Piano Technicians Journal

October, 1984

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- ***Comprehensive user's manual explains time-saving electronic techniques.***

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U.S. Patent Nos. 3,879,684; 3,968,719; 3,982,184; 3,983,473; 4,014,242; 4,015,218.

CASES by GENCK

For the professional technician who demands the finest!

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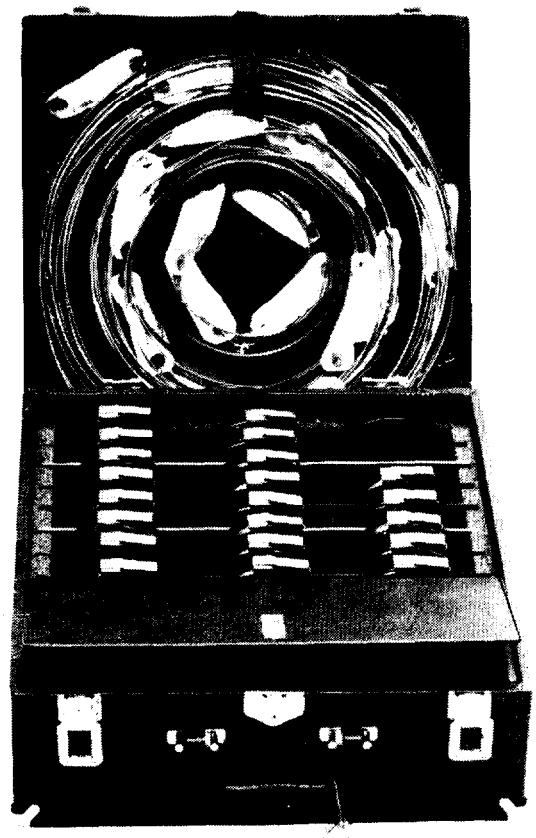
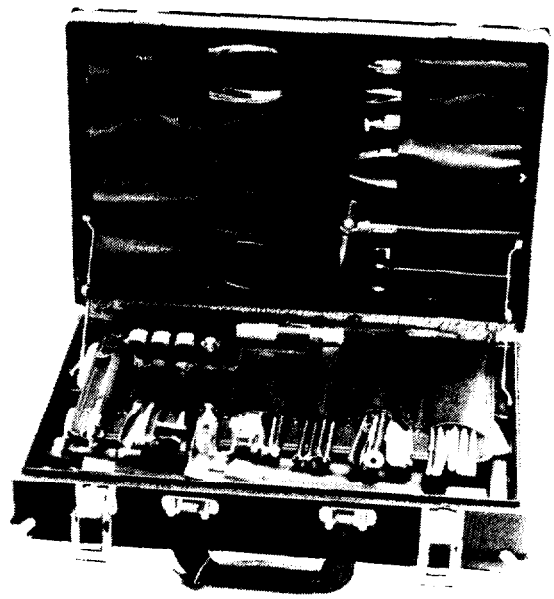
Never before has a case been available to store both universal string sets and all of the common sizes of piano wire. A complete restringing case that is professional looking, organized and protects the strings and wire from moisture in the air. There are 24 compartments to hold wire, a top section that stores over 30 universal strings and a large open compartment, with inside dimensions 14"L x 5"W x 4½"D, for restringing tools and supplies. The empty case weighs 6 lbs., measures 16½"L x 15"W x 6½"D and is constructed with 3/8" thick hardwood covered with a black, leather looking high grade vinyl material. The case should last a lifetime. Patent pending. Wire not included.



No. 276 — Genck Universal String and Wire Case Only. Each Net.....$175.00



To our knowledge, this is the only case that has been completely organized and designed specifically for the piano technician. Genck case can hold over 100 different tools and supplies. Pouches are made to accommodate the standard tools of the trade. Case should last a lifetime. Tools not included.

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These cases created much enthusiasm and received overwhelming approval at the latest national P.T.G. convention. Many orders were placed after seeing the quality and attention to detail that the cases presented. Order now, you will not be disappointed.

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Piano Technicians Journal
Official publication of the Piano Technicians Guild
October 1984
Volume 27, Number 10

About the Cover:
Detail of a harpsichord constructed from a Zuckermann kit by Gary Shulze, Ft. Worth, Texas. Schulze said the project took more than 400 hours spread over two years.

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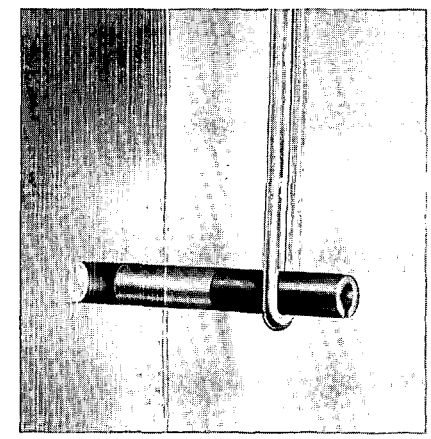
THE PIANO TECHNICIANS GUILD, INC.
9140 Ward Parkway
Kansas City, MO 64114

Office Hours: (Central Time)
Monday-Friday
8:30 a.m.-5 p.m.

Baldwin's all-new Scale 52-1. . . .

