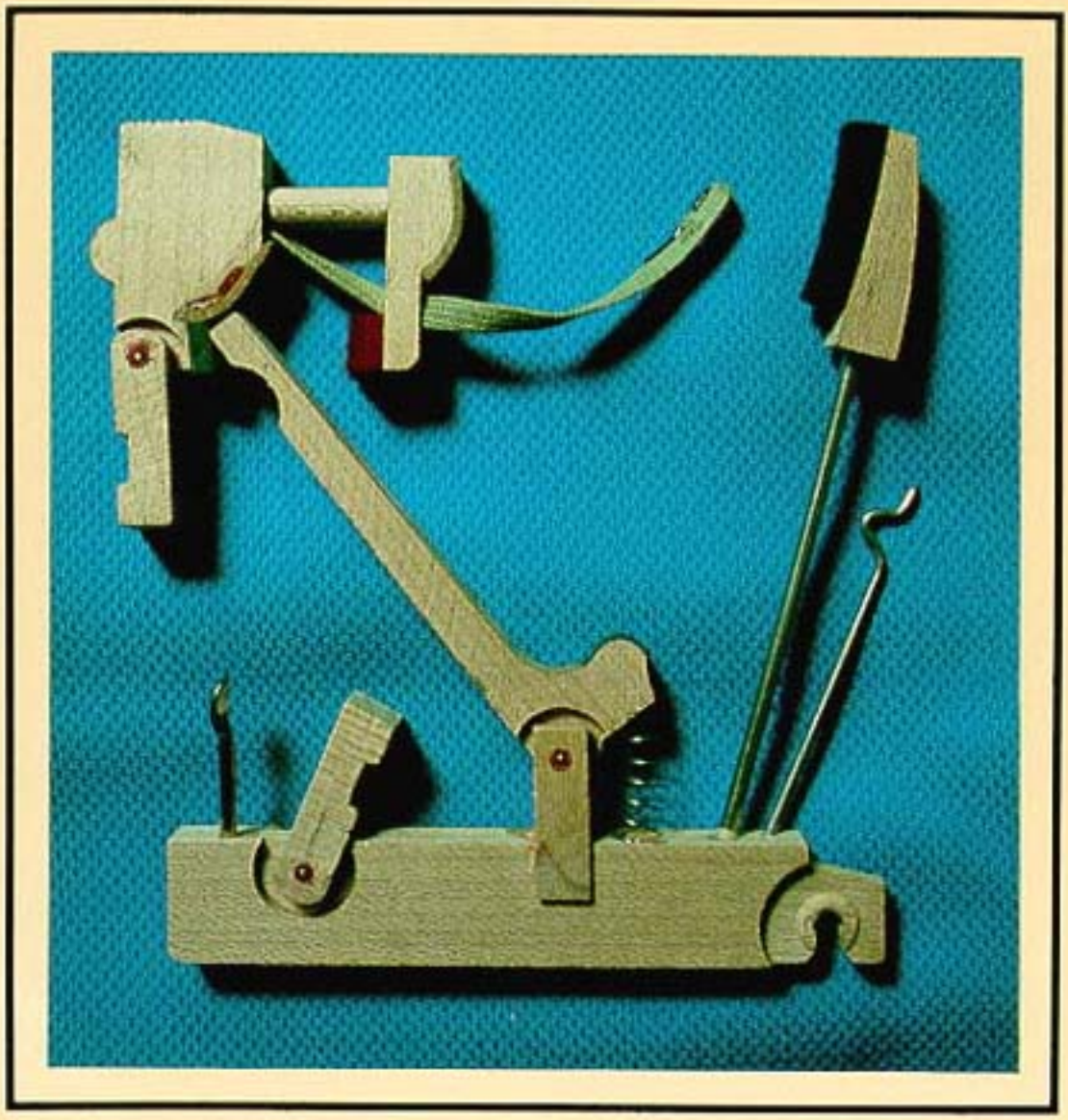
Piano Technicians
Journal

November 1984



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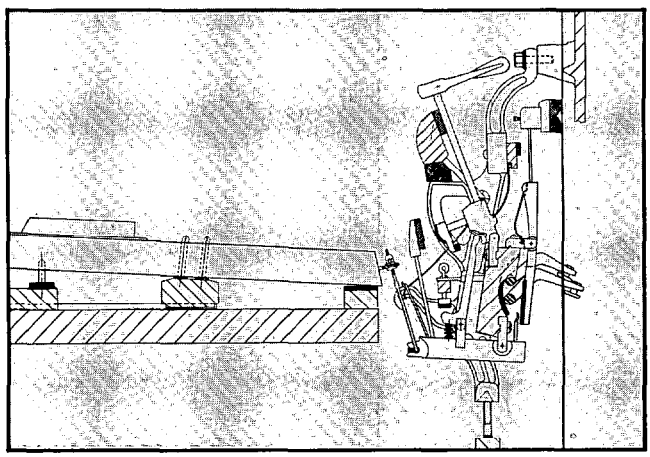
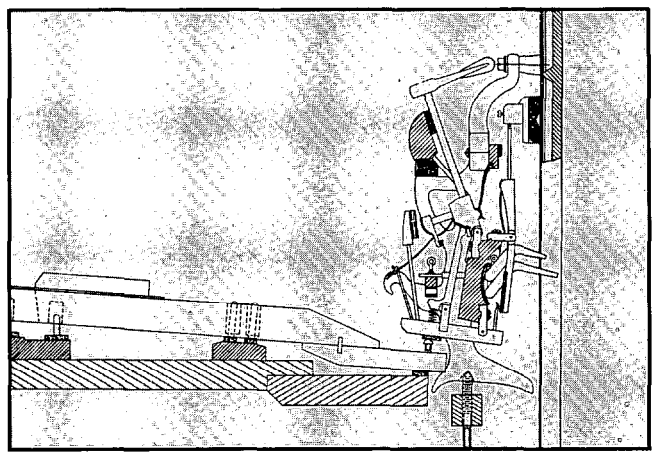
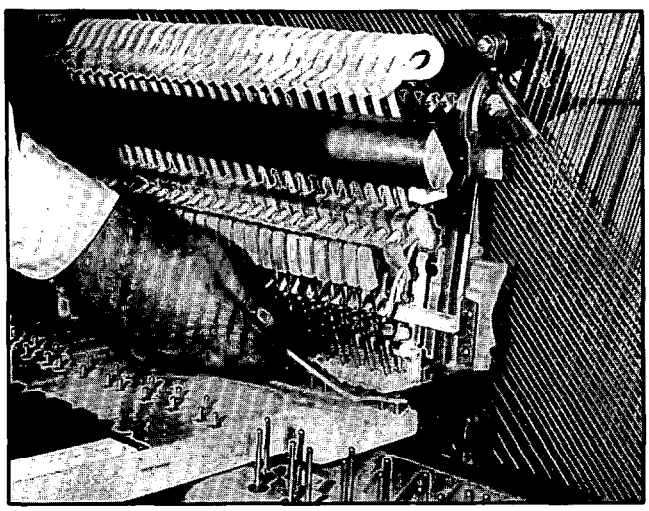


Baldwin 40-inch console



Baldwin 42½-inch console*



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Correction

Because of an editing error in the production stages of last month's *Journal*, the photograph of Gary Shulze's fortepiano on the cover was mistakenly identified as a harpsichord.

The President's Perspective

Charles P. Huether
President

Giving Thanks For One Man's Legacy

November is the month of Thanksgiving. The traditional symbol of the day is the turkey. Did you ever think about the fact that the turkey which we use to symbolize thanks for all the great gifts and achievements of our country is also used to describe a loser? To call someone a "turkey" is hardly a compliment.

One of the things we in the Piano Technicians Guild have reason to feel grateful for is the many wonderful people we come in contact with who help us add to our professional skills with their sage advice, counsel and example.

I have been extremely fortunate in that regard and especially so because of one gentlemen I met the first time I ever attended a Guild meeting. There was in the group that evening some very talented people. Among them was one man who added a dimension of stability, of importance, of graciousness and of kindness. He was well on in years, and as time went on tapered off his work but never his enthusiasm for the organization. I learned a lot from him, not only as a technician, but also of the importance of having an organization and the social, fraternal byplay that it developed.

When discussion grew hot and heavy and members argued, as they often do, without regard for proper parliamentary procedure; when the issue became so clouded one wondered how it would ever be resolved, this gentleman would ask for the floor. He would stand up in his quiet, dignified way and address the group as formally as if he were addressing the United States Senate. In a few short, succinct sentences he would reduce the confusion to the simple question it was. What more needed to be said? No more. Calm was restored, votes taken and business moved on.

I learned from this man the importance of the organization, the importance of maintaining its dignity and stability. These are the factors which make us a credible organization, instead of a group which just "hangs out" for a little while each month, as the spirit moves the members to attend. Before we can expect anyone to take us seriously, we must take ourselves seriously.

High up in the long litany of things for which I am thankful, I place the name of Alfred Holder. My hope is that each of you have such a person in your life.

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From The Executive Director

Barbara Parks
Executive Director

Job Description For A Successful Association

What does an association do? Here's how the International Association of Wiping Cloth Manufacturers, a New York City group, responded to that question. According to IAWCM, an association:

"Overcomes, coordinates, stimulates, improves, listens, accomplishes, serves, reaches, transforms, moves, pleases, contributes, reinforces, unites, inspires.

"Also, it awakens, performs, anticipates, accounts, advances, enables, enriches, dreams, organizes, cooperates, enlists, cares, channels, builds, publishes, bridges, initiates, involves, guides, warns, arouses, persists.

"And it administers, unifies, produces, reflects, safeguards, zips, welcomes, activates, refers, motivates, accommodates, enkindles, helps, humanizes, congratulates, invigorates.

"As well as alerts, informs, encourages, integrates, expedites, complies, heads, progresses, examines, prepares, petitions, enlarges, delivers, responds, shakes, instructs, betters, recruits, consolidates, identifies, renews, answers, acts, voices, cautions.

"Plus, it resolves, structures, establishes, does, consults, communicates, produces, hustles, promotes, aids, distributes, changes, recognizes, harmonizes, activates, notifies, attracts, speaks, replies, restores, probes, institutes, nudges, shapes, befriends, supplies, surveys, verifies, visits, sponsors and (whew) works!"

There are a lot of verbs there, and there probably are quite a few more that also apply. Taken together, they're a job description for any successful organization, society or guild. Each one implies action and each activity is a test of a successful association. It's up to you to evaluate how many of them the Guild accomplishes and how well.

While you're evaluating, remember that an association operates on the energy of its members. You can't get more out of an organization than you put into it, so view the above list as a job description, pick your verb and get involved!

Remember Someone Who Made A Difference!

Remember those who taught you your trade with a tax-deductible contribution to the ***Piano Technicians Foundation.*** Donations may be sent in memory of one who is deceased or in honor of a person who has been a special inspiration or made a significant contribution to the profession or to the Guild.

Donations may be sent to: *Piano Technicians Foundation, 9140 Ward Parkway, Kansas City, MO 64114.*

The International Scene

Fred Odenheimer
Chairman, International Relations Committee

The Piano Technicians Guild has always been fortunate in finding support from our piano manufacturers exhibiting and conducting classes at our conventions. We also owe a lot of gratitude to Japanese and, of late, Korean manufacturers. There is now a chance that Bechstein, the German manufacturer, will join the list of our supporters, and I know we would really welcome them at our conventions. It would give us an opportunity to widen our horizons.

Recently I read an article in *Europiano* magazine regarding round versus hexagonal wire in wound strings. The writer points out that hexagon wire of the same diameter is lighter than round wire which gives the string a different timbre. He advises not mixing hexagonal and round wire in a unison. For those of us who on occasion have used Universal replacement strings, this is good advice, especially for all of the better pianos.

According to the same magazine, 1984 is the 125th year of the death of Ignaz Bosendorfer, founder of the world-famous piano factory.

Some of our friends we missed seeing in England were the Yorks of the Knight factory. The factory was closed for vacation and the whole family was in Majorca, including Florence Knight, widow of Alfie.

Wherever we went in England, we had a wonderful reception. And so it was at the Welmar piano factory where Ralph Long got his start as a technician. It is a small factory, but they are building an excellent piano. Incidentally, Welmar is also the distributor for Bluethner pianos which actually antedated the manufacture of their own instruments.

IAPBT Adopts New Logo

The board of the International Association of Piano Builders and Technicians, meeting during the Piano Technicians Guild Convention in Indianapolis last July, adopted a new logo for the group.

IAPBT, an international association of piano technicians' associations and piano manufacturers from all over the world, will meet again in Kansas City July 17, 1985. That meeting, the group's fourth, will be its first in the United States since it was formed during the Guild's convention in 1979.

MOVING?

Be sure to let us know!

If you're moving, whether it's across town or around the world, be sure to let us know so your *Journals* can follow. To speed the change, send a mailing label from an old issue and your new address to: ***Subscriptions, Piano Technicians Journal, 9140 Ward Parkway, Kansas City, MO 64114.***

THE
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Vertical Rebuilding, Repetition Height Stability, Talc Vs. Rosin, The Multipurpose Tool Contest, Cristofori Action, Broken Key Repair, Tech Tips And What's New

Jack Krefting
Technical Editor

Vertical Rebuilding

At last it is time to end this series, which has lasted longer and said less than was originally intended. Each writing venture, like each rebuild job, becomes a learning experience in itself; one of the lessons of this one was that the topic is too varied and vast to be covered in a book, let alone a few pages in a trade magazine each month for a couple of years. Upon review, it is evident that more was left out than included, yet one cannot endlessly agonize over detail to the extent that no project is ever completed, so we are using that excuse to finish this project, even though it isn't complete. Someday a comprehensive book on the topic will be written, but until then, we will continue to try to cover smaller topics as they are raised.

Having regulated the action, it is time now to make the little changes which make a musical instrument out of a green piano. We have carefully set the bearing for optimum volume and ring time, somewhat more for the former and considerably less for the latter, so presumably the "box" is as good as its design will permit. The action finishing process, however, makes a vast difference in the overall performance, and that is one of the final operations we will consider.

We have already discussed spacing, alignment and filing of hammers, as well as striking points, but if there is any problem with tone in the high treble, double-check the latter especially. If the strike point is correct, the strings are level, the hammer is sufficiently hard and is striking all three strings properly and there is still a woody sound in the treble, it may be necessary to remove some of the mass from the hammer assembly. A word of caution, though: there is a difference between the woody sound of a hammer that is not properly voiced and one that is merely too massive, and that difference is not easy to describe in words.

If the technician is working with hammers that are a known quantity, it is certainly easier to make this distinction, and experience doesn't hurt at all. The typical Japanese hammer, for example, contains chemical hardeners that give it a lot of percussive "click sound" on impact, together with a quick decay rate. Such a hammer won't sound good — this is a subjective judgement, obviously — until the technician releases some of the tension/compression which was built into the hammer but locked in place by hardeners. Squeezing the hammer with pliers produces a surprisingly quick, though not very controllable, result. Better still, needling low on the shoulders, back near the staple, seems to break the grip of some of the hardener, allowing the felt to move around the molding on impact.

This movement, slight though it may be, dramatically changes the way the piano sounds, partly because the moving felt rebounds faster from the string and partly because it spreads a bit on impact, automatically dampening some of the upper partial sound which is commonly associated with harshness, brilliance to excess, or lacquered hammers in general.

There still are a few hammers available that do not contain hardeners, and these can be roughly divided into two categories: those that are pressed soft with the intention of lacquering after intallation, and those that are pressed hard with lots of tension and compression. The former will have to be brought up chemically, but the latter will usually respond to a combination of filing and low shoulder needling to bring out the tone.

If the hammer is sufficiently hard and the felt is moving on impact, yet the woodiness persists, try removing some material from the sides of the shanks or, better yet, from the hammer molding as shown in *Figures 1* and *2*. If possible, remove material only from the tail portion, starting by tapering the sides as shown in *Figure 1*. If an immmediate improvement is apparent, even more wood can be removed as shown in *Figure 2*, but be careful to keep continuous grain from the shank to the tip of the molding. Needless to say, one must also maintain enough molding material around the shank to support that glue joint, and one should

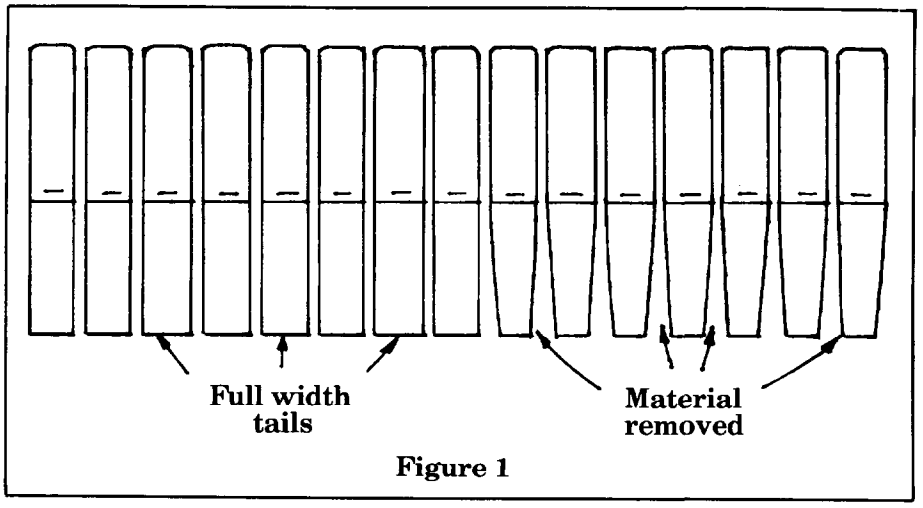


Figure 1

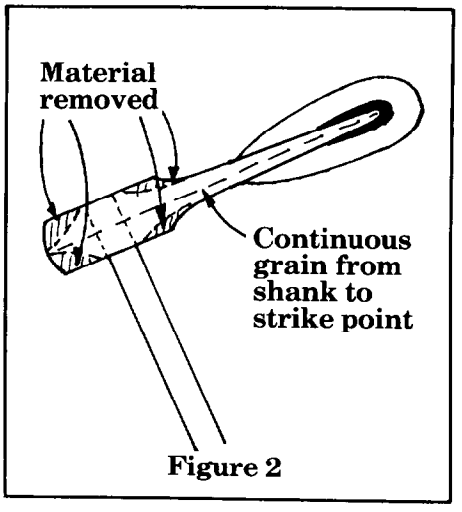


Figure 2

never cut felt from the shoulders as this destroys the tension of the hammer. To reiterate one more caution, before doing any thinning, be sure that there is good ring time when the strings are plucked and that the strike point is correct.

The last thing to do, when the piano is voiced and fine-regulated, is to weigh off the keyboard. Double-check the keys and action centers for uniform friction, though, because otherwise we could be adding weight to compensate for friction rather than for evenness of weight. Assuming that when we rebuilt the action, we checked the torque on every center and repinned those centers which did not meet our specifications, we can now make just a few quick checks.

Operate the soft pedal quickly several times, watching for hammers that either move too slowly on return or that bounce too far off the hammer rail. Repin the centers or regulate spring tension or evenness, as required. Next, with the right and left pedals depressed and the keys held down in back, flick the whippens upward with the fingers while watching for speed of return. This is a reasonably quick check of the whip flange centers, which can be followed by a winking of the jack tenders to test the jack flange centers.

Check the sizing of the balance rail holes by lifting groups of keys 1/16 to 1/8 inch above their normal at-rest positions and releasing them. If the sizing is correct, the keys should just slide down the pins of their own weight. To check the balance rail cloth bushings, place a finger on each key near the balance rail and try to move the key from side to side while watching the front of the key. There should be enough rocking movement to be felt but not enough to be seen. Finally, check the front rail bushings by pinching keys together at the front, watching the gaps between them. Assuming normal key spacing, it should be possible to decrease the gap by at least 50 percent but impossible to make the keys touch one another.

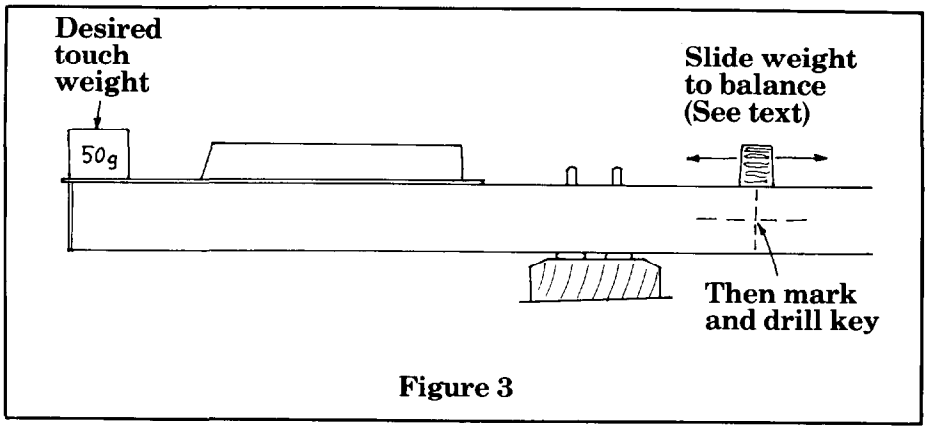


Figure 3

When you are satisfied that the friction is correct and even from note to note, place a weight equal to the desired touch on the front of the key and see whether a few knocks on the underside of the keybed will make the key just move downward. All keys that perform in this manner should be marked as correct, requiring no additional weight. Those keys that go down when the touch weight is set on the key, without knocking on the keybed, are too light and will have to be leaded behind the balance rail; those that will not budge, even with the knocking, must be leaded in front.

It should be noted here that some pianos are designed not to require lead at all, which is ideal from the standpoint of quick repetition because the inertia of lead has not been introduced, while others will almost inevitably require at least one weight in back because the keys will not otherwise return to rest. Both systems work, but neither is really uniform in touch from key to key without a custom weigh-off, so the rebuilder has a real opportunity to improve the instrument by so doing.

Figure 3 illustrates a weighing procedure which is similar to that used in weighing grands except that here the weight will usually be behind the balance rail. The touch weight is placed on the front of the key and, assuming the key immediately went down, a cylindrical key lead is placed on the key just behind the balance point. Slide the lead forward or back as necessary to achieve a balance so that the key will just go down about halfway when vibration is introduced by knocking on the keybed. When that balance is reached, mark the side of the key so that it may be drilled to

accept that particular key weight. Remember that key leads are available in various sizes, and that for good repetition it is better to have a larger weight close to the balance rail than a smaller one near the end of the key even though either will balance the key. Remember also that there should never be lead on both sides of the balance rail in any one key.

In some cases it may be necessary to use more than one key lead. Be sure that all holes are drilled in the same vertical plane, halfway down from the top, so there will be continuous grain from end to end regardless of the number of weights. The key will be the strongest if the continuous grain is on top and bottom, somewhat on the same strength principle as an I-beam. Drill the keys all the way through with a spur drill, and stake the lead in place with a punch and anvil. If the lead is not staked with enough force the key will click in performance, and if the staking is overdone the pressure will split the key. Experience suggests that the smaller the contact area between tool and lead, the less pressure required to do the job.

When the keys have been reinstalled, check everything once again. Be sure the case parts will go back on without interference, that the pedals don't squeak, and that everything is ready for delivery before calling the customer. This seems like an obvious thing, but remember that the average piano owner knows so little about what you have done that he can only judge the work based on what is obvious to him. A buzzing hinge or a crooked fallboard can cause suspicion that maybe the rest of the work was done just as carelessly, and then the customer starts to look for trouble that isn't there. It is difficult to overestimate the importance of that first impression.

Repetition Height Stability

One of our readers makes the following argument:

Dear Jack,

I read with interest your response to the reader with the problem of repetition height stability (Journal, August 1984, p.14). After careful reading, however, I believe the solution suggested will not work.

If I am not mistaken, reversing the nap of an incorrectly installed knuckle will reduce the friction between the knuckle and repetition lever, resulting in even greater hammer kick. It took me the first three years of my regulating experience and exasperated me to no end, before I discovered (what I think is) the answer. It seems to me that, clearly, the spring must be strong enough to support the hammershank at rest. There being no other provision in the action. So we adjust the springs for that condition. We now must find a way to slow the hammer down. Of course, all the hammer centers were checked, but I'll bet that most of us never touch the repetition lever centers. We can slow the hammer down by bringing the center's torque back to "specs!" I've never measured it, but in practice it is very easy to see that the center is loose and to pin it like any other. The specs are: the wippin flanges and repetition lever center are about the same and are the firmest in the action, being a little more than the hammer center. So you see, it's elementary!"

I have to respectfully disagree with some of the ideas expressed above, especially the notion that the repetition lever should be expected to bear the entire weight of the hammer without assistance from the jack. This means that, presumably because there is too much friction between the jack and the knuckle to allow the jack to return without inducing lost motion, instead of reducing that friction and regulating normally, we would add lost motion. We then, according to this suggestion, would add spring strength until the lever holds the hammer up on its own, knowing full well that now the spring will be way too strong; and then, to compensate for jumping hammers, it is suggested that we add friction by pinning the repetition lever tighter than the hammer flange, at best an unusual procedure.

Granted, the center torque on the repetition lever is all too often ignored, and our correspondent is certainly justified in pointing this

out as well as reminding us that the torque of this center must be within a certain range of stability of regulation. If we are indeed bringing that center's torque "back to specs", fine. But that should have been done as a matter of course before any regulating was started, not as a means of slowing the hammer down, even if it can be demonstrated to have that effect. In any event, we are unaware of any maker that specified higher torque in the repetition lever center than in that of the hammershank, as the latter takes the most force and is therefore generally pinned more firmly than any other.

As to the matter of the knuckle nap direction, certainly most if not all would agree that it should feel smooth when stroked toward the hammer, partly so the jack won't escape prematurely on a hard blow and partly so it can return freely even though there is no lost motion. This also should have been checked before regulating, as the action will not pass the wink test if the nap is backwards. If, because of excessive friction between jack and knuckle, the jack will not return to rest, the spring is then not fully extended; so it would be stronger, not weaker, and if that's true, then the proposition that reducing knuckle friction would increase hammer jump is a specious one.

The only real discrepancy here, aside from a difference of opinion on relative torque, involves the treatment of friction. Rather than beginning with the premise that the repetition lever must hold the hammer up, and adjusting the spring for that purpose, and then curbing jumping hammers by increasing friction in the action centers, let's consider starting at the other end. First, make sure the friction in the centers is correct: the hammershank centers should move when a force of about 6 grams is applied to the end of the flange, or the hammer should swing about seven times in the usual swing test. The wippen flange should just drop with the weight of its flange screw, or move with a force of two to three grams. The repetition lever, with the spring disengaged, needs about two grams of resistance, as does the jack center, and the damper centers should move without measurable resistance.

When the centers are uniformly pinned, and all knuckles have been checked for nap direction, the jacks and repetition levers should be burnished to a smooth, slick surface. Talc the knuckles if necessary, but don't apply anything else as other lubricants tend to make the buckskin nap stick down, which prevents it from doing its job. If the knuckle is smooth in both directions we won't be able to avoid skipping without placing the jack too far back under the knuckle, so it is vital to maintain that nap.

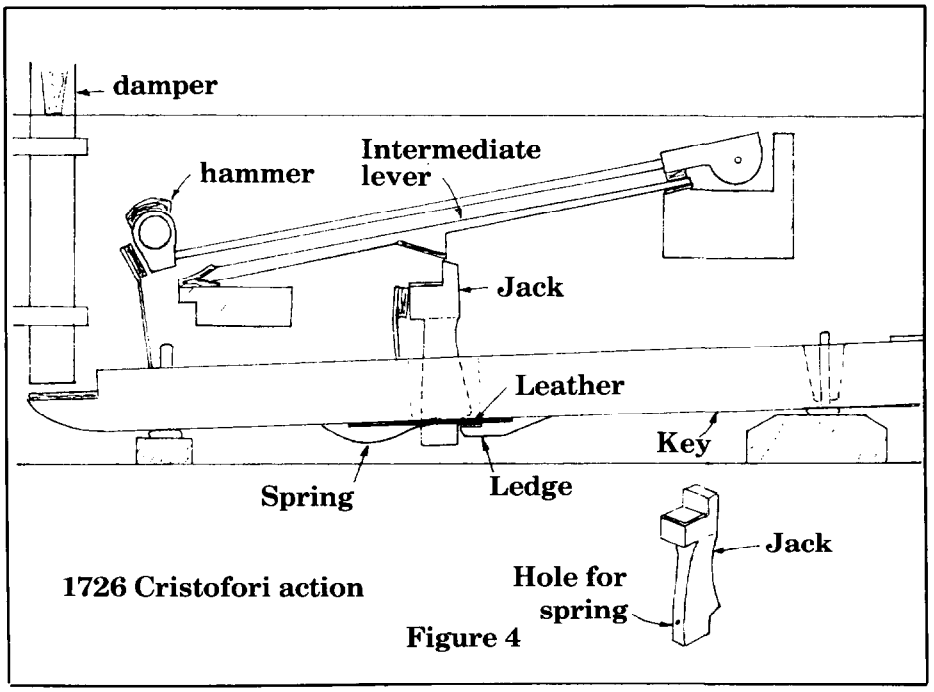
Raise the capstans enough to get the shanks off the rest rail, strengthen the springs enough to get a rough ballpark rise, and then regulate the action. The fine regulation of the springs should be the last thing we do, and they should be regulated for a smooth, quick rise without jerkiness. Any attempt to refine the amount of hammer jump by adding friction to the centers at this point will only cause the action to feel heavy and unresponsive, in our opinion.

Talc Vs. Rosin On Tuning Pins

The following was submitted by a member of the San Diego Chapter: *Sometime back there was discussion about talcum powder and tuning pins. About that time, the Guild organization changed and I dropped the thought. Anyway, I had a technician run an experiment with piece of pinblock and tuning pins. Talcum was put around one tuning pin, powdered rosin (athletic supply) on another. The talc covered pin did not hold. Therefore, it is best to keep hands dry with rosin, not talc when installing tuning pins.*

Before we accept that at face value, let's look a bit closer. What kind of talc was used? What kind of pinblock? What size holes were drilled? What were the torque readings of both pins, before and after? There are many questions that could be asked.

A number of years ago, having heard that rosin is good to have on the hands while stringing, I decided to give it a try on my next restringing job. The pinblock was Falconwood, and I had drilled it with an 0.272 inch bit at 920 rpm with an air stream on the bit, everything just as usual. After driving



1726 Cristofori action

Figure 4

the first three pins, 0.281 inch in diameter and 2-3/8 inches long, I decided to check the torque because the pins had been so difficult to drive. All three were so tight that they could not be turned at all, and they all broke at the becket hole when I tried to remove them. Extracting those pins consumed the rest of the afternoon, and that was the last time I ever used rosin. Should we then conclude hastily that rosin should never be used when stringing?

Of course not. Rosin, like talc, is useful in certain situations. We know that the use of rosin will increase pin torque, so if the torque feels lower than it should, we could add rosin to increase it, just as we could have switched to longer or larger pins. Rosin is most useful when repinning an old block, which is of course a chancy thing to do anyway, but at least it affords the opportunity to possibly increase the pin diameter by only one size instead of two, which would certainly result in a more tunable piano. How long the increase in torque would last is another thing entirely, and we would leave that for the comments of our readers who may have more experience with rosin.

Unscented talc is soapstone or steatite, ground into fine particles which, interestingly enough, can be used as either a fine abrasive or a lubricant, depending on the application. Its use as a dessicant while stringing is fairly widespread, and should have no effect on pin torque. It should be emphasized that only unscented talc be used, however, because the commercially available "talcum powder" contains an additive which may be oil-based and which could indeed cause pins to slip.

The reason to use anything at all is to prevent oil from the hands from contaminating the pins, since it is fairly well established that such contamination can cause jumping pins. Some technicians just don't have much oil in their hands, and can get away with no dessicant at all, simply washing the hands well before starting and periodically wiping them on a towel. Others have devised elaborate — or sometimes very simple — devices for holding the pin while cranking on the coil, and still others wear gloves.

Experience suggests that the amount of effort required to drive the pin bears a direct relationship to the eventual torque reading, and certainly if one can conveniently drive any pin with a hammer weighing less than thirty ounces, that pin will eventually be loose. The exception to that rule would be when driving fluid is used, which is usually varnish or something similar. In that case, the pins drive more easily and tend to tighten up when the fluid dries.

Multipurpose Tool Contest

Former President Sid Stone of the San Francisco Chapter suggests with a smile that we consider the common six-inch steel rule that most of us carry around. Sid has 12 uses for the tool.

1. Measure hammer blow distance.
2. Measure back check distance.
3. Measure key height.
4. Measure tuning pin height.
5. Measure pressure bar height.
6. Measure key dip.
7. Use as screwdriver on screws with narrow slots.
8. Drop screw regulator.
9. Center pin lubricant applicator (fits between flanges).
10. For liquid graphite (squeak douse) on damper hangers.
11. Remover of articles between keys.
12. Inserter of mute strip before tuning.

Cristofori Action

The following contribution, which refers to *Figure 4,* was made by a member of the Detroit-Windsor Chapter:

...Cristofori's jack design is the most ingenious I've ever seen. Rather than use a pin or hinge to allow rotation for escapement, he has simply built a small extension into the front edge of the jack and provided a ledge underneath the key for it to rock back and forth on. The lower edge of the extension has a slight upward draught to insure that the jack will not rise up in the key as it rocks forward, and the area where the extension contacts the ledge is padded with cloth or felt topped with the leather which extends back to line the edges of the slot in the key. The return spring serves a dual purpose, returning the jack after escapement, and by virtue of its length, holding the jack securely in place against the ledge....

Unusual Repair For Broken Key

On occasion, because of punky wood or errant grain, a key will break downward from the top, in which case a gusset is not just

desirable but an absolute necessity. Hiram Hunnicutt of St. Louis, whose ideas have been aired here once or twice before, has submitted the following information:

Tension at top of key pulls wood apart. Compression at the bottom of the key leaves the key in perfect alignment and the balance rail hole is not damaged.

Wipe some glue into the cracks with your finger. Put the key on a flat surface and hold the top of the key together with your finger pressure for three minutes. The glue begins to set. Wipe excess glue out of balance rail routing with a probe.

Smear both sides of the key with more glue at least one inch beyond the break. Let dry until glue is transparent. Split a sliver of bamboo, about 1/64 inch by 1/8 inch (see Figure 5). Bamboo has tremendous tensile strength because the grain is straight. Smear glue on the bamboo sliver, press it into place, and leave the key on the flat surface until you finish tuning your piano. This makes a strong, perfect repair ready for instant use.

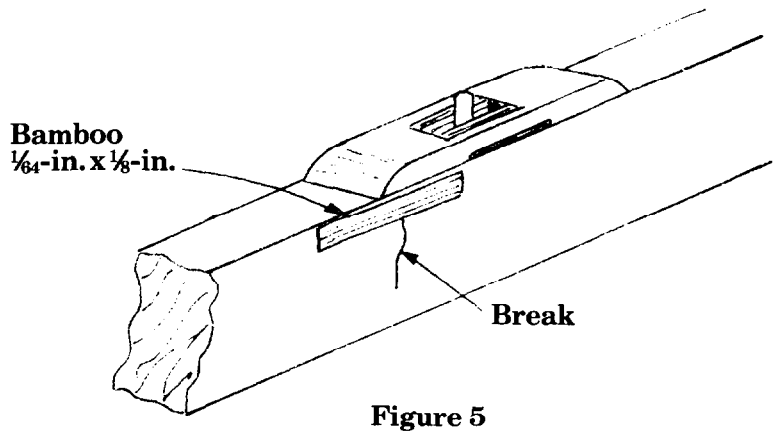


Figure 5

Tech Tips Stanley Oliver of the Detroit-Windsor Chapter, who always has a good idea to share, sends us two of them this time:

Steinway balancier tool: I have at one time or the other tried everything available and this simple idea works well, perhaps because I am simple also. A cheapie screwdriver about five inches in length... lock this in a vise and bend the tip about an inch from the end about 20 degrees. File a "V" notch in the tip and put a flat side on the handle on the same side as the tip is inclined. You can now close your eyes and readily pick up the spring just below the lever and slip it out to one side. To weaken it, I would retain the spring in the tip and merely push it down and slip it back into place. A little wiggle when you think it is in the groove is a safety idea. To strengthen, I let the spring up and with my thumb push it away from me slightly, using the tool to reset it. I have found this gadget very efficient.

Shank height gauge for upright shank repair: This consists of a metal rod about six inches long fitted with the standard shank clamp which acts as a measuring stop. After the drilled-out butt is back in the action, drop the rod in the hole, slide down the clamp so it rests atop the adjacent hammer moldings and lock it into place. The drilled-out hammerhead is fitted out with a shank and then butted up against the underside of the clamp. Use Mehaffey's shank cutters to nip off at the end of the rod for a micrometer measurement of shank length. I like to fit both ends of the shank dry first, to allow for any necessary customizing before socking it in with Titebond.

Stan Oliver, RTT
Detroit, Michigan

What's New

Having noticed an item we published a few months ago about using a modified Portalign dril attachment for drilling bridge pin holes, Ed Adams of Garland, Texas, notes that an adjustable model is available. Here's Ed:

...I noticed a tool similar to the one in the April, 1984 Journal, page 18, for drilling bridge pin holes. You can set it at any angle you wish. The tool, without drill or chuck, is $19.95 at The Fine Tool Shops, Inc., P.O. Box 1262, 20 Backus Ave., Danbury, Connecticut, 06810.

Please send all technical material for publication, whether it be for this column or to be used elsewhere in the magazine, directly to me at this address:

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1801 Gilbert Ave.
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Taking The Mystery Out Of Tuning

Virgil E. Smith, RTT
Chicago Chapter

Definitions:

Every tuning process must involve two notes: the note being tuned and the note to which it is tuned, which must already have been tuned.

Check note: A note or notes other than those involved in the tuning process that can be used to determine the validity of each tuning step. It is not necessary that they be in tune, just close enough to make a measurable beat on the right side of pure.

Tuning checks: The process by which check notes are used to ascertain the correctness of the tuning process.

Temperaments

Goals:

1. A gradual increase in beat-speed of about 1/2 beat per half step in ascending major thirds, major sixths, and minor thirds. With F33 as the lowest note, the major thirds start at approximately seven beats per second, the major sixths one beat faster at eight, and the minor thirds at 9-1/2.

2. Perfect fifths slightly increasing in beat-speed from slower than one beat per second (F33 to C40) to one beat per second (B♭38 to F45).

3. Perfect fourths slightly increasing in beat-speed from one beat per second (F33 to B♭ 39) to a trifle faster than one beat per second (C40 to F45).

Note that perfect fourths and major intervals are expanded to produce their correct beat and minor intervals and perfect fifths are contracted.

Checks:

Perfect fourth. Check note: the note a major third below the low note of the fourth and a major sixth below the high note of a fourth. Check — the major sixth should beat one beat faster than the major third. If they beat the same speed the fourth is pure, if the sixth is slower the fourth is contracted rather than expanded. If the difference is greater than one beat,the beat in the fourth will be obviously too fast. This is called the third-sixth check.

Perfect fifth. Check note: The note a minor third above the lowest note of the fifth and a major third below the highest note of the fifth. Check — the minor third should beat one beat faster than the major third. If they beat the same speed the fifth is pure, and if the major third is faster the fifth is expanded, not contracted. Too great a difference will produce a beat that is obviously too fast in the fifth.

Procedure:

Tune C40 to fork or bar. Check note major 10th below C40 (A♭ 24). Check — compare A♭ and C with A♭ and fork. The C is correct when the beat is the same speed, high when the A♭ and C is faster, low when the A♭ and C is slower.

Tune F45 to C40. (fourth expanded by slightly more than one beat per second). Check note A♭36 (not yet tuned). Check — compare A♭ and F (M sixth) with A♭ and C (M third). F45 is correct when the sixth beats one beat faster than the third and the fourth has a beat slightly faster than one per second.

Tune F33 to C40 (fifth contracted to slightly less than one beat per second). Check note A♭36 (not yet tuned). Checks — compare minor third (F33 and A♭36) with major third (A♭36 and C40). The fifth is correct when the minor third is a beat faster than the major third, and the fifth has a beat slightly slower than one per second. F minor third should also beat the same speed as the A♭ major sixth.

Tune B♭38 to F33. (fourth expanded by one beat per second). Check note D♭29 (not yet tuned). Check — D♭ sixth should beat one beat faster than D♭ third.

Tune G35 to C40 (fourth expanded by one beat per second). Check note E♭31 (not yet tuned).

Tune F♯34 and B39 to each other (fourth expanded by one beat) so that the G to B third beats 1/2 beat faster than the F♯ to A♯ third. Check note D30 (not yet tuned), G35 and B♭38. Check — D sixth should beat one beat faster than D third and G third should beat 1/2 beat faster than F♯ third. The fourth is too high when the G third is too fast, too low when the F♯ third is too fast. Adjust the fourth up or down until the thirds are correct.

Tune A37 to F33. (third 1/2 slower than F♯ third). Tune A♭36 to C40 (Major third 1/2 slower than F♯ third).

First Refinement:

All of the notes from F33 up to C40 are now tuned, and if they are correct the rest will be easy. Included are one fifth, three fourths, four major thirds, and five minor thirds which should all be checked and slight adjustments made if necesary before going on. Do not adjust any note until you are sure it is at fault, and have determined what that adjustment will do to every other interval in which it is involved.

Tune C♯41 between F♯34 (fifth)

and G# 36 (fourth) so that the G# fourth beats slightly faster than the F# fifth, and the A to C# major third beats slightly faster than the A♭ major third.

Tune D42 between G35 and A37 so that the fourth beats slightly faster than the fifth, and the B♭ to D major third is slightly faster than the A to C# major third.

Tune D#43 between G#36 and A#38 so that the A# fourth is slightly faster than the G# fifth, and the B to D# third is slightly faster than the B♭ to D major third.

Tune E44 between A37 and B39 so that the B fourth is slightly faster than the A fifth, and the C to E major third is slightly faster than the B to D# major third.

Check the four sixths, F to D, F# to D#, G to E, and A♭ to F. They should gradually increase in speed as they ascend, and each be one beat faster than the third with the same bottom note.

Final Refinement:

Now recheck the entire temperament and make whatever corrections are necessary until every interval relates correctly to every other interval. Check by playing up chromatically by fifths, fourths, major thirds, minor thirds, and major sixths. Any irregularity should be apparent at once, but again don't make any change until you have determined the effect of that change on other intervals involved.

Octaves Above The Temperament

Goals:

1. To extend the accuracy and consistency of the temperament through the entire upper range of the piano.

2. To achieve a normal stretching of the octave based on corresponding over-tones beginning right at the temperament area.

Checks:

The following checks will serve as guidelines for stretching the octaves the maximum without over-stretching.

1. The fourth should beat faster than the fifth when their common upper note is the top note of the octave being tuned.

2. The major 10th below the upper note of the octave should beat at least as fast (slightly faster on some pianos) than major third below the lower note of the octave, and slightly faster than its lower neighboring 10th.

3. When the third-10th test becomes too fast to evaluate accurately, switch to the 10th-17th test where the same principles will apply.

4. The double-octave check (the note being tuned and the note two octaves below), will prevent over-stretching the octaves. A beat in the double-octave indicates that the upper note is tuned too sharp.

Finally, it should be remembered that the check intervals, fourths, fifths, 10ths, and 17ths, are for the purpose of improving and refining octave tuning, not working in opposition to good octaves. Consequently, something is drastically wrong if one has to choose between a beatless octave and a correct check interval progression.

Octaves Below The Temperament

Goals: *1.* A gradual slowing of all the intervals of the temperament as they descend as far down as they can be heard, usually around F21. The greatest help will come in comparing the minor third with the major third having the same low note, and its inversion, the major sixth. The minor third must be faster than the major third, and equal to the major sixth. For example, when tuning E32 to E44, the minor third (E32 to G35) must be faster than the major third (E32 to G#36), and equal to the major sixth (G35 to E44).

2. Below F21, compare parallel 10ths until they become difficult to hear, then switch to parallel 17th. The slowing of the beat-speed is now so gradual that it almost seems not to change. Tune the bass notes as low as possible being sure that there are no beats in the double-octave, and that no 10th or 17th is faster than its upper neighbor. As in the case of the treble, everything will fall into place if the temperament has been accurately tuned.

How I Learned To Stop Worrying And Love The Checklist

Stephen H. Brady, RTT
Seattle Chapter

Recently, I was privy to an extended episode of piano troubleshooting with a conclusion I found very interesting, if not stunning. While I was not involved with the case, except as an observer, I feel that I learned a valuable lesson nonetheless.

A well-established piano teacher in our area owned a fairly new grand piano (one of the better imported makes) which had problems. It seems it was hard to play and particularly difficult to control in the bass. Putting it succinctly, she said the piano played "like a truck."

After complaining to the dealer, she began receiving a succession of piano technicians sent by the dealer and, later, by the manufacturer. These technicians were all locals, and were all excellent technicians who had previously earned the respect of the dealer and the manufacturer. In each case, however, the technician failed to solve the problem to the client's satisfaction. Again, I must emphasize that these technicians were skilled practitioners with substantial experience in troubleshooting, yet each one of them concluded either that the client was imagining the problem or that somehow the design of the instrument was to blame.

"Putting it succinctly, she said the piano played like a truck. After complaining to the dealer, she began receiving a succession of piano technicians sent by the dealer and, later, by the manufacturer... In each case, however, the technician failed to solve the problem to the client's satisfaction."

At this point, the manufacturer, in desperation, spent several hundred dollars to fly a technician in from another state. Prior to making the trip, this technician called me, and I agreed to let him use my workshop here at the university if it became necessary.

After arriving in town and examining the piano, this technician, a distinguished senior member of the Guild, brought the action into the shop. I asked him if he had found the problem.

"No," he answered, "but I suspect it just needs a thorough regulation."

With that, he began to do a complete action regulation, following a checklist which included some 40 or 50 items. During the first phases of this project, he checked such things as action "spread" and hammer

bore distance, then removed the action stack and keys and proceeded to inspect, clean and polish the capstans and keyframe pins. This process extended to the wippen cushions and knuckles, which he brushed and cleaned. The wippen cushions were coated with a black substance which must have been some kind of graphite grease or wax, and which had to be cleaned out by soaking the cloth with dry-cleaning fluid and then brushing with a suede brush.

"Well," I said, "it looks like you've found the culprit, huh?"

"I wouldn't be surprised," the visiting technician replied, "but I'm going to finish the checklist, since I've got the action here in the shop anyway."

He continued with eliminating friction problems: "Ease keys; check. Open tight balance holes: aha!" Several balance holes were tight, particularly in the bass. Between the gunk on the wippen cushions and the tight balance holes, it appeared that our visiting technician had indeed solved the problem.

The rest of the overhaul-regulation went without incident, taking the better part of a day and a half. The technician returned the action to the customer's home, and the two of us met for dinner that evening.

"You won't believe what happened," he said. "I put the action back in the piano and started playing it, and it still played like a truck! I had a few items left on the checklist, so I decided to finish the job. I found the real culprit on the next item."

"What was it?"

"The damper stop rail was set too low, especially in the bass! I raised it to the right height and the piano played perfectly."

The important thing I learned from this story was not the fact that a damper stop rail set too low can make a piano hard to play, but the method this technician used to find the problem. A checklist!

Let's face it: many of us disdain the idea of using a checklist because we don't need to, right? We don't need to follow a list of instructions because we already know how to regulate a piano action, right?

Wrong. I can think of at least three good reasons for using a checklist. First, with some 50 items or steps involved in a procedure, a checklist insures that you not only remember all the steps, but that you perform them in the most efficient order (presuming, of course, that your checklist lists the items in the most efficient order). Second, on a job where you will have to cope

with interruptions (like most shop jobs), the checklist saves time when you are trying to remember where you left off. Third, as this story shows, sometimes there is no substitute for a thorough checklist when you're troubleshooting the problem that no one else has been able to solve.

So, what kind of jobs are suited for checklists, and where does one acquire these checklists? I would say that most shop jobs are good candidates for checklisting. Looking through my files, I find checklists for grand action regulation, grand damper replacement and regulation, wippen rebuilding, pinblock replacement, restringing, keyboard construction, action replacement, upright action restoration, and trapwork reconditioning.

These checklists come from basically three sources: handouts from convention classes, lists I have gleaned from *Journal* articles, and lists I have put together from my own experience.

"These checklists come from basically three sources: handouts from convention classes, lists I have gleaned from Journal articles, and lists I have put together from my own experience."

In addition to these shopwork checklists, I have drawn up checklists for periodic examination of pianos. This type of checklist is particularly useful in my present situation as a univerisity technician. These lists, one for grands and one for uprights, run to only about a dozen items each, but they do provide a yardstick which enables me to easily determine the condition of each piano in relation to the others.

Another kind of checklist I use is a rebuilding time record, which lists 17 items from tear-down to miscellaneous, and provides space after each procedure for me to record the time spent on the item. This helps me project how much time future rebuilding projects will take, and therefore makes my estimates more accurate than before.

With the ready availability of copy machines today, it is a simple matter to make several copies of each checklist you have, and keep a supply of them in your shop, ready for use. Using checklists makes a lot of sense to me. If you don't use them in your work, I hope you'll give it a try.

Contiguous-Interval Aural Tuning Tests

A.E. Sanderson, RTT
Boston Chapter

Two contiguous musical intervals are intervals that touch each other — in other words, intervals that share one note in the middle. Tests that use contiguous intervals are easy to learn and use. They tell the tuner not just that there are mistakes in the temperament, but also tell him explicitly which notes are at fault and what to do to correct them.

Contiguous major thirds, for example, should beat in the ratio of four to five, because the major third itself consists of two notes whose frequencies are in the ratio of four to five. Displacing any interval up the keyboard will theoretically speed it up in the ratio of the frequencies of the two root notes involved. Therefore, two contiguous major thirds should beat in the ratio of four to five, two contiguous minor thirds in the ratio of five to six.

Similarly, two contiguous fourths should beat in the ratio of three to four, and two contiguous fifths in the ratio of two to three. However, on the piano this theoretical relationship holds well only for the major and minor thirds. The fourths and fifths are so strongly affected by inharmonicity that these contiguous intervals beat at almost the same speeds.

Using the above facts, we can develop a test for one note of the piano at a time. Take C4 for example. Play down a third and up a third, G♯3-C4 and C4-E4, keeping time at the rate of four beats of the lower one, and then at the rate of five beats of the upper one. Think of it as four beats to the measure, followed by five beats to the measure. The tempo of the two kinds of measures should agree. If the upper beat rate is too fast, it indicates that C4 may be flat, and vice versa.

Before moving C4, we need more evidence. Play down a fourth and up a fourth, G3-C4 and C4-F4, and listen for either equal beat rates or an upper beat rate just slightly faster than the lower. If C4 is flat, the upper beat will be too fast and the lower too slow, and vice versa. If both the fourth test and the third test indicate that C4 is flat, for example, then this is very strong evidence that C4 should be moved. But to nail down your decision, you can add a contiguous-fifth test as well.

To check contiguous fifths, play down a fifth and up a fifth, F3-C4 and C4-G4. If C4 is flat, the lower fifth will beat faster than the upper, and vice versa.

In our example, we have not used three tests involving six other notes to check up on one note. If all the tests indicate that C4 is flat, then it is a good idea to move C4 — after all, the odds are six to one that C4 is in fact flat! If some tests say flat and some say sharp, then leave C4 where it is and go on to test other notes. Eventually you will find the main culprit or culprits, the notes for which all tests say the same thing. Move these notes without hesitation. Your temperament will improve steadily as you find and correct each note that fails all three of these tests.

The range of this contiguous-interval test is at least from C3 to C5, a two-octave span. After tuning the whole piano, unisons and all, start applying this test to C3. Move up one semitone at a time, and correct any note that fails all three tests before moving on. Go all the way up to C5 this way. If you like, you may make a second pass from C3 to C5 and polish your tuning even more. Eventually you will reach the point where no notes can be improved upon, and at that point you will have an extremely fine tuning — a supertuning, if you will!

Editor's note: This is a summary of a class presented by Dr. Sanderson during the Piano Technicians Guild's recent Convention and Institute in Indianapolis.

Preferred Temperaments Of Bach, Mozart And Other Composers

Jack Greenfield
Chicago Chapter

Research on Composers' Tuning Preferences

The changes in keyboard tuning practices that were followed in the evolution from early meantone to equal temperament can be traced in the writings of Mersene, Werkmeister, Neidhardt, Rameau, Kirnberger, Marpurg and others.

Except for Rameau, who ranks as both theorist and composer, there is not much documentation on the preferences of the composers beyond what can be inferred from studies of their music. Musical characteristics such as key signatures, accidentals, intervals, harmonic structure and modulations give some indication of the desired intonation of the composer. Barbour's work includes analyses of many examples of typical keyboard compositions by leading composers at various stages of the development of music. He considered the compass of scale degrees to be an index pointing to the selection of temperaments. For example, he concluded that within a certain chronological period a piece with $E^{\flat}$, $B^{\flat}$, $F^{\#}$, $C^{\#}$ and $G^{\#}$ was probably written for a regular meantone temperament tuned to include these accidentals. When over 12 different pitch names counting enharmonic equivalents occur, the tuning possibilities are:

1. Some compositions contain pauses, as between sections, during which several notes could be retuned to shift the tuning cycle.
2. The dissonance of such intervals as diminished fourths or others in regular meantone intonation may not be objectionable in some rapid passages or may produce an intentional effect desired by the composer.
3. The instrument could be tuned in well or other irregulating circulating temperaments as well as in equal temperaments.

Barbour gives figures for the mathematical deviation from equal temperament for most of the temperaments he presented. Later scholars who have continued in this research do not consider such data a measure of accoustical merit or application. In more recent work, while at the Department of Physics, University of Colorado, Donald Hall devised a system, "The Objective Measurement of Goodness of Fit For Tuning and Temperament" (*Journal of Music Theory,* Vol. 17, Fall 1973) based upon a complicated computer-calculated deviation from just intonation. Pointing out that a completely just scale giving 12 each major and minor triads is as mathematically impossible as trisecting an angle, Hall established "optimum" scales for the intervals from all tones of the chromatic scale occuring in a given piece.

A count of the intervals, with a weighting factor for frequency, was fed into a computer. The computer was programmed, transposing if necessary, to give intonation figures for all 12 notes which would result in the lowest overall "error" or deviation of fifths, major and minor thirds and their inversions from the just ratios for these intervals. Compositions investigated ranged chronologically from medieval to late Romantic. Various historic temperaments including 1/4- and 1/6-comma meantone, several well and equal temperaments were then compared with the calculated optimum temperaments for specific pieces.

Table I gives figures selected from Hall's data comparing 1/4-comma meantone intonation with the optimum scales for the music indicated. The meantone and virginalist scales are extremely close. The deviation of the Bach optimum from the meantone scale is a little larger. It is quite evident that the Franck Chorale and equal temperament are a match.

Table I: Comparison of Computer "Optimum" and 1/4-Comma Meantone Temperaments Intonation (¢) as shown by Hall

Temperament Based On:	*C*	*C#*	*D*	*Eb*	*E*	*F*	*F#*	*G*	*G#*	*A*	*Bb*	*B*	*C*
Virginalists (average)	0	77	194	301	388	503	581	697	773	890	1006	1085	1200
Bach Prelude	0	82	193	300	389	505	579	695	812	892	1008	1082	1200
Franck Chorale	0	100	204	303	404	493	600	702	802	907	998	1106	1200
1/4-Comma Meantone	0	76	193	310	386	503	580	697	773	890	1007	1083	1200

In calculations to give a single figure for composite error, 1/4-comma meantone had the smallest deviation for all music up to and including the music of Bach. Equal temperament showed the greatest error for the earlier music but was best in later compositions with extensive modulation. The high ranking of 1/4-comma with its large number of just major thirds is to be expected in the earlier music in which such intervals appear with great frequency. However, Bach is known to have preferred and used the subtle differences in the tempering of the thirds and their inversions in well temperaments to enhance the musical qualities of his compositions. Well temperaments showed larger deviations than the regular meantone temperaments in Hall's tests. Hall acknowledged the deficiencies of his and other theoretical studies. He pointed out that his purpose was to provide an objective measure to aid in understanding but the most reliable guide to selection of historic temperaments was the musical judgement of those who have had actual experience in trying various systems of intonation.

Studies Centered On Bach's Tuning

The composer whose work has received the most attention by researchers in temperament is Johann Sebastian Bach. There is little verified information on his tuning methods other than his preference for well temperament. In addition, according to Kirnberger, while a student he was taught by Bach to tune all major thirds larger than pure. Bach's first biography, published in Leipzig in 1802 by Johann Nikolaus Forkel, a director of music at the University of Gottingen, is the source of the statement that it never took Bach more than a quarter of an hour to tune a harpsichord or a clavichord. Forkel, who was a child when Bach died, obtained much of his information in his 69-page book in interviews with two of Bach's sons.

Among modern authorities with experience in the use of historic temperaments, Mark Lindley ("Temperaments" and "Well Tempered Clavier", *Grove Dictionary of Music,* 1980) believes Bach was quite flexible in his acceptance of the typical well temperaments of his time other than his objecting to pure or just major thirds. Lindley found no evidence in Bach's music favoring any particular well temperaments in use during his day. Jorgensen (*Piano Technicians Journal,* January 1978, page 18) mentions probable use by Bach of Aron-Neidhardt/Kirnberger III and Werkmeister III/Correct Temperament No. 1 specifically for organ tuning. These temperaments are frequently used today for performance of Bach's music.

The results of studies by two German writers with very similar names is viewed with doubt by other contemporary specialists. Herbert Kelletat's suggestion in a paper published in Germany in 1960 that a temperament credited to Kirnberger might have been obtained from Bach is ruled out because of the presence of pure major thirds and a large number of Pythagorean major thirds. The other writer, Herbert Kellner, presented an unusual 1/5-comma (Pythagorean) temperament derived by a numerological method based on metaphysical principles described in a 1977 paper in *Das Musikinstrument,* also available in a 1980 English translation, "The Tuning of My Harpsichord" offered by the same publisher.

A recent temperament proposed by John Barnes, "Bach's Keyboard Temperament" (*Early Music,* VII, 1979, pages 236-249) is considered more favorably. Barnes' background includes education in physics, experience in the electronics industry and work at making and restoring keyboard instruments before taking the position of Curator of the Russell Collection, Edinburg, in 1968. Barnes examined each of the 24 Bach preludes in the major keys. He found a general tendency for major thirds to be more prominent and numerous in preludes with key signatures with few sharps and flats and conversely less prominent and numerous in keys with more sharps and flats. There were some exceptions. The major thirds on G and D were underused, but this could be corrected by adding the aural effects of the broken chord figures in the G-major Prelude (Book I).

However, he could find no explanation for the evident overuse of the major third on $A^b/G^\#$, which would be maximum-tempered, 22 cents above just, if the instrument were tuned in 1/4-comma Werkmeister III temperament. Barnes' modification consists of reduction of the tempering to 1/6-comma and addition of two more tempered fifths. The resulting temperament differs from the Vallotti-Young pattern by only one switch in placement of a tempered fifth and a pure fifth as shown in *Table II.*

The Valloti-Young pattern given is the transposed version with F and B as the dividing tones between the tempered and just series of fifths. Besides the procedure given by Barnes, his temperament can be set by first tuning the sequence of six pure fifths from F - B^b - E^b - A^b - D^b - G^b - C^b and all but

the last of the 1/6-comma tempered fifths F - C - G - D - A - E - B of the Valloti-Young temperament (*Piano Technicians Journal,* August 1984, page 23). Tuning $E^{\flat}$ pure then also changes $BF^{\#}$ to a 1/6-comma tempered fifth.

Table III compares the size of major thirds and shows the Barnes modification and Valloti-Young temperaments very close to each other. Both provide a more graduated distribution of interval size than Werkmeister III. Barnes belives his study reveals that Bach probably used a modified Werkmeister III temperament although not necessarily Barnes' version for the compositions concerned.

Use Of Irregular Temperaments After Bach

Although some prominent musical figures such as C.P.E. Bach and Marpurg wrote favorably concerning equal temperament, in recent years increased evidence has been disclosed which indicates that the use of a variety of different temperaments, including regular meantone as well as regular systems persisted through the later 18th century and into the early 19th.

Opinion is growing that Mozart and Beethoven, at least in his earlier keyboard music, and other composers of the era used irregular temperaments. John Hind Chesnut's paper "Mozart's Teaching of Intonation" (*Journal of American Musicological Society XXX,* 1977, page 154) contains information and conclusions derived from his study of contemporary writings including documents a young Englishman, Thomas Attwood, acquired while a student in theory and composition with Mozart in 1785-1787.

According to Chesnut, throughout this time there continued to be influential theorists who believed that regular meantone temperaments extended to 17 tones with corresponding sharps and flats at different pitch were the "correct" intonation. Irregular temperaments were considered the most practical alternative for keyboard instruments with only 12 notes to the octave by those who did not accept equal temperament. Notes in Attwood's manuscript indicate that

Table II: Tempered Fifths in Well Temperaments (All others not shown are just)

Werkmeister III	
1/4—comma	CG, CD, DA, $BF^{\#}$
Barnes Modification	
1/6—comma	FC, GC, GD, DA, AE, $BF^{\#}$
Vallotti-Young	
1/6—comma	FC, GC, GD, DA, AE, EB

Table III: Tempering of Major Thirds (¢ above just)

Temperament	$E^{\flat}$	$B^{\flat}$	*F*	*C*	*G*	*D*	*A*	*E*	*B*	$F^{\#}$	$C^{\#}$	$G^{\#}$
Werkmeister III	16	10	4	4	10	10	16	16	16	22	22	22
Barnes Modification	14	10	6	6	10	10	14	18	18	22	22	18
Vallotti-Young	14	10	6	6	6	10	14	18	22	22	22	18

these were also Mozart's thoughts on temperaments.

In regular as well as irregular temperaments, when fifths were tempered, it was usual to temper by 1/6-comma. This gives slightly raised major thirds in regular temperaments and more gradual distribution of variations in intervals in irregular temperaments than 1/4-comma fifths.

In addition to all of the variations in regular and irregular temperaments in use, further disparity was added by a revival among string players of Pythagorean-type tunings. Several contemporary musical writers indicate bad intonation to have been quite common, perhaps due in part to the absence of uniform tuning. Mozart appears to have mocked inept string players in his orchestral "Musical Joke" (1787) in which a cadenza at the end of the third movement concludes with an ascending high passage of a scale in C major transformed to C♯ major and then finally to D major.

Mozart's rival, Clementi, also preferred well temperament, according to a 1784 magazine. Other references cited by Lindley mention use of irregular temperaments for some of the piano music of Beethoven and other composers active in Vienna through the first quarter of the nineteenth century. Information on tuning for early 19th century keyboard music is still uncertain, more investigation is desirable.

It's The Little Things That Count!

Isolating Problems

Gerald F. Foye
San Diego Chapter

It amazes me how negligent many tuner technicians are in taking care of the little things. It may be lack of knowledge, lack or time or laziness but, there are unquestionably too many simple problems that are grossly overlooked.

A customer complains of a buzzing noise on a specific string — what's so difficult about tracking that problem down by isolation? On an upright simply removing the kick panel for a clear view of the bridges may reveal a wood chip lying across a string. Or applying a small amount of pressure with the tip of a screwdriver on the end of the bridge pin may reveal a loose pin. Or, on buzzing wound strings, the offending string can be isolated with the use of mutes. Plucking individual strings may also help determine if the noise is actually caused by the string or the hammer, or something else.

Sticking keys are a big problem and not so easy to service in many cases, but the problem should at least be isolated and the customer advised as to the problems and the possibilities for service. The concept of shooting in a household type lubricant followed with the advice that the problem will go away by itself doesn't do much except lose points for the technician. Worse yet, it creates a feeling of distrust between the customer and the next technician. A bit of effort with a system of eliminating the possibilities will isolate the specific problem. Then, what to do about that problem can logically be discussed.

There are customers who have suffered with piano problems for years because a previous technician simply did not bother to isolate the cause. If you're the type who prefers not to get involved with problems or service then do yourself and the customer a favor by passing the work on to a techician who is qualified or does not mind performing repairs and service work. In some cases you may be able to make an arrangement with a specific technician to make the service call while you retain the tunings.

Broken Agraffe Repairs

Paul Bergan, RTT
Houston Chapter

When do agraffes break? During tuning; during stringing; at night — the customer hears a "loud bangy noise;" or at the factory when the agraffe was over-tightened.

What causes agraffes to break? Brass has little "give." Like other metals, it crystallizes over the years. When complete fatigue is reached, this 36-threads-per-inch brass pin goes "bang" and must be replaced.

The most common break is at the top, often caused by pulling a string up faster and higher in pitch, putting a tremendous strain on one side of agraffe. This additional tension forces the agraffe to bend and break.

A break may be caused by tuning to an extremely high pitch, considerably above A440. The increased tension occurs when raising pitch quickly from a major third below to pitch of A440.

There are three types of agraffes — the single-hole type, for single wire; the two-hole type, for two-string unisons; and the three-hole type, for treble three-string unisons and sometimes in some three-string unison bass strings.

All agraffes are practically uniform in size, with the exception of old Steinways, whose diameter was 7/32 inch with 36 threads per inch. Nearly all others have diameter of 1/4 inch with 36 threads per inch.

Tools Needed

1. An assortment of agraffes of various sizes. Good, used ones may occasionally be used as replacement.

"What causes agraffes to break? Brass has little give. Like other metals, it crystallizes over the years. When complete fatigue is reached, this 36-threads-per-inch brass pin goes "bang" and must be replaced."

2. Drills — electric and a small hand drill.
3. Tap drills — #11 for 7/32" agraffe, #2 for 1/4" agraffe.
4. Taps — size 7/32" by 36 threads per inch, size 1/4" by 36 threads per inch.
5. Tap handle with chuck for holding taps.
6. 7/64" drill bit for drilling small hole through agraffe in plate.
7. Small center punch.
8. Set of "easy outs", called extractors, or square extractor tool.
9. A few additional miscellaneous larger size drill bits and extractors.
10. A small can of "Liquid Wrench," WD-40, or other satisfactory rust dissolver.
11. A small ball peen hammer.
12. A small, round, rat-tail jeweler's file to remove burrs often found in the holes of buzzing agraffes.

Removing Broken Agraffe And Replacing New One

There are two (broken) parts: the top part, still held by the string or strings, which broke away from the lower part, and the lower portion, still lodged in the plate.

To remove the top of a broken agraffe, loosen string tension in

broken agraffe. This will also release pressure on damper wire on a grand. Pry off string coils at tuning pins. Take a fairly long screwdriver, insert into coils and, with a quick jerk unwind each of them. Caution — keep hands a safe distance from wire. Unwind string coils. Now the upper half can be removed.

Remove the frozen lower half of agraffe in the plate. If you think the frozen lower half will be hard to get out, apply a few drops of "liquid wrench" in agraffe hole. Don't worry, these few drops won't get into pin block. Often the lower half is so loose it may be easily unscrewed by tapping gently with punch in counter-clock-wise direction.

Make center punch indenture exactly in center of the broken agraffe bottom half. Use your small drill bit, size 7/64", and drill a hole completely through the agraffe or at least 3/4 of the way. Caution — drill a *straight* hole.

Attach a #2 extractor, "easy out" or your square extraction tool to the chuck of the tap handle. If the rust dissolver has done its job, the extractor will dig into the brass and bring out the agraffe. But if it doesn't budge, get out the larger drill bits and extractors you have on hand. Caution — don't damage the threads in the plate.

What do you do when threads in plate have been damaged? You may need to re-tap the threads. For example, if the threads of a 7/32" agraffe in a plate were damaged beyond use, drill a hole with a #2 drill bit, then tap this hole with a 1/4" by 36 thread-per-inch tap for a 1/4" agraffe. Don't retap unless absolutely necessary. Use oil sparingly when cutting with the tap. Sometimes you can re-tap with the original thread without making a larger hole. I always turn the tap into the hole anyway for the purpose of cleaning out the rust, corrosion and metal fragments in every job.

What to do when somebody has damaged a 1/4" agraffe hole? This is a major job. The damage is usually caused by crooked drilling, or an extractor broke off and must be removed. Don't allow this to happen. Such damage calls for a major repair. Caution — if you don't feel competent, engage a first-class machinist, with instructions to proceed as follows.

The hole must be enlarged, so use a 5/16" diameter drill bit to bore through the plate at agraffe position. Use 3/8"-16 tapered tap, going 3/4 of the way through the plate.

A special plug similar to a hexagon-head machine screw has been prepared and tapped for a 7/32" agraffe. As the plug is forced tightly into position in the 3/8"-16 tapered tap hole, the hexagon head of the plug will break off because the plug is stopped at the 3/4 distance through plate.

Now face off the top of plug to form a seat for the agraffe. This is done with a special fraizing tool. Slightly countersink the center hole of the plug to get rid of the rough edge caused when the hexagon head broke off. Also recheck agraffe tap threads for metal filings, etc.

Now you can insert the new 7/32" agraffe.

Buzzing Agraffes

Due to slight vibrating side motion of the string a buzz may occur. What happens is that a slight burr forms in the soft brass hole. To remedy, remove the string with the buzz. Use a very small rattail (jeweler's) file to ream out the burr in the hole. Put a drop (only) of light lubricant into agraffe hole before replacing string.

Another Repair For A Damaged 1/4" Agraffe Hole

Engage a first-class machinist for this repair. Give him an agraffe that will fit into the damaged (enlarged) hole. Instruct him to braize a good, strong, fine-threaded bolt of the same thickness to the agraffe bolt. This added bolt must be long enough to go through the plate and come out of the wood beneath the pin block section where a nut will be added to the bolt. Be sure to countersink the wood where nut will be tightened, and hold the agraffe in place. If any of the bolt extends beyond the countersunk nut, hacksaw it off so that there will be no obstruction when piano action is replaced.

When Putting In A New Agraffe

If a new agraffe screws in beyond its correct position for string alignment, back it out and add a .010 thick copper washer, then tighten up the agraffe to position.

Getting The Organizational Spirit

M. B. Hawkins
Vice President

In discussing what organizational spirit involves, one cannot bypass loyalty. Like other groups, the Piano Technicians Guild expects its members to be loyal.

This loyalty develops over a period of time from associating with other piano technicians. When we meet there is always a sharing of knowledge and know-how. This information naturally spills over into what constitutes not only improved work habits and good business ethics, but a real spirit of belonging, too. Over a period of time one finds that on a daily basis those shared bits of knowledge, technical and otherwise, become a part of your method of operation. Then when people ask "where did you learn to do that?" or "I guess tuning pianos is just about a lost art, isn't it?" and other similar questions, it stands to reason from what direction the answers will flow.

What an excellent opportunity to let people know what we are all about. I have actually received invitations to speak to groups about pianos and their functions from conversations that began in the home during a routine service call. This is an aspect of loyalty which may not be normally thought of as loyalty but when one stops to consider the many ramifications of loyalty, it is. When we remember from whence much of our know-how came and pay tribute to that source at every opportunity, that is loyalty. It is also a beneficial promotional tool.

There is still another aspect of loyalty we should touch on. It can perhaps be best described by this short story. At a meeting one time Joe found himself in earshot of a conversation which went something like this.

"Sam, it is good to see you. Where have you been for so long?"

"Well, Henry, I've been too busy to come to these meetings and besides, I've been thinking about dropping my membership."

"Why is that Sam?"

"I just can't see what this organization has to offer me any more."

"Yeah, Sam I know what you mean. I can do most of the work myself now so I can't really see continuing to pay dues. I don't see what more there is for me to gain. Like you, Sam, I am beginning to wonder why the dues are so high."

At that point Joe joined the conversation. He began in a nice way to inquire as to what had Sam upset. After all, Sam was rarely around at any of the chapter sessions and neither Sam nor Henry had been seen at a seminar or a convention for ages. Joe also structured his comments in such a way as to explain how our dues are used. What Joe did was seize this opportunity to build up two fellow members by relating to them how they could help the chapter and hence the organization would become even stronger.

The conversation between Henry, Sam and Joe turned out to be a positive experience even though its beginning was very negative. Just as Joe did not listen in silence while the organization was being attacked, we as members as a whole need to respond and refute unjustified criticism of facts. This kind of loyalty assumes, of course, that you are informed about the organization — its history, policies, practices, operation and executive personnel. In order to make your defense of our organization effective, it must be an informed defense.

These two samples barely scratch the surface of all the many ways we as members can be loyal positively. That means much more than paying dues and receiving the *Journal*. These couple of examples will surely suggest other ways in which we can cause our membership to become more positive. When we raise our thinking to a higher level, we will relate to prospective members on a higher level as well. As we continue to grow in this fashion newer members develop the organizational spirit early on and thereby stand a greater chance of maintaining it.

So, allow me to suggest that a little time be spent reviewing our attitude relative to our organizational spirit. I'll bet there are areas each of us can improve on. The result will carry over to prospective members we find ourselves talking to.

Next month we will discuss how an improved organizational spirit can help us thrive in '85.

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Reclassifications

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East Texas Chapter
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Maritime Provinces Chapter
MacDonald, Michael H.

Tri City Illinois Chapter
Buffington, Don

Twin Cities Chapter
Barrett, Gary R.

Vancouver, B.C. Chapter
Caunter, Drew H. G.

Member Recruitment Points
June 1, 1984—October 1, 1984

Booster Club	Pts.	Mbrs.	Booster Club	Pts.	Mbrs.	Booster Club	Pts.	Mbrs.
Anderson, Robert A.	4	1	Hazzard, Nancy M.	4	1	Nelson, Clifford G.	1	1
Bessette, Roland	5	1	Heismann, Barry	1	1	Ousley, Robert L.	5	1
Betts, David C.	4	1	Hess, James N.	5	1	Pagano, Joseph L.	4	1
Bittinger, Richard E.	4	2	Hess, Marty A.	5	1	Palm, Stanley S.	1	1
Blees, Willem	5	2	Hines, David M.	5	1	Pearson, Walter T.	5	1
Bridges, Nate	2	2	Hitt, Henry L., Jr.	4	1	Pierce, James C.	4	1
Bryant, Ken L.	5	1	Holder, Leopold	5	1	Pierson, James B.	1	1
Burow, Burtis L.	4	1	Houston, James P., Jr.	9	2	Pike, Gene A.	5	1
Burton, Robert H.	4	5	Howell, W. Dean	1	1	Prentice, Randy A.	1	1
Callahan, James J.	4	1	Jackson, Stephen S.	1	1	Riedel, Paul W.	4	1
Cannon, James D.	5	1	Jorgenson, Les O.	1	1	Rosenfeld, James I.	5	4
Churchill, Kenneth R.	1	1	Keast, Lawrence J.	1	1	Schmitt, Jake E.	5	1
Coffey, Barbara L.	10	2	Kreitz, Richard C.	1	1	Schoppert, Robert L.	5	1
Coleman, James W., Sr.	5	1	Krentzel, Jim L.	1	1	Sierota, Walt	1	1
Delpit, John A.	4	1	Leary, Kevin M.	5	1	Sloan, Kenneth A.	4	1
Doss, Harry W.	4	1	Lillico, John E.	2	2	Sloffer, Phillip C.	5	1
Foss, Mark E.	5	1	Lovgren, Christine	25	6	Stout, Clarence P.	1	1
Fox, John D.	5	1	Macchia, Frank S.	5	1	Towne, Christine S.	5	1
Geiger, James B.	1	1	Manna, Tony	1	1	West, Ivan	4	1
Godfriaux, Stan R.	1	1	Matley, Wayne O.	6	2	West, Richard E.	1	1
Graham, Susan E.	4	1	McKay, C. Guy	1	1	Wilkinson, Asa	4	1
Groot, Gerald W.	1	1	McVey, James I.	5	1	Winters, Kenneth E.	5	1
Grossman, Matt	1	1	Mahaffey, Francis	2	2	Wisenbaker, Martin G.	1	1
Grossman, Michael S.	4	1	Melton, Eddie J.	1	1	Wurz, Douglas K.	5	1
Hansen, Charles	1	1	Metz, J.A.	4	1	Yonley, Fred T., Jr.	4	1
Harmon, Clayton C.	1	1	Morrow, Hope E.	1	1			

The Auxiliary Exchange

Belva Flegle resigns as PTGA President

For personal and professional reasons, **Belva Flegle** found it necessary to tender her resignation as President of the Piano Technicians Guild Auxiliary. The Auxiliary owes a sincere debt of gratitude to Belva for the leadership, integrity, friendship and love she gave to each of us during her tensure as a PTGA officer. We wish her much happiness and success as she goes forward in her chosen field.

Meet Your New President: Mary Louise Strong

In **Louise Strong** we have a proven leader with an impressive and varied background. She received a bachelor's degree from Augustana College in South Dakota and a masters degree from the University of Michigan at Ann Arbor.

She is currently in her 25th year as assistant professor of music at Berry College in Mt. Berry, GA. She is secretary of the Georgia Federation of Music Clubs, an affiliate of the National Association of Music Clubs. She is also immediate past president of the Northwest Georgia Chapter of Sigma Alpha Iota Alumnae. (SIA is a professional music fraternity for women in music).

Louise married RTT **Doug Strong** eight years ago after many years as a professional working woman. PTGA is fortunate to have someone with Louise's qualifications to serve as president of the Auxiliary.

A Sketch of our Auxiliary

As recording secretary, part of the responsibility of my office is to collect and record the reports of our various chapters over the country. I thought you might be interested in the profile of our organization that the reports show. I do not pretend to be a statistician, but I find an interesting picture of the Auxiliary emerging from the data I have received.

At best count, there are 16 active chapters in the National PTGA. These chapters represent about 90 of our 264 members. Of these 16 chapters, only six meet on a regular monthly basis. The others report that they get together mainly for picnics and parties, or to visit informally as their spouses attend a Guild meeting. Three chapters were involved in various projects during the year or engaged speakers for their meetings.

As I reviewed the records of previous reports, I found that there have been 34 different Auxiliary chapters. There seem to be flurries of activity whenever a chapter hosts a state convention or other Guild function, and then it returns to meeting on a social basis or becomes inactive. You can see from the figures that a great majority of our members are either members-at-large, or members of chapters which are now inactive. This means that roughly two-thirds of our membership is involved in the Auxiliary solely on the national level.

Given the above information, I would like to sketch a picture of our Auxiliary as it is now. Remember that this is a generalization, and there are bound to be individuals and chapters that do not fit into it exactly.

Most Auxiliary members belong actively only to the national organization. They are not particularly active in local chapters except when called upon to help their Guild chapter host a Guild function or seminar. Auxiliary members enjoy meeting with other Guild spouses socially, especially at national conventions, where they enthusiastically participate in the Auxiliary program and renew friendships made at past conventions. At the Indianpolis convention, there were 76 registrants in the Auxiliary program. There were 61 present at the opening assembly, and about 35 participated in the Council meeting as voting members. I believe this shows a vital interest in the Auxiliary by those who attend conventions.

As well as giving aid to the Guild, the Auxiliary offers us an opportunity to lend support to others in similar situations as ourselves. At the same time, because of this common interest, members find themselves forming lasting, warm friendships which they look forward to renewing at each convention. There is a wonderful camaraderie possible between spouses of piano technicians. We share the same frustrations, concerns, and problems dealing with our spouses' clients. It's terrific to have someone to share with who really understands you.

We need the Auxiliary because it is a vehicle for these relationships.

Maybe we don't boast a chapter roster that buzzes with activity, but so what? An organization should exist to fill a need. Presently, that need seems to be for a framework which provides a comfortable and inviting forum at Guild functions where we can all get to know one another better. I think that is good. It's not a lofty purpose, but definitely a practical and satisfying one.

I hope that you have a better idea now of the identity of the Auxiliary than you did before you read this article. Remember that these are my personal opinions and observations. Perhaps you disagree with me or have drawn some different conclusions than I. Why not jot them down and send them to our president or our Auxiliary Exchange editor? They would love to hear from you!

Helena Thomas

Meet Your Officers: Kathryn Snyder, Treasurer

Kathryn Snyder is the wife of RTT **Willis Snyder,** veteran national institute instructor. They are the parents of three sons and three daughters and have six grandchildren.

Kathryn volunteered to do the bookkeeping when Willis started tuning pianos and a short time later she was handed a screwdriver and told to remove all of the screws from a player action. Ever since she has been assisting him in various areas of remanufacturing pianos—everything from helping to make and install soundboards to cleaning corrosion off tuning pins.

Since their son David entered the business she still does the bookkeeping and keeps herself available when needed to assist in some jobs.

She has been active in Auxiliary activities for some time, having served for two years as assistant parlimentarian, two years on the nominating committee, two years as second vice president and this is her second year as treasurer. She is president of the Reading-Lancaster, PA chapter. She and Willis attend many conventions and seminars and she reports she has many enjoyable memories of them.

She does volunteer work with the "Meals on Wheels" program and

bakes pies at her local church on a regular basis. She enjoys decorating cakes, sewing and curling up with a good book. Both she and Willis enjoy bowling and she loves it when she can beat him. She puts writing letters in a class with cleaning windows and mending—jobs she puts off as long as possible.

How Do You Define Success?

Success means something different to each of us. My tried and true friend, Webster, defines it as: "succeeding fully, or, in accordance with one's desires." To some, money translates to success, to others, the accumulation of material things; to some, that which fulfills their own ego equates with success.

Certainly many in the Guild measure their success by the quality of work they turn out. A definition of success which I would like to live by was found in an article by Bessie Anderson Stanley.

To laugh often and much; to win the respect of intelligent people and the affection of children; to earn the appreciation of honest critics and endure the betrayal of false friends; to appreciate beauty; to find the best in others; to leave the world a little better place than we found it, whether by a healthy child, a garden patch, a redeemed social condition; to know even one life breathed easier because you lived. This is to have succeeded.

On this upcoming Thanksgiving Day, let us not only give thanks for our successes, whatever they might be and our family, for which we should give thanks each day, but let us not forget our friends. Friendship is a sweet responsibility — not an obligation. May each of you have a happy day giving thanks!

Tidings And Tid-Bits

Congratulations to **Grandma** and Grandpa Huether on the birth of their first grandchild, **Jean Rohe,** born to daughter **Anne** and her husband **Jim** on July 28, 1984. What a joy you have in store for you!

Bob and **Ginny Russell** are off again. (No pun intended). This time to spend the Christmas holidays in Germany with their daughter **Cynthia** and her husband who are "infanticipating" (?).

To **Helen Oliver:** Hope the cast is off and all is going well. We need you healthy so you can continue to attend those chapter picnics!

Auxiliary Officers

MARY LOUISE (Mrs. Donald) STRONG
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Treasurer
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Corresponding Secretary
5201 Whitaker Avenue
Philadelphia, PA 19124

Editor, Auxiliary Exchange
GINGER (Mrs. Jim) BRYANT
1012 Dunburton Circle
Sacramento, CA 95825

Coming Events

Nov. 1-4, 1984	New York State Convention	Ramada Inn Clifton, N.J.	Brad Renstrom 67 N. Greenbush Rd. West Nyack, NY 10994 (914) 358-6995
Nov. 16-18	North Carolina State Convention	Radisson Convention Center, High Point	Anthony Thompson 407 Woodlawn Ave., Greensboro, NC 27401 (919) 274-1922 (919) 274-3407
Jan. 4-5, 1985	Arizona State Seminar	Arizona State University, Tempe	Wirt Harvey 5901 Calle Del Norte Phoenix, AZ 85018 (602)945-8515
Feb. 1-3, 1985	NAMM Winter Market	Anaheim Convention Center, Anaheim, CA	NAMM 5140 Avenida Encinas Carlsbad, Calif. 92008 (619) 438-8001
Feb. 15-17 1984	California State Convention	St. Claire Hilton, San Jose, CA	Robert W. Brown 2853 Butte Street Santa Clara, CA 95051 (408) 984-0625
March 8, 9, 1985	North Central Louisiana Seminar	Holiday Inn, Alexandria, LA	F.M. Kelly Ward 5731 Jackson St. Ext. Alexandria, LA 71301 (318) 443-2235 (Home) (318) 443-6365 (Work)
March 28-30, 1985	Pacific North-west Conference	Ridpath Hotel Spokane, WA	Scott Colwes 1315 Coeur D'Alene Ave. Coeur D'Alene, ID 83814 (208) 667-3393
March 28-31, 1985	Pennsylvania State Conference	Philadelphia	Walter Sierota 5201 Whitaker Ave. Philadelphia, PA 19124 (215) 533-3231
April 19-21, 1985	Northern Illinois Piano Technicians Seminar	Northern Illinois University, DeKalb, IL	Jack Greenfield 259 Riverside Drive Northfield, IL 60093 (312) 446-9193
April 26-28, 1985	Central West Regional Seminar	Minneapolis, MN	Jonathan C. Nye 1515 Almond Ave. St. Paul, MN 55108 (612) 646-1622

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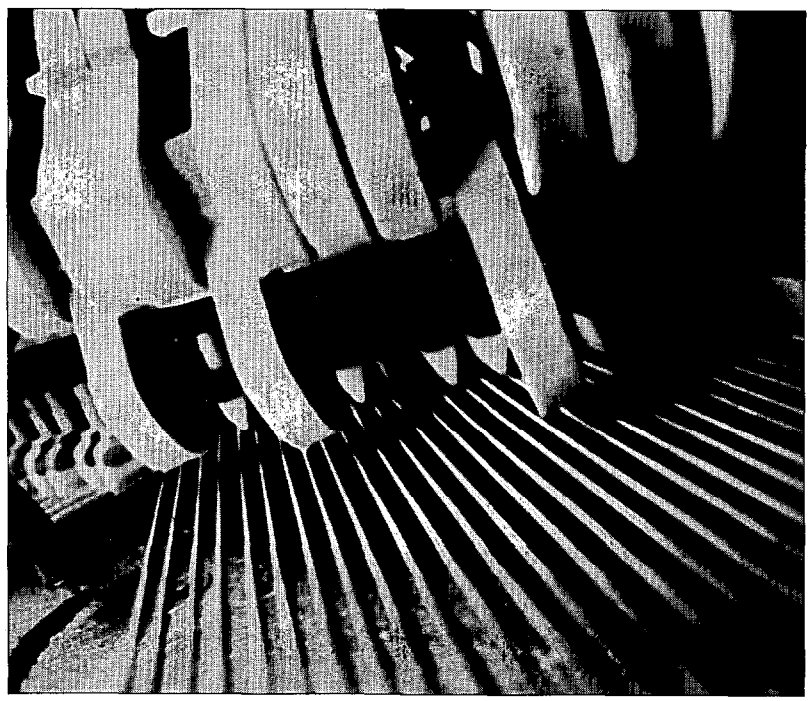

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