E) Pitch Raise: Minimum Time, Maximum Results — *Harold Buyce, Western Michigan Chapter*

How to raise pitch on a piano that is very flat. Tools needed and how to use them. This is a tuning class for aural tuners.

(I) Testing, Testing, (and more) Testing —*Michael Travis, Washington, DC Chapter*

This is a tuning class focusing on when, where, how and why we perform aural tuning tests and where these tests come from. No one uses all these tests, but everyone can benefit from some of them, especially those preparing to take the RPT Tuning Exam.

(E) Troubleshooting the Temperament —*Jim Geiger, Heart of Texas Chapter*

Vibrations of the piano string, partials, the musical scale and why tempering is necessary. Several temperament patterns and checknotes and how to check the temperament.

(B) Understanding the Use of Partials in Tuning — *Fred Tremper, Bluegrass, KY Chapter*

Particular emphasis will be on how partials are used to check intervals in aural tuning. Also, we will learn what is meant by 2:1, 4:2, 6:3 octaves; 3:2 and 6:4 perfect fifths; and 4:3 perfect fourths.

Voicing & Concert Preparation Classes

(A) Advanced Voicing: Language and Technique —*David Barr, Pittsburgh, PA Chapter*

This class attempts to create an understanding of how and why voicing a piano works as well as a usable language with which to comprehend it ourselves and then convey it to our customers. We will learn how to distinguish the individual elements of tone that we can manipulate, useful vocabulary and descriptive phrases to describe them, and different techniques to make adjustments as needed. This is a methodical, understandable system for anything up to concert grade voicing.

(I) Aftertouch: The Secret of Ultimate Piano Performance — *LaRoy Edwards and Kirk Ise, Yamaha*

This innovative class will help to clarify the whole picture of "aftertouch." You'll see how to factor in the "human element" that the pianist places on the mechanical system of the piano, and what the pianist expects from your regulation work. We'll examine all of the related regulating adjustments to understand how each one contributes to the control and efficiency of making music at the piano.

(AI) Concert Prep/Maximizing the Performance Grand — *Kent Webb, Baldwin*

Performance grand service is a demanding aspect of our profession. In this class, Kent will review how touchweight analysis, regulation, and attention to detail are applied to bring out the potential of any given grand.

(E) From Rocks to Cream Puffs; Voicing Difficult Hammers — *Don Mannino, Kawai*

This is a basics of voicing class in which samples of 4 different sets of hammers are installed in one Kawai grand piano, and each is voiced during the class for the best tone. The hammer manufacturing process is discussed.

(A) Kawai Concert Grand Service — *Ray Chandler, Kawai*

The focus of this class will be on action and tonal detail work in servicing the Kawai concert grand. Please, RPT level or equivalent.

Historical & Special Interest Classes

(E) Historical Temperaments — *Owen Jorgensen Northern Michigan Chapter*

A theoretical basis for understanding and tuning the historical temperaments by ear will be presented. Instructions will be given for just intonation and also the meantone, modified-meantone, well, and Victorian temperaments.

(E) Player Piano Workshop —*Mark Haas, Detroit—Windsor, MI Chapter*

Complete overview of player mechanism restoration, including the removal and recovering of pneumatics; jigs and tools specific to the player piano trade; proven techniques to get the best results from various player actions; increasing profit by building your own suction boxes; techniques for accurate reproduction of severely damaged, unrepairable components; sources for hard to find tools and supplies.

(Mark Haas' Shop) You must pre—register for this class by 3:00 p.m. Friday in the PTG Institute Office(Stutz Bearcat).

MIDI & Digital Technologies

(E) PianoDisc—Servicing the System — *Don Dusenbury* —

This class involves participation for the complete time allotted. There will be an overview of the PianoDisc System. We will troubleshoot a system and demonstrate how to fine-tune the available adjustments. Tape recorder or video camera is suggested for there is much information covered in a short time. A certificate for servicing PianoDisc Systems will be given to all technicians meeting the minimum PianoDisc requirements. What's Unique? This seminar can lead to significant income opportunities for technicians.

(E) Servicing the Disklavier & Silent Piano — *Bill Brandom, Yamaha*

This class will give you a good overview of the features and functions found in the Disklavier and Silent upright and grand pianos. We'll include general tuning and regulating service, action removal, and a peek at the functions of the exciting new instruments. You will get a first-hand look at these acoustic/digital hybrid pianos. You'll emerge with a taste of the exciting music potential in these remarkable piano systems for the future.

The 1996 Institute Symposia Coordinated by Fred Fornwalt

"Communication for the 21st Century," — This Symposia will explain how keeping in touch is a key element of business success. Topics will include effective, affordable application of available technology, future trends, and the "Virtual Office."