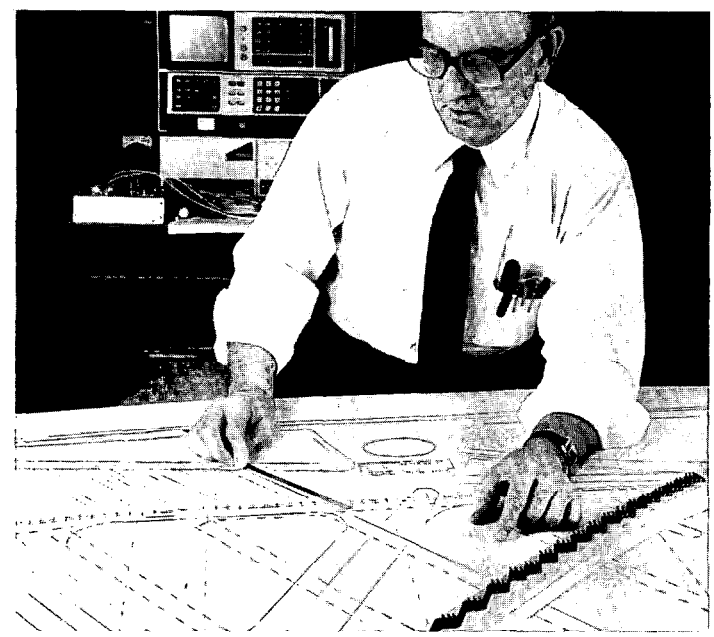
Baldwin's goal in developing the Style 6000 Concert Vertical has been to produce the ultimate in vertical pianos.

Look over the specifications to see what we've built into this new piano and decide if you think we've succeeded.



This piano is all new, not a resurrection or redesign of an old upright. Our research team in Cincinnati spent over a year on this design, which includes a remarkable new scale. Contributing to its outstanding tone and dependable performance are features associated with the finest pianos such as a duplex scale, solid spruce soundboard, and a true sostenuto.

The Concert Vertical is also the first vertical piano to utilize Acu-Just hitchpins. This patented hitchpin arrangement is a major factor in Baldwin's ability to produce full, rich, uniform tone throughout the scale. With Acu-Just hitchpins the downbearing of each individual string can be very accurately adjusted at the factory, after the piano is strung and chipped to A-440 pitch. Since all soundboards do not compress the same amount, this design allows a much more precise adjustment than conventional methods of construction.



. . the Style 6000 Concert Vertical™

Style 6000 Baldwin Concert Vertical — Scale 52-1

Manufacturing Specifications

BACK	
Number of posts	6
Back post size	
Cross section, each post	11.5 square inches
Length of each post	49.625 inches
Volume of all posts	3,350 cubic inches
SOUNDBOARD	
Material	quartersawn Sitka spruce, 6 annular rings/inch minimum
Total area	2,375 square inches
Active area (total area less area of glued edges)	2,169 square inches
Ribs	12 quartersawn Sitka spruce ribs, feathered at each end
BRIDGES	
Material	Northern hard maple
Capping	Northern hard maple
Bridge pins	.086 inches coppered steel
Tone Extender	yes
PINBLOCK	
Material	19 plies of Northern hard maple, rotary cut, cross laminated and bonded with thermal-setting moisture-resistant glue. rear pinblock plank of Northern hard maple
Tuning pin bushings	maple
Tuning pins	2/0 diameter, 2.5 inch length, chrome plated with blued threads
SCALE	
Type	duplex
Designation	52-1 (cast into plate)
Longest speaking length	54 inches
Shortest speaking length	2.07 inches
Wound strings	Baldwin patented SynchroTone design
Average string tension	173 pounds
Total tension, all strings	38,444 pounds
ACTION AND KEYS	
Length of natural keys	16.5 inches
Key material	
Keystick	basswood
White keytops	acrylic resin
Sharp tops	black phenolic, 3.75 inches long

ACTION (continued)	
Action rail	Northern hard maple, grain oriented to minimize chance of splitting
Action brackets	4 die-cast aluminum
Action parts	Northern hard maple
Action centers	#20 German silver centerpins in clean, oil-free, 100% virgin wool bushing cloth centers
HAMMERS	designed and manufactured by Baldwin
Moldings	Northern hard maple
Underfelt	5 pound virgin wool felt
Outerfelt	12.5 pound virgin wool felt
Chemical hardeners	none
PLATE	
Material	traditional class 20 gray cast iron
Hitchpins	Baldwin patented Acu-Just
Finish	hammertone polyurethane
TRAPWORK	
Right pedal	full sustain
Center pedal	sostenuto (grand piano type)
Left pedal	soft (short hammer blow)
CASE AND FINISH	
Case core	solid hardwood, edge-glued, grain oriented for maximum stability
Crossbanding	rotary cut poplar
Face veneer	maple
Finish	stain, filler and multiple coats of lacquer, hand-rubbed to a satin ebony sheen

DIMENSIONS AND WEIGHT

	Boxed	Unboxed
Height	57 3/16 inches	52 1/2 inches
Width	66 7/16 inches	61 7/8 inches
Depth	32 1/16 inches	27 1/4 inches
Weight		720 pounds

We're very proud of this vertical piano and feel we have certainly achieved our goal. We encourage you to hear a Baldwin Concert Vertical and judge for yourself.

The President's Perspective

Charles P. Huether
President

A Season Of Change

October is a month for dramatic changes. At least it is here on the eastern seaboard. We enjoy the most dramatic display of changing foliage to be seen anywhere in the world. The colors, the variety and the intensity must be seen to be believed. The usual pictures one sees may seem to be too intense to be true, yet they hardly convey the reality. It reminds me of the first time I saw the sun rise over Texas. The dramatic impact and the flamboyant colors made every photograph I had ever seen tame by comparison.

In my mind, October is the month of dramatic change. Why not follow that concept in your own professional life? If you have been keeping track of your business and technical skills, and if you have been trying to improve in both directions, why not set your goals this October and try to pull yourself out of whatever rut you may be stuck in?

Think a bit about what you may have learned in these past 12 months and see if there is something in that burden of intelligence which you have not been using which could be used to your advantage. Speak to your fellow technicians at the next meeting and explore with them the same idea. If you can't come up with something along those lines, you have been vegetating. If that is the case, then your first step should be to schedule your coming months to make sure that when October of next year rolls around, this will not be the case.

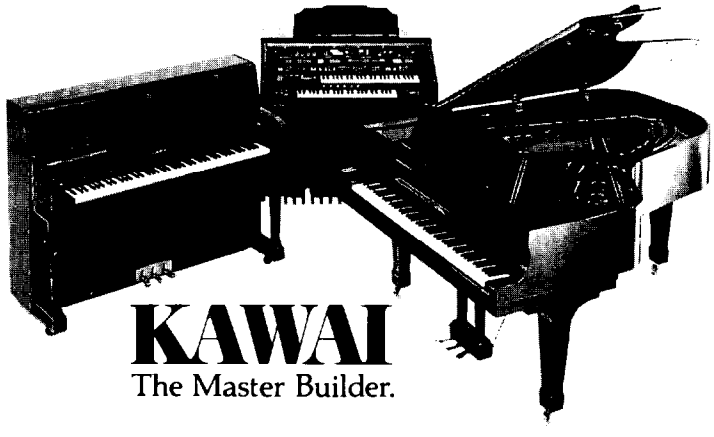
Make sure you attend all the chapter meetings. Make sure that there will be worthwhile programs and discussions. Plan to attend a seminar in your area or in one nearby. And above all, plan to attend the 1985 Convention and Institute in Kansas City.

Speaking of the 1985 Convention and Institute: did you know that this will be the largest and most exciting International meeting of Piano Technicians ever? If you have feelings of superiority, or of inferiority, it is important that you attend. You will meet and rub elbows with some of the best in the business, worldwide. Bring your humility, for there is plenty of cream in the world. But also bring your pride, for you will find that our practitioners can hold their own with the best.

October is not too soon to start to plan. October with its dramatic seasonal changes is a wonderful time to start planning some dramatic changes in your own life.

See you in Kansas City.

At Kawai, the tuner's hands and ears alone can determine the final "rightness" of a piano in the final tuning process.



KAWAI
The Master Builder.

From The Executive Director

Barbara Parks
Executive Director

The More Things Change: A History Lesson Repeated

To paraphrase a familiar line, those who fail to learn the lessons of history are condemned to repeat them. W. Jesse Lyons passes along an editorial on that very subject which appeared exactly 30 years ago this month in *The Piano Technician.* The article, by Leslie J. Hoskins, bears remembering, so I'd like to quote parts of it for you.

"History shows that (the piano tuner) was once highly regarded as a skilled artisan, looked up to and respected. He was 'Herr Professor' and looked upon with the same respect as the family physician or legal counselor.

"Gradually commercialism polluted what had been an art. From then on, the decline was swift and complete. When affairs had reached their lowest point, the few who had kept alive the artistic spirit began the painful process of reconstruction. They realized that their work could only regain public esteem by united effort; through an organization with professional standards and composed of members with professional ethics.

"The inevitable happened, internal friction, mistrust, fanaticism and other human weaknesses combined to wreck the structure and bring chaos out ofwhat might have been perfect order. The tuner was reduced to the level of a tramp, tolerated only because he happened to have the tools and knew a trick or two which were needed when a piano went out of order...

"Out of this slough of disrepute and disdain, the few intrepid souls once more came forward to preach with zeal the creed of better things. They were listened to chiefly because things could not get worse and theirs was the only message of hope that was offered. History was repeating itself; the same plan, the same process and the same incomplete degree of success. Those who clung to the lifeline in the storm let it go when fair winds blew.

"It is not necessary to recount how many times this rise and fall has taken place, but it is necessary to point out until the piano tuner and technician frees his mind of the delusion that he can successfully weather the storms of adversity by his own efforts, no relief from feast and famine can ever be looked for."

There are lessons to be learned here. None of us can withstand the storms on his own, and there still is much to be done. As the eloquent Mr. Hoskins said in closing, "History offers its lessons, but time alone holds the answers."

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The Young Chang piano has added another trophy to its case of impressive world-class awards...the 1982 International Trophy for Technology. Presented to Young Chang following the 1983 Frankfurt Music Fair, the trophy signifies the highest standards of technological accomplishment and quality of manufacture in the piano industry.

The 1982 International Trophy for Technology reflects the professional and educational acceptance of discerning American customers such as U.C.L.A., the Long Beach (CA) Symphony Orchestra, Ballet West, the Portland (Ore.) Symphony Orchestra, and the Suzuki Music Academy of Chicago.

Reward yourself.

Enjoy the pleasure of owning and playing a Young Chang, the quality piano which continues to earn the awards of excellence.

For the Serious Pianist

YOUNG CHANG

Contact Steve Strauss for the full Young Chang Quality Story.

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The International Scene

Fred Odenheimer
Chairman, International Relations Committee

As I write this, we are in the middle of the Olympic Games, which would not be of any consequence except for TV. We are glued to the tube and nothing is being accomplished. The Games bring athletes and people from various countries and backgrounds together and some lasting friendships across borders are established for — it is hoped — a more peaceful future.

When we go to meetings, seminars and conventions, it is for the reason of learning. It is also for the reason of making friends and meeting them through the years. Guild trips to various countries both in the Far East and Europe are naturally learning experiences but one also meets people and hopes to meet some of these fine craftsmen from other countries again in the future.

This was naturally the thought behind forming the International Association of Piano Builders and Technicians, an organization of various national and international associations, which will have its fourth convention in Kansas City this coming year. Those who made trips in the past know that the reception we had in various countries was outstanding. In Kansas City, it will be our turn to put out the welcome mat and make our foreign guests feel at home. It will be a time to meet old friends again and make new ones. Preparations have started and your support is essential. A mere $15 will make you a member of "Friends of IAPBT" and it will be an excellent investment in international cooperation. While you think of it, make out your check and send it to the Home Office and specify membership in "Friends of IAPBT." You will receive a membership card.

On our recent British tour, we were nearing the Naish Felt Factory and had specific instructions where to park our coach (not bus), avoiding a corner which the driver would be unable to pass. Our drawing, however, was not that clear and we arrived at the place we were supposed to avoid. Reg, our fabulous driver, managed to get around this tight spot with possibly all of a fraction of an inch to spare.

Our reception at Naish was excellent, starting with a wonderful lunch at a nearby restaurant and followed by a leisurely tour of the factory. It gave us an insight into the making of hammerfelt from the start — carting, pressing under heat and pounding with giant hammers, to shrink the sheet of felt to the desired size and density. We must not forget the manufacture of felt for other purposes, since felts for use in pianos will always remain a limited, though for us important, part of the factory output.

1985 Convention Dates Changed

If you had resigned yourself to giving up a Fourth of July holiday for next summer's International Convention and Institute in Kansas City, you're in luck.

Responding to comments from registrants at past conventions, the Guild's convention planning committee approved new dates which will move the 1985 convention away from the holiday. Next year's convention will be July 15-19, 1985. The convention, which will include a biannual meeting of the International Association of Piano Builders and Technicians, had previously been scheduled for July 1-5, 1985.

"We feel that the new dates will help us attract more people who might otherwise have been unable to attend because of family commitments," said Guild President Charles P. Huether, who chaired the Sept. 14 planning meeting. "This will allow us to put on a better Convention and Insitute for more people. With the continued help of our longtime friends and supporters in the American piano industry and the added spice of an international convention, we're looking forward to an unforgettable week in Kansas City."

As previously scheduled, the Convention, as well as the Institute classes now being planned by Institute Director Ernie Juhn, will be in the Hyatt Regency Kansas City, a large, modern hotel in Kansas City's Crown Center area. The Hyatt has more than 700 sleeping rooms and extensive meeting facilities.

Sohmer.
Concerned with the science of music as well as the art.

S O H M E R

Some piano makers feel that turning out pretty pianos year after year is their only responsibility. Fortunately, this is not the case at Sohmer.

For over 110 years, we have been working to make our pianos technically sound and acoustically perfect as well as beautiful to look at. Because we consider the science of piano technology and the innovations that develop from it to be fundamental in the perfection of the Sohmer piano.

We turn this belief into action by maintaining an ongoing dialogue with piano technicians all across the country.

Can we improve our selection of materials to insure better stability and tonal quality? How can we make it easier to clean, regulate and service our pianos? Your input helps us find the answers to these and other questions essential to the science of building pianos.

And vital to the art.

In turn, we provide facilities for meetings and piano demonstrations and study. And our representatives are available to speak on industry trends, styles and innovations.

We believe that together we can continue to create a beautiful instrument that is also a beautiful piece of furniture. A Sohmer. The perfect synthesis of science and art. We would like to hear from you. Call or write Harry Sohmer, Sohmer & Co., Ivoryton, Connecticut 06442 (203) 767-2675.

Economic Affairs

Bob Russell
Economic Affairs
Committee

A $350 Billion Market

Last year sales of traditional and electronic musical instruments, sheet music and sound reinforcement equipment sold through stores moved ahead nearly six percent. The increase is attributed to the broadside growth of electronic keyboards. Portable keyboards had a more than *50 percent* increase over 1982. Synthesizers also had a *60 percent* growth in dollar value. *While at the same time, the dollar value of pianos rose only seven percent over the prior year.* To change these growing trends, groups like the National Piano Foundation are committing large sums of money and time toward educating and promoting the benefits of the *acoustic* piano.

The Piano Technicians Guild has always promoted technical education to the piano technician, *but are we promoting the piano?* Other than a few bright spots, we seem to worry only about our own small world, and that's known as a business loser. As Gunther Klaus recently said,

The winner *is always part of the answer; the* loser *is always part of the problem.*

The winner *always has a program; the* loser *always has an excuse.*

The winner says, "let me do it for you:" the loser *says, "that's not my job."*

As professional business people, we must take a broader view of our business. One example might be giving talks concerning pianos to adult groups of people, senior citizen groups and so on. Remember, today the over-50 crowd of people accounts for 20 percent of the population, earns $350 billion a year and *controls* 28 percent of the total discretionary income.

INDUSTRY NEWS

Wurlitzer Donates Records to University

Wurlitzer, an American manufacturer of pianos, organs, jukeboxes and vending machines which traces its roots back 128 years to a German-born immigrant, has donated all its surviving past corporate records — 75 cubic feet of them — to Northern Illinois University's Earl W. Hayter Regional History Center in DeKalb.

The collection includes 1,200 drawings detailing the installation of "Mighty Wurlitzer" organs in ornate movie palaces throughout the U.S. and Europe, as well as catalogs, advertisements, photographs, ledgers and promotional efforts. The oldest document in the collection is a price list manuscript from the 1860s.

As Wurlitzer had no formal archive system, most of the collection was simply stored in boxes shipped to DeKalb in the late 1970s when the company consolidated its corporate headquarters there. An inventory will be compiled and become part of the collection.

Now struggling to regain some of its former financial health, the company recently reported a turnaround from a long spate of deficits with net earnings of slightly more than $1 million for the fiscal year ending March 31. Wurlitzer President George Howell noted that the turnaround from near-bankruptcy follows losses of $10 million three years ago, $6 million two years ago and $4 million last year.

Story & Clark Moves

Story & Clark has moved its piano operation 28 miles up the Grand river to a larger facility in Grand Rapids, Mich., the Bergsma furniture plant, according to Director of Marketing Ted Krumwiede.

All Story & Clark and Hobart M. Cable pianos will now be completed and shipped from the Bergsma plant, where many cabinet parts were manufactured in the past. Story & Clark Piano Service Manager Jon Light will be headquartered at the plant and may be reached for technical advice and parts and warranty information at (616) 361-1356. The address is 425 Richmond Avenue, N.W., Grand Rapids, Mich., 49504.

Seiler Increases Activities In U.S.

The West German family owned and operated Ed. Seiler Piano Co. celebrates its 135th anniversary this year by stepping up its activities, including those in the United States.

Seiler exhibited at both the National Association of Music Merchants show and the Frankfurt Trade Fair this year, according to Steffen Seiler, the fourth-generation owner of the company. The Seiler line includes 45-, 46½-, 48- and 50½-inch uprights in 24 styles, woods and finishes, as well as 5'11" and 6'9" grands.

Hydroceel Introduced

The Hydroceel Unit, a piano humidifier manufactured in the Netherlands, is now available in the U.S. and Canada, according to the importer, Louis den Toom, Stirling, Ont. The unit is a tube which is immersed in water for 10 minutes, dried and then placed in clips mounted in the piano. During humid summer months, the unit also absorbs moisture, den Toom said.

THE
TECHNICAL
FORUM

Vertical Rebuilding, Tech Tips And Reader Comments

Jack Krefting
Technical Editor

Vertical Rebuilding

The regulating procedure we will use as the basis for discussion here has been arrived at somewhat arbitrarily, but not entirely so. We have studied the procedures of leading technicians as well as leading manufacturers, and have tried to come up with a procedure which will work efficiently in the majority of situations.

Naturally, any procedure can be criticized on the basis that it does not work well in all instances, and of course this one will be no exception. The one-pass method, for example, may be great for a piano that is already in almost perfect regulation, but of little value in a rebuilding situation. Nonetheless, we will describe a procedure that minimizes doubling back because that procedure is most often efficient. Some of our readers will most assuredly disagree with our procedure, and we hope to hear from them. All reasonable rebuttals will be published.

We would ordinarily set the blow distance first, followed by the capstan adjustment and key height, but since we have not yet discussed refelting the keyframe, a word on that topic is in order.

One of the more common mistakes of the novice is in using a thicker backrail cloth than the original, on the theory that a more plush, cushioned surface will be less noisy than a firmer, thinner one. Unfortunately, what also happens is that the back of the key is raised higher than before, which of course lowers the front by a similar amount. Now the keys are too low, so the technician raises them by adding punchings at the balance rail, only to find that the key bushings are now too high for the keypins. If the technician corrects this by removing the extra punchings and shimming up the balance rail with veneer, that solves the bushing problem but raises the keys in the middle so now the fallstrip won't fit. Worse yet, if this is a direct blow or upright sticker action, in order to get the shanks back to the hammer rail, it may be necessary to drive the capstans so deep into the keys that further adjustment is difficult, simply because the backs of the keys are higher than they were originally. In exasperation, the technician rips off that wonderfully luxuriant new cloth and replaces it with thinner material. Lesson learned.

Manufacturers rarely adhere to their own key height specifications, due to small variations in dimension here and there in keyframes and case parts, so the rebuilder should always save samples of the original cloth and punchings to simplify replacement, and before refelting the frame, by all means check for clearance and adjustment with a few sample keys on the keyframe. Use both naturals and sharps to confirm clearance between keys and case parts, and check for capstan position with the action in place. If there is a problem with the latter even though the backrail cloth dimension had not been significantly altered, it probably means one of two things: either the keybed has been moved to different position with respect to the sides, or the plate position — and therefore the action setting — has been altered.

Figure 1 illustrates a typical upright keyframe with its attendant parts. We should note that the backrail cloth is glued at the front edge only, so that the part of the cloth that actually touches the keys is always unglued and simply lying on the backrail. This gives better key height stability, since glue wicks unevenly into felt and can cause hard spots which won't compress as readily, and it also provides for quieter operation.

Balance rail cloth punchings should be as thin as possible from the standpoint of stability of key

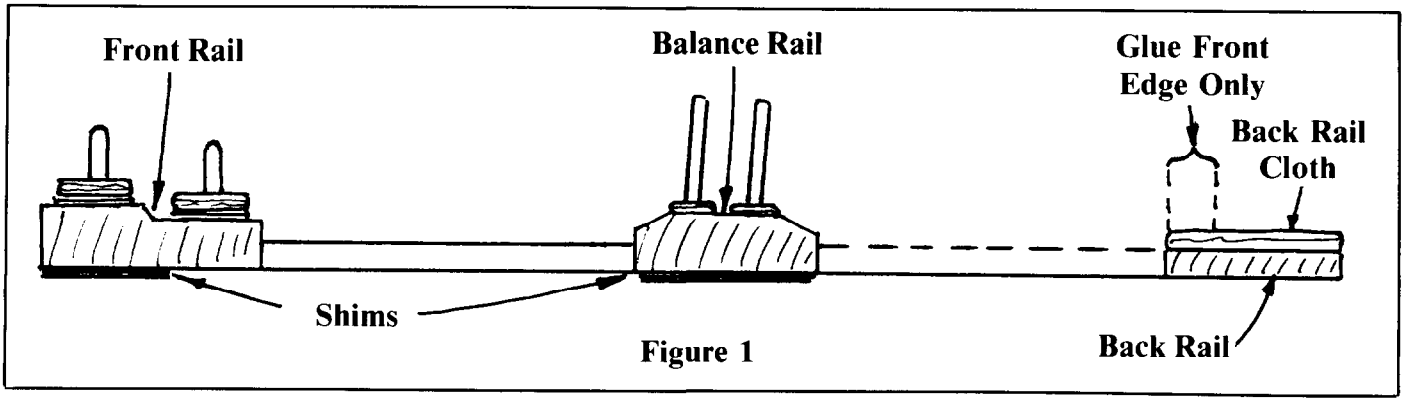


Figure 1

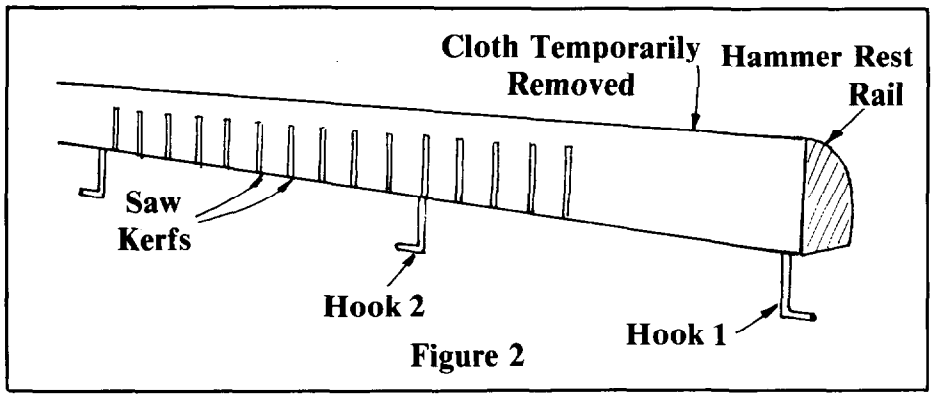


Figure 2

level. Thick punchings do not help keep the keyboard quiet, especially at the balance rail where the key simply pivots on the punching. Thick punchings necessitate considerably more leveling work than thin ones, so their value is very limited. Many technicians prefer to use nothing thicker than what the suppliers call "medium thin," and some even pre-compress the cloth punchings by rolling or hammering them before installation. It should also be mentioned that several manufacturers have switched from the traditional cloth punching to one made of bushing cloth, because the latter is thinner, denser and more stable in thickness.

If thinner punchings are to be used, consider the fact that to maintain key height we will then either have to add paper punchings or raise the balance rail. A tall stack of paper and cardboard tends to be unstable, so in general we would want to raise the rail instead. Remember, however, that there must be sufficient total punching thickness (cloth and paper) to allow full key travel without any part of the key touching the balance rail. Too little punching thickness can cause this annoying slapping sound, particularly from the sharps on a hard blow or from the naturals on a quick return to rest.

The thickness of the front rail cloth punchings has somewhat more to do with noise, in theory at least, although there is some doubt whether any pianist has ever complained about the sound of the key bottoming on the punching. This is probably because if it bottoms with enough force to make a noise, the hammer is almost simultaneously hitting the string with enough force to mask the sound of the key. One must also remember that the surface area of the punching touched by the sharp keys is considerably less than that touched by the naturals, so it follows that more compression and aftertouch will be felt in the sharps as they are played more and more. A relatively dense punching minimizes this, so the suggestion from here is to try to match the original punching in thickness, but to be sure that the replacement is at least as dense. The white punchings seem to be preferable to the green ones in terms of density and they also make it easier to spot key bushing wear because the dusting of red on the punching is easier to see against the white. This gives the alert technician more warning of a nicked front rail pin.

Whatever combination of cloth and paper is chosen, there should be sufficient total punching thickness that the keypin will not hit the top of the mortise at full dip, and enough that there is some paper left under every cloth punching to allow for subsequent adjustment. Too much paper here can lead to instability of dip and, worse yet, allow the key to rise above the top of the keypin. Make the appropriate compromise by using some paper on the rail and some veneer shims under it. Be sure the tops of both rails are straight and level to minimize leveling problems later, and always leave the punchings on the pins in order, cloth on top and thinnest paper just below the cloth, with thicker paper at the bottom.

Regulating Procedure

1. Set the blow distance to the manufacturer's specs by adjusting the height of the hammer rail. Most verticals have a piece of hard felt at each action bracket which supports the rail and establishes blow distance. This felt compresses with time and use, so ordinarily we have to add felt to achieve the required blow distance. However, if new hammers have been installed or if the blow had previously been set too close, it may become necessary to burn or cut off some of this felt. Some pianos have a capstan screw at each action bracket to make this adjustment easier, and others have an immovable hammer rail with a secondary rail for the short blow. In the latter instance, the blow can be set by replacing or shimming the hammer rail cloth. That cloth should be glued only at the bottom, partly to reduce return noise and partly to allow individual blow adjustment by adding paper to the rail behind the cloth.

If the factory blow distance specification is unknown, try the "5-6-7" rule: spinets and consoles, 1 5/8 inches; studio uprights, 1 6/8 (1 3/4) inches; tall uprights with stickers or dowels, 1 7/8 inches. Since World War II, some U. S. makers have deviated from these standards to a degree, but just about any piano made in this country before that time could be regulated by standard specs, regardless of make.

For evenness of regulation, it is important that the blow distance be the same throughout the scale, so check it at each end of each section. If the action has been played heavily with loose centerpins or loose flange screws, some of the hammers could be flattened so badly that they can neither be voiced nor regulated, in which instance, a new set would be indicated.

Another possibility, when the blow distance is uneven from one section to another, is that the hammer rail is warped. If the hammer rail is flimsy and flexible, it may be possible to correct the warpage simply by bending the rail support hooks until the blow distance is even. If it isn't flexible, remove the rail and kerf it straight as shown in *Figure 2*. Remove the cloth and make parallel saw cuts about halfway through the rail. Then glue in pieces of veneer of an appropriate thickness to straighten the rail — allowing for expansion with wet glue and subsequent contraction as the wood dries, of course — or simply make the saw cuts deep enough that the rail can be

held straight by the hooks after reinstallation.

If the bass hammers are not shorter than their treble counterparts by exactly the amount of bass overstring elevation, glue a veneer or cardboard shim to the hammer rail under the rail cloth in either the treble or bass section as required to make the blow distance the same across the scale. A variation of this, involving selective shimming wherever the blow is long, could be used as an alternate correction for a warped hammer rail.

2. Take up the lost motion by adjusting the capstan screws, or whatever substitute mechanism is provided in the case of an indirect action, so that all shanks are resting lightly on the rail, but also so that there is almost no trace of lost motion. Why do we hedge by saying "almost no trace?" Herein lies one of the problems of vertical piano regulating. Since we have no repetition lever, we must allow room for the jack to reset under the butt even after a very slow release of the key, which undeniably requires either the proper clearance or an unduly strong jack spring; yet if the lost motion is perceptible, we won't be able to level keys reliably and the butt skins will compress prematurely.

Most would agree that we need a compromise specification, and here is one: the shanks should be resting on the rail with sufficient force that if the rail is pulled down, the hammers will all wink slightly; yet when the key is depressed slowly, the backcheck and catcher will appear to move at the same time. *Figure 3* illustrates excessive lost motion in an action where the combined weight of the wippen and the back of the key is sufficient to return the key to rest. With this design, it might be possible to level keys without removing lost motion, but the pianist would surely complain of a lack of response and loss of control, especially on a soft blow. *Figure 4* illustrates a zero-lost-motion situation with a spinet action where the pickup finger (inverted sticker) is adjusted in lieu of a capstan screw.

3. Key height and dip. As discussed previously, the key height should be established according to the best estimate of the technician with respect to the nominal height, the original height, key dip adjustment and fit of case parts around the keys. Space and square keys as required so that they may be leveled with a straightedge, and level the naturals first. The height of the keys, subject to the above provisions, should naturally allow for some compression, depending on the type of punchings used. The keyboard may be crowned if desired, so long as the crown does not exceed 1/32 inch, although most technicians prefer to make the keys absolutely level.

The sharp key height should be set next, and this is usually 1/2 inch above the natural height. If, because the keys are unusually short, it will become necessary to set a very deep key dip, it would then obviously be desirable to set the sharp height a bit on the tall side to prevent them from becoming swallowed between naturals on full dip.

When all keys have been leveled at their optimum height, we can set the dip on at least the naturals, and possibly — some would say preferably — on the sharps as well, depending on whether we decide to compromise sharp dip for an even backcheck line, which will be discussed later in some detail. For now, let's say we will set the dip on all 88, at least preliminarily.

Most dip blocks are too thin as received from the supplier, and unfortunately that has led to a lot of pianos having been regulated with a too-shallow touch. It has been "common knowledge" that pianos should have a 3/8 inch key dip, but the problem is that many have assumed that this measurement is to be taken at the end of the key rather than over the front rail pin, or 1/2 inch back from the front of the key, or at some other point. Many pianos that supposedly have a 3/8 inch touch actually require somewhere between 0.390 inch and 0.430 inch, while published specs range from

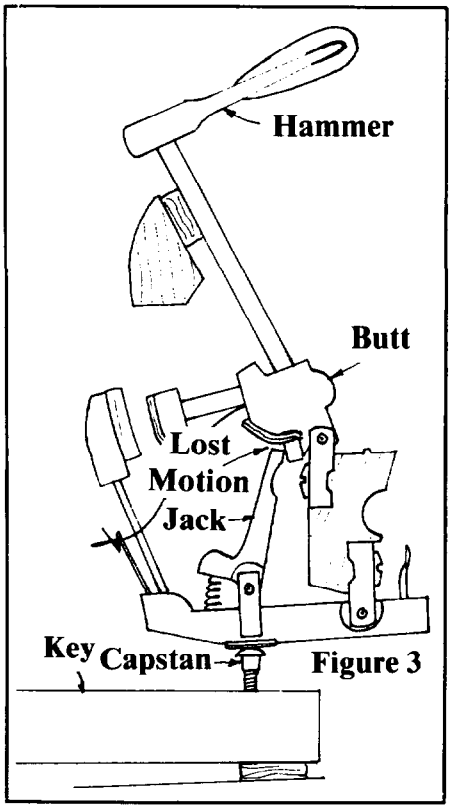
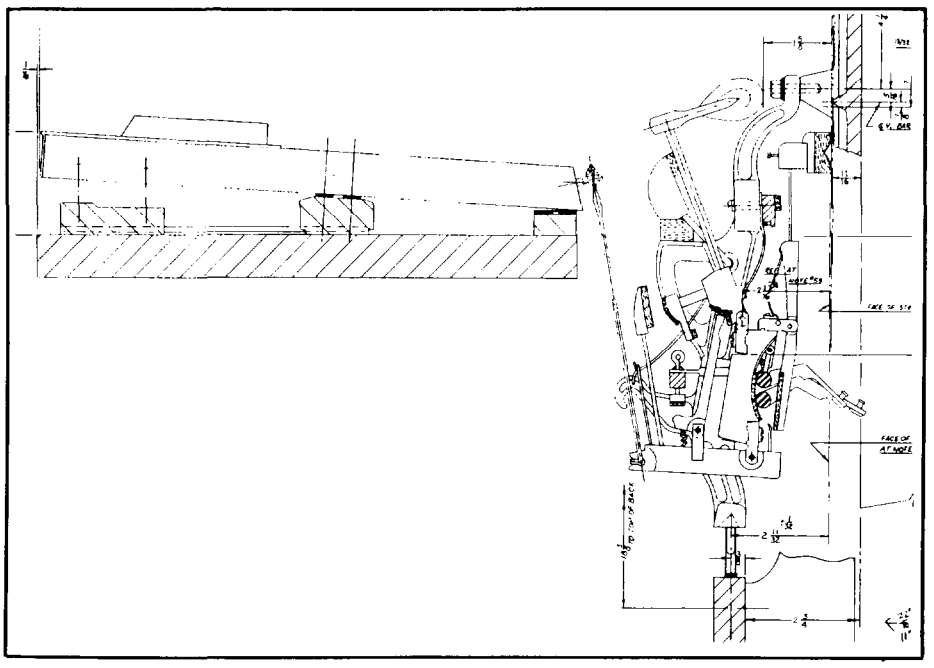
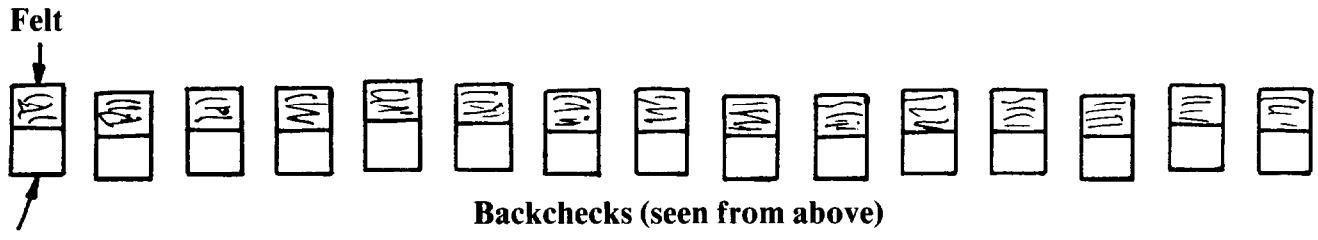


Figure 3





Backchecks (seen from above)

Figure 5

5/16 to 1/2 inch.

Most experienced technicians are unconcerned about specifications anyway, because, first, more often than not, the pianos aren't built to specs, and second, they will only work at one particular setting anyway, and that's the way they will have to be regulated whether or not it agrees with the specification.

One of the most controversial aspects of vertical regulation is whether to set the dip on the sharps for uniformity of key travel, evenness of the backcheck line at rest or evenness of aftertouch. Obviously we would like to have a uniform dip, but would the pianist notice a discrepancy or unevenness here more or less than one in aftertouch? Many technicians feel that so long as aftertouch exists at all, in whatever amount, it can safely be ignored in favor of uniform key travel. Others feel that the amount of aftertouch actually affects the way the piano feels more than does the amount of key travel, and the debate continues.

What, then, of the common manufacturing expediency of setting the dip on the naturals, aligning the sharp backchecks to those of the naturals with a straightedge, and then achieving evenness of checking by altering the dip on the sharps? This is