"Faces of Success" — A roundtable discussion with piano technicians from across the country who have achieved business success. They will discuss philosophies, backgrounds, business plan, motivation, and "a day in their lives."

EXAM CLASSES

Written

(B) Preparing for the PTG Written Exam — *Randy Potter, Randy Potter School*

This class will help Associate members prepare to take the PTG Written Exam. Discussion of exam questions will center on why a particular answer is correct, rather than just what the answer is. Using actual and similar test questions in a short mini-exam pre-test at the beginning of the first session, and mini-exam post-test at the end of the second session, attendees can evaluate their readiness to take the Written Exam. This class will also be good for RPT's involved, or thinking of becoming involved, in either teaching exam readiness or giving exams at the chapter or regional level.

(B) The RPT Written Exam — *Mike Carraher, South Central Pennsylvania Chapter*

The RPT written exam will be administered to members only. Tests will be scored on site and if time permits, test evaluations will be offered.

Technical

(E) Preparing for the PTG Technical Exam — *Mike Carraher, South Central Pennsylvania Chapter*

A walk through the procedures and requirements to pass the technical exam. Learn what tools to bring plus the physical and psychological strategies necessary to pass these basic skills.

Technical Examiner Training — *Curtis Speil, Seattle, WA Chapter and Mitch Kiel, Puget Sound, WA Chapter— **(RPTs ONLY)***

Technical examiners for the RPT exam have no formal training program, yet must become skilled in administering the exam. This class will be a forum for asking questions about the technical exam and a "master" examiner training session. This class is designed for RPTs (no Associates please) who are or wish to become technical examiners.

Curtis Spiel, ETS Technical Exam sub-chair, and Mitch Kiel, ETS chair, will discuss exam equipment (including the new Vertical and Grand action models), interpreting the manual, humanistics, paperwork, etc. The class will also include some role-playing.

Tuning

(E) Preparing for the PTG Tuning Exam —*Mike Carraher, South Central Pennsylvania Chapter*

Experience the actual test room layout with a prepared test piano. Learn what detuning and scoring procedures are involved in the exam. Helpful tuning tips and critical psychological preparation will be emphasized.

Tuning Examiner Training — *Teri Meredyth, Los Angeles, CA Chapter and Mitch Kiel, Puget Sound, WA Chapter **(RPTs ONLY)***

Certified Tuning Examiners are made, not born. Help yourself become a great CTE by attending this examiner "master" class. You will have ample opportunity to ask questions or discuss problems you've encountered.

Teri Meredyth, ETS Tuning Exam sub-chair, and Mitch Kiel, ETS chair, will lead the discussion. We will cover such topics as piano selection and placement, master tuning, scoring, SAT operation, paperwork, humanistics, etc. We will do some role-playing. This class is for RPTs, CTE trainees, and CTEs (no Associates please).

Rebuilding Seminar

New this year, the ***Rebuilding Seminar***, coordinated by Wally Brooks, will be a series of eight classes given by some of the finest rebuilders and instructors PTG has to offer. Subjects ranging from teardown and reassembly of a grand piano to soundboard installation will be covered. Each class will be given only one time. The classes will be open to all registered members and non-members.

(AI) Bridge Construction & Duplication — *James Reeder, Lansing, MI Chapter*

Nothing unique about bridge making but it is an important part of piano remanufacturing. Bridge work is as important as soundboard work in the art of remaking a piano.

(E) The Business of Rebuilding — *Ed Dryburgh, Dryburgh Adhesives*

Building business — Estimates — Contracts — Making a profit. You know Ed as "Mr. Glue-All," but Ed is also a very successful and organized rebuilder.

(E) Efficient Destringing and Restringing Techniques — *Ken Hannah, Twin Cities, MN Chapter*

Dealing with piano wire can be a struggle and source of frustration, or a delightful feeling of accomplishment. This class will explore information that must be noted prior to destringing, tools and techniques used for destringing. Ways to install the new string that will yield you an accurate professional job in perhaps less time. So leave your frustrations and look forward to many satisfactions.

(I) Grand Pinblock Replacement — *Andre Bolduc — Bolduc Pianos*

Practical and simple procedures to remove, bore and re-install new pinblocks in a grand piano. This task is easier than ever. The job is simplified and accessible to more piano technicians.

(E) Jigs — Fixtures — Tooling: How a Small Shop Reproduces What Took Big Factories to Create — *Shawn Hoar, Connecticut Chapter*

"Tools (Toys) of the Trade." Jigs for tricky repairs. Fixtures for speed and efficiency.

(I) Soundboard Construction and Replacement in the Shop — *Nick Gravagne, Albuquerque, NM*

When does a piano require a new soundboard? And what sort of tone is probable, given appropriate bearing, in either retaining the original board or in replacing it. Through discussion and slides, Nick will outline the processes he and other bellymakers use to construct and install soundboards. Related topics such as plate setting and downbearing will also be covered. An enlightening class even if you never install a soundboard.

(I) Soundboard Repairs: Teardown to Reassembly — *David Vanderlip, Los Angeles, CA Chapter*

This class will briefly cover teardown, repairs and reassembly procedures including shimming techniques with hand and power tools, rib repairs, and scraping and refinishing.

(E) Woodworking for the Rebuilder — *Andre Bolduc, Bolduc Pianos*

Practical veneering (repairs), touch-ups and joinery, bench repair, tips and

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tricks for simple wood working at the customer's home.

APPLIED SKILLS
Hands-On—$20.00 per session

Lecture classes are fine, but have you ever wished you could actually try your hand at a new skill right in the class? Or have you often wanted to have a top—notch instructor all to yourself for twenty minutes to get the answers to your questions? If so, this "Hands-On Work-Station Room" is for you.

This large classroom will have a number of stations, each manned by a well-known instructor and set up to teach a different technical skill. Experienced instructors and a variety of topics ranging from intermediate to advanced ensure that this session will be valuable to all technicians. Want to get one-on-one tutoring in removing a broken agraffe? Go to that station. Need help with repinning? Ask for it at the pinning station. Never could get the hang of splicing a string? The instructor at the stringing station can point out just where you're going wrong.

This will be a rare opportunity to get quality tutoring tailored to your needs and skill level. As you can see from the list below, instruction in a wide range of topics will be provided by some very prestigious instructors, including three Golden Hammer winners. All necessary tools and materials will be provided.

Admittance to the Applied Skills room requires pre-registration at the door. Admittance is for convention registrants only, and requires an additional fee of **$20** to help defray the added instructor and equipment costs. Please try to be there 30 minutes before the start of class. Check, Cash, Visa or Mastercard accepted. *Please note: Full convention registration fees must be paid to attend these classes.*

Workstations include:

- Hammer shaping on grands & verticals
- Touchweight measurement & diagnosis
- Repinning action centers
- Ivory chip repair
- Finish touch-up
- String repair and replacement
- Vertical piano let-off and aftertouch
- Grand keyframe bedding
- Grand hammer alignment and travel
- Grand damper adjustments
- Broken agraffe removal
- Grand lyre adjustments

Instructors will include: *Richard Bittner, David Brown, Jim Bryant, Rick Florence, Glen Hart, Fern Henry, Ben McKlveen, Joyce Meekins, John Minor, Doug Neal, Norm Neblett, Webb Phillips, Dale Probst, Isaac Sadigursky, Eric Schandall, Richard Wagner, Liz Ward, Margie Williams and Doug Wood.*

Hands-On
Regulation — $35.00

(B) Grand Regulation — *Kathy Smith and David Vanderlip, Los Angeles, CA Chapter*

This class will cover complete basic grand regulation, and will provide all information necessary for an Associate preparing to take the Grand section of the PTG Technical Exam for RPT. Attendees will work in teams on action models.

(I) Vertical Regulation — *Fern Henry and Bill Spurlock, Spurlock Specialty Tools*

In this hands-on class, participants will get the chance to completely regulate a three-note action model with pedals. In addition to step-by-step procedures, this class will stress the principals of regulation, enabling participants to derive regulation specs from the piano, rather than just from a book. Also included will be troubleshooting procedures, time saving methods, tool recommendations and helpful homemade tool ideas. All necessary tools will be provided.

Hands-On
Tuning Tutoring — $20.00

The tutoring sessions are arranged for the accommodations of 3 students along with a CTE level tutor. This setting allows for dialogue and interaction to create an atmosphere of individualized supportive learning.

These classes require a special registration and a surcharge to help defray the added cost of equipment and materials used in the classes. Please note: Full registration fees must be paid to attend these classes. The only way to register is to call the Home Office at 816-753-7747 and speak with Sandy. She will be able to tell you which classes have openings. When your full payment is received by the Home Office, you will be sent a confirmation securing your place in the selected class. Visa or MasterCard are accepted. *Registration for these classes will not be accepted by mail or fax.*

(B) Beat Rate Tutoring

Receive individualized help in learning beat rates. Learn to identify beat rates within various intervals and checks and examine corresponding partials. Participants will be able to tune intervals and receive critique from a qualified tutor. **(3 SLOTS PER PERIOD)**

(I) Comprehensive Tuning for Advanced Students

Receive hands-on help from a tuning examiner. This session is designed to have tunings critiqued and/or to focus in on individual areas of concern. All aspects of tuning can be covered ranging from temperament to octaves to unisons. This is an excellent class for those who feel they are ready to take the exam but would like to receive final tips, practice, and evaluation. **(3 SLOTS PER PERIOD)**

(B) Octaves Tutoring

Receive individualized assistance learning proper stretching of bass and treble octaves. How much is too much? How do you get accurate results in the high treble and low bass. **(3 SLOTS PER PERIOD)**

Temperament Tutoring (Choice of Basic, Intermediate or Advanced Level)

Work with a CTE tutor to hone your temperament to the exacting standards of the PTG Tuning Exam. Practice tests and checks and receive valuable assistance from a qualified tutor. **(3 SLOTS PER PERIOD)**

(B) Unisons & Stability Tutoring

Get hands-on help from a qualified tutor. Training covers how to set unisons to exam standards, and how to get your tuning to hold well enough to pass the PTG tuning exam. **(3 SLOTS PER PERIOD)**

(B) Electronic Tuning Tutoring

Receive individualized help in using electronic tuning devices. This tutoring session is geared for beginners seeking help with the basics in using the Sanderson Accu-Tuner. **(3 SLOTS PER PERIOD)**

Visually Impaired Classes

(E) Business Techniques — *Wim Blees, St. Louis, MO Chapter*

How much money you make depends on how much you charge. This class will show how to set your fees, discuss business ethics and show how to build your business.

(E) The Finer Points of Regulation — *LaRoy Edwards, Yamaha*

An informal discussion and hands-on (as much as practical) treatment of regulation for the visually handicapped technician, both vertical and grand regulation will be discussed.

(B) Understanding the Use of Partials in Tuning — *Fred Tremper, Bluegrass, KY Chapter*

Particular emphasis will be on how partials are used to check intervals in aural tuning. Also, we will learn what is meant by 2:1, 4:2, 6:3 octaves; 3:2 and 6:4 perfect fifths; and 4:3 perfect fourths.

(E) Using the PTG Business Resource Manual — *Wim Blees, St. Louis, MO Chapter*

A thorough examination of what is in the PTG Business Resource Manual — and the best ways to use the materials will be discussed.

College & University Technician's Forum

1st Period

Mini-Forums — *Dennis Johnson, Twin Cities Chapter*

These forums will cover: Disklaviers for University use, computer programs for the university technician, how to figure the worth (salary) of a university technician, and retrofitting action parts.

2nd Period

From Hammer to String — *Stephen Birkett, University of Guelph, ON*

While much attention has been focused on investigating the mechanical properties of piano actions, comparatively little has been directed at studying how energy is transferred from hammer to string during, and after, impact. The initial few milliseconds after the hammer contacts the string are examined via a computer simulation in which many important physical parameters can be varied: hammerhead mass, material, geometry; hammerhead covering material, layer thickness and distribution on the head; shank geometry and physical characteristics; pivot friction; string diameter, tension, material, strike point and scaling; overall geometry of the gap layout. Data from specific pianos can be incorporated into the model to determine how the physical parameters and characteristics used by different builders affect the efficiency of the impulse, by changing the compliance and inertia of the components that make up the hammer system.

Mini Technical Classes

Business

(B) A Course of Action — *John Ragusa, Southwest Florida Chapter*

Learn the art of starting up and running a piano service business. John will cover business building and management, including servicing, scheduling, and record keeping. Maximize your success through customer education and by offering a variety of services.

(E) Economic Freedom: Fact or Fiction? — *Beverly Kim, Puget Sound, WA Chapter*

Every working person plans to retire. These plans raise important questions. How much will you need to save and invest between now and your target retirement age? How will inflation affect you in retirement? Other questions revolve around the benefits we provide ourselves and our dependents now. We will discuss all of these topics as we prepare for our own "Economic Freedom."

(E) What's Wrong With This Picture? — *Kathleen Gilkey, Pomona, CA Chapter*

A skit will be performed depicting a service call, showing what ***not*** to say and do in a customer's home. Class attendees try to pick out all the wrong things to do. Discussion follows the skit. The skit is humorous but the subject is serious!

(E) Where Are We Going? — An Inside Look at the International Piano Industry & Impact on Piano Technicians — *Lloyd Meyer, Renner USA*

A fact-filled, fast-moving presentation of where the piano industry is going, and what impact this could have on your business in the future. Music industry veteran, Lloyd Meyer, shares confidential data and research about the piano industry worldwide, and explores some of the secrets to increasing your business, even in a flat market.

In-Home

(E) Add a Little Splice to Your Life — *Jeanni Grassi, Seattle, WA*

String splicing — an introduction on the basic level. Class members will get a hands-on attempt to learn about this clever and useful little knot.

(BI) Damper Rails — *Dale Probst, Texoma Chapter*

Damper rails are the foundation of damper work, but are often overlooked. This class will focus on damper rails used in grand and vertical pianos — their purposes, common adjustments, and troubleshooting techniques.

(E) Forty Practical Tips For In-Home Servicing — *David Patterson, Toronto, ON Chapter*

How to be more effective immediatley without buying and making tools, changing habits or taking up more time.

(E) Home Spiff the Vertical — *Kerry Symes, Dallas, TX Chapter*

Technicians know that pianos need more than tuning. Kerry shares the methods and benefits of complete service for a quality job and for your own profit. Provide your customers with additional service which is often neglected but vital to the piano's health.

(E) The Ins and Outs of Player Actions — *Herbert Lindahl, Connecticut Chapter*

Learn how to determine the safest way to remove the upper and lower player actions to gain access to the piano. Slides are used together with an actual player action to demonstrate removal and installation.

(E) Pedaling — Fitting the Pedal to the Pianist's Foot and Style — *Joyce Meekins, Washington, DC*

Pedal position and adjustment will be discussed in relation to foot size, angle of foot, and pedaling style. This will include videotaped examples of different musician's techniques.

Rebuilding/Shop

(A) Brass Rails and Brass Agraffe Annealing — *William Balamut, Twin Cities, MN Chapter*

Put new life in brass agraffes and rails. Bill presents the technique for annealing brass to original hardness, adding years to its operation and performance.

(E) Fast and Efficient Keyframe Prepping — *Peg Browne, Orange County, CA Chapter*

There's a lot more to this work than meets the eye! Whether prepping a keyframe for rebuilding or for a dealer, what the processes are, and what tools and materials you need. Highlighted in Peg's demo will be: Lubes, cleaners, polishers and work techniques. A checklist of the prepping procedure will be handed out.

(E) Production Pinning and Bushing for the Shop — *David Brown, Central Iowa Chapter*

Learn how to streamline your shop procedures when re-pinning or bushing sets of flanges. Materials, tools, and time/motion will all be presented. Make a job you dread easier.

(E) Something Got Lost in the Translation — *Margie Williams, San Francisco*

Continued on Next Page

Classes Scheduled for Dearborn

Continued from Previous Page

Chapter

Have you ever regulated a grand action on the workbench and then been dissatisfied with the result in the piano? This class will show techniques for accurately translating the condition of the action cavity and keybed to your workbench. Also, tools and tips for in-home regulation will be covered.

(B) Speed — *Kim Fippin, Columbus, OH Chapter*

Which to use — a hand tool or a power tool? When is a power tool an option, a necessity, or a mistake? In this class, Kim will take a look at some common and some not-so-common situations and discuss some basic ideas on how to pick the best tool for the job.

(E) Tail Length: How Important Is It? — *Peter Collora, Dallas, TX Chapter*

Hammer tail length — how it affects repetition, height of checking, spring tension, drop, key dip, and the mechanical relationship to back check. Peter will discuss the whys and hows of tail length.

(E) Two Easy to Make Jigs for Precise Hammer Hanging — *Tom Servinsky, Palm Beach, FL Chapter*

For less than $30 you can gain greater control over the hammer hanging process. These jigs are designed to evaluate the existing hung hammers, accurately transfer measurements, and provide a template for the "to be installed" set. No expensive materials needed. Eliminate careless errors, increase your profit, and give your hammer hanging projects that extra touch. A slide demonstration will guide you through the process and blueprints will be provided.

(E) What's the Point of the Hammer? — *Bruce Christensen, Twin Cities, MN Chapter*

How to quickly improve the sound of your every day vertical piano tunings. Easy, in-piano hammer shaping, aligning and facing. Includes some string leveling and spacing.

Tuning and Voicing

(E) The 5—4—3—2: 1 Pitch Raise Method Using a Sanderson Accu—Tuner — *David Knudtson, Twin Cities, MN Chapter*

How to analyze the entire keyboard for pitch deviation, and determine the off-set to compensate for pitch error. David demonstrates his proven method used to over-pull the piano to stable pitch that gives an accurate pitch raise on any piano at any pitch, every time!

(E) Hammer Shape and Tone — *Doug Wood, Seattle, WA Chapter*

Hammer shape affects several important aspects of tone in pianos. The relationship between shape and these parts of overall tone development will be explored in light of how hammers are built and how they wear.

(E) SAT as Aural Teacher — *Mitch Kiel, Puget Sound, WA Chapter*

The SAT can be more than a workday tuning device. It can be a powerful teaching tool for learning to tune aurally-only and it can help you assess your readiness for the RPT tuning exam. Mitch will discuss coincident partials, FAC strengths and weaknesses, prescreening for the RPT tuning exam, and using your SAT (or other electronic tuning device) to learn to hear RPT exam tolerances.

(I) Just the Nuggets — Grand Regulating and Voicing Highlights — *Eric Schandall, Vancouver Island, BC*

We often come away from Institute classes with a particular new approach or technique which hits pay dirt. This class will highlight some of these nuggets collected over the years which will help in voicing and grand regulating.

(E) Piano Tuning 101.5 Basics and Beyond — *Sid Stone, Golden Gate, CA Chapter*

This is a tuning improvement class for RPT's, Associates and non members. RPT wannabes are especially invited.

(E) Tuning Stability — *Richard Ruggero, Research Triangle, NC Chapter*

Learn a system for creating a stable tuning. Eliminate guesswork and stop excessive pounding of the keys through proper posture, tuning hammer technique, and analyzing tuning pin position. Follow Richard's Rule, "initial pitch of a string does not always determine which direction the tuning pin will be turned," and cut your tuning time by 25 percent.

Miscellaneous

(E) Audio-Visual Techniques for Piano Technicians — *Bob Anderson, Tucson, AZ Chapter and Alan Eder, Los Angeles Chapter*

Video-taping can be a powerful tool for piano technicians. Its uses include: taping technical procedures and presentations for future study and chapter programs, archival interviews, self-evaluation in teaching situations, and other instructional uses. This class will provide an introduction to the equipment and techniques necessary for filming and editing videos.

(E) De-Mystifying the Perfect Pitch — *Isaac Sadigursky, Los Angeles, CA Chapter*

"Do you have perfect pitch?" technicians are often asked. Have you had situations in the field when it's hard to deal with clients with "perfect pitch?" Although there's no such thing as perfect pitch, Isaac has it, and he will help you understand its mysteries and misconceptions.

(E) The Glues We Use — *Bill McKaig, Southwest Florida*

This class will describe the various glues available to technicians as well as the proper selection of glues for specific jobs. Bill will fill in the gaps in your understanding of how adhesives function.

(E) Piano Prep School or "Crate Expectations" — *Allan Gilreath, Atlanta, GA Chapter*

New pianos don't come from any factory ready to go. Our job, should we choose to accept it, is to prepare the raw instrument for the piano-buying customer. This class shows how to inspect, repair, tune and communicate with the dealer while making a profit at the same time.

(E) Video Action Analysis — *Rick Florence, Phoenix, AZ*

The class will view a slow-motion video of a grand and an upright action and discuss how it affects our understanding of regulation and voicing.

Exhibit Showcases

New this year, exhibitors will be doing Showcase Classes. These classes will be 40 or 90 minute segments throughout the convention. Learn more about piano supply companies and piano manufacturing companies and meet their personnel. The subject of these classes may include:

- Demonstrations and explanations of products and services.
- Visual tours of factories or facilities.
- Introduction of new products or services.
- General classes on products or services.

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In Memory...

HAROLD ACKMAN, RPT
PENSACOLA, FL

ROBERT JANES, RPT
SPOKANE, WA

ROBERT SHAW, RPT
FOLEY, AL

Thomas H. Karl

November 2, 1952
—
February 23, 1996

Thomas H. Karl, a former member of the Research Triangle Chapter from Raleigh, N.C., died Friday, Feb. 23, 1996, at the age of 43.

Mr. Karl withdrew from the Piano Technicians Guild last year. He had operated Tom Karl's Piano Service after 20 years with Piano and Organ Distributors, first as a salesman and then spending the next 15 years repairing and maintaining pianos.

After becoming a Registered Piano Technician with PTG in 1986, Mr. Karl taught classes on polyester repair and computer use for small businesses.

Born Nov. 2, 1952, he is survived by his parents, George J. and Deltha H. Karl of Charlotte, N.C., and brothers Donald J. Karl and David B. Karl, both of Phoenix, Ariz.

A memorial service was held Feb. 27 at St. John's Metropolitan Community Church where he was a member.

Calendar Of Events

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

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

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

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

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

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

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

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

May 4, 1996
NEW MEXICO SEMINAR
Vintage Piano Workshop
Contact: Les Conover
4805 Central NE
Albuquerque, NM 87108
505-255-0658

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

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

AUXILIARY
EXCHANGE
Dedicated To Auxiliary News and Interests

Minding the Store, E-mail and the PTGA

The California Convention was a total success! Even our Scholarship Store netted $159.98. on total gross sales of $1078. We still have a long way to go to meet our annual goal of $1000 net for the fund. Remember, we will ship the merchandise to you for your chapter to sell at any state convention/seminar. Please let me know if that is something you or your chapter would like to help with.

How many of you have computers yet? And out of those, how many of you have E-mail or an Internet connection? If all of us did, we could "Zap" this information to you instantly and for free! In case you are one of those still on the outside looking in, the wonderful world of the Internet is the best resource tool ever. Once you learn one or two of the many ways to find information you'll wonder what you ever did without it. The entire Encyclopedia Britannica is available on line and is continually updated. I understand they charge a bit for that connection but far less that the set of books, and to find something is a breeze. Just type in the subject and it will find everyplace it is discussed in the entire set!

L. Paul Cook

You can visit many museums throughout the world, even the Louvre in France. You can look at photographs of the great artists and even print them out on your $250 color printer. Yes, that's all a color printer costs today for a home unit. I even found many cities have very important information available on the "Net" such as council and commission agendas, emergency information, event information, copies of the codes that affect your life in that city, and much, much more. The State of California even provides a place to download, which means copy the information to your own computer — every law the state has. No, you don't have to copy everything, just search by "key words" and print or copy to your own computer disk, just the information you need. California also provides a great FREE service where you can check, again by "key words," all bills in the legislature, passed or in progress. Then you can view the current status, history, and voting records. You may even "subscribe" to that bill which means they will notify you by E-mail every time that one bill is coming up for a vote and the outcome of it.

The PTG has a home page too. You ought to see it. Every member is listed by state and sometimes by zip code too. There is lots of other Piano information on the PTG page you might be interested in like "Coming Events" and photos, even a Salvador Dali about Pianos! The address of the PTG "HomePage" is "http://www.prairienet.org/arts/ptg/homepage.html" check

it out!, My E-mail address at home is "cookies2@ix.netcom.com" and at the office you can reach me at "pcook@cwcook.dolphin.net" If you have the ability to, please send me some E-mail, I would love to hear from you.

At the time I wrote this article, the PTGA Nominating Committee had no recommendations for the positions of President, Recording Secretary and Corresponding Secretary. They had no recommendations because everyone they asked turned them down! This caused me to think about the organization as a whole. Come to think about it, we have had no stories submitted over the last few years for either the *Journal* pages or the PTGA newsletter. At the last few annual PTG conventions it has been reported that almost no PTGA chapter met more that once or twice a year. Yet we continue on with a "formal" annual PTGA organization. Each chapter elects delegates to serve at the annual council meetings. But for what purpose? Who pays the delegates ways and registration fees? Then what purpose is there for two days of PTGA Board meetings at your expense and another day of PTGA formal Council meetings. For what? What do we accomplish and who appreciates us or all the time put in? All we really accomplish at the national level is that we arrange for a tour for one day and three meals at the annual convention.

That's it! We send out a PTGA newsletter with nothing in it except the minutes of the long meetings we hold about who knows what. The president is responsible for filling these two pages in the *Journal* every month, which isn't free for the PTG. About all I can write about is about things that have happened to me or my family because I get no other stories or information about the Chapters because there is no information.

One good thing we do is raise funds for the PTGA Scholarship Fund, which in turn promotes the Guild, which in turn will get our tuner spouses more tunings and, therefore, more money in our homes so we can buy something we put off last year.

Those of us who do go to the annual conventions do have a lot of fun, no doubt about that. I really enjoy seeing all my friends every year, and I look forward to that very much. But, isn't there a better way to have even more fun with less work? After seeing things from the inside over the last few years, I think so.

The Scholarship Fund could continue. All our funds now must be held by the PTG Foundation because of legal reasons dealing with nonprofit organization's legal filings and all. The Foundation could continue to provide the legal basis for our Scholarship Fund. The local PTGA chapters could certainly continue under the local PTG chapter. Best of all, we could completely eliminate the PTGA board and council. The spouses and guests of the PTG members could be better entertained for less money than is now spent on us. The two days of PTGA board meetings are expensive, so is the one day PTGA council session. PTGA members in the state where the annual convention was being held could help the PTGA board by setting up tours and lunches and/or breakfasts for us to just have fun at.

At my suggestion the PTGA council appointed a committee last July to study the organizational makeup of the PTGA. This July in Dearborn, Mich., we will learn the committee's recommendations and vote on the future of the PTGA. This could be that last really important thing the PTGA council does, or maybe not.

If you have any suggestions please let the committee's co-chairperson, Julie Berry, know right away. Please copy me, too, with your ideas. You response or lack thereof, will tell us a lot.

FOR SALE

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

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

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

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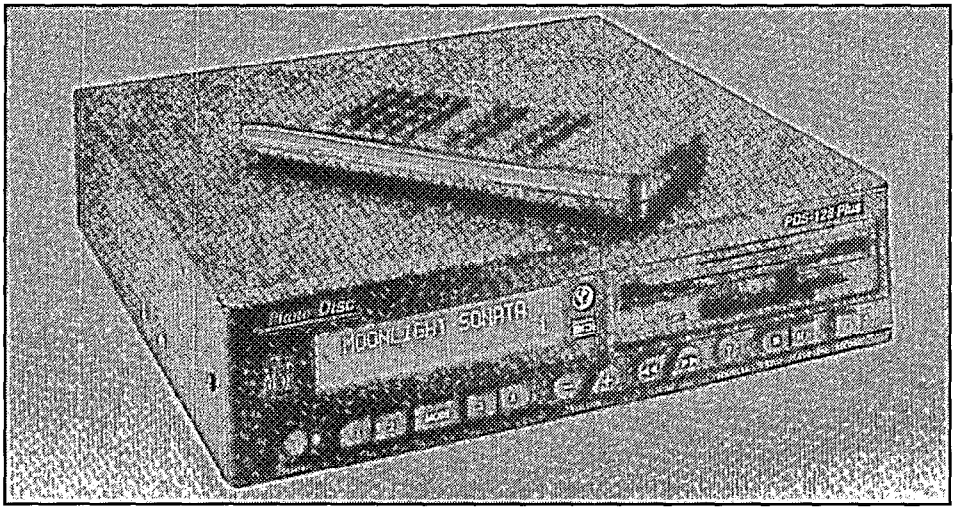

PDS-128 Plus

Not your father's player piano

If you thought that player piano technology couldn't get any better, step up and take a long look at the PDS-128 Plus System from Music Systems Research. The company that brought you the two finest player systems on the market, PianoDisc's PDS-128 and PianoCD, has topped itself with its new 128 Plus.

By far the most advanced MIDI player system on the market, PDS-128 Plus combines sophisticated computer and digital technology with the audio performance of CD quality. Computer microprocessors provide playback of 127 levels of individual note expression, capturing every exact tone and nuance of each keystroke. A new volume control makes possible whisper soft playback, and "flash memory" gives easy and convenient upgrades when new features are introduced. Another advantage of the PDS-128 Plus is its ability to play either floppy disk or compact disk software.

Dealer reaction to the new system was immediate and overwhelmingly positive. "Sales have been phenomenal! Supply is only barely able to keep up with demand," commented MSR President/Marketing Gary Burgett. "When you put out a product that does and has everything, you know you'll have a winner."

PianoDisc dealers have been especially enthusiastic about the new 128 Plus controls. The consensus is that they are now even more user friendly than those of the past. "Simpler and more logical," is the comment most often heard.

In conclusion, PianoDisc's PDS-128 Plus is a far cry from your father's player piano. And you can bet he'd love it.

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Tuition for the installation and Continuing Education seminars is **free**, but a $50.00 refundable deposit is required for confirmation. The PianoDisc Continuing Education Series seminars are restricted to PianoDisc certified technicians in good standing. For more information about attending a PianoDisc Installation Training seminar or a Continuing Education seminar, call PianoDisc during our office hours.

INSTALLATION TRAINING SCHEDULE

• April 22-28 • May 6-11 • June 17-22

CONTINUING EDUCATION

April 29-May 1 June 24-26

Liner Notes

Jessica Williams scores heavily in jazz critics' poll

PianoDisc Artist Series favorite, Jessica Williams has scored a major coup with international jazz critics. For the second consecutive year, two of Jessica's recent CDs have been voted to the Top Ten Albums of the *Jazz Journal International Critics Poll.* The albums are "A Song That I Heard" and "Encounters."

PianoDisc dealers will recognize her name from two PianoDisc releases. PD (and CD) 6004 and PD 9006. PD 6004 is vintage Jessica Williams, perfectly showcasing her percussive technique and melodic imagination. The disk makes it clear why jazz legends like Dave Brubeck and Cedar Walton rave about Ms. Williams, and why many in the jazz community think she is overdue for superstar status. To sum up her talent, Mr. Brubeck has called her, "One of the greatest jazz pianists I have ever heard."

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If you're interested in learning new skills and making more money than you do now, don't let these opportunities pass you by.

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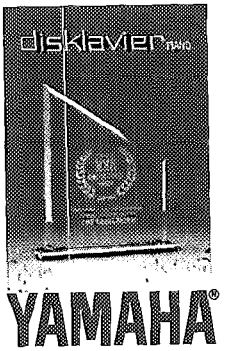

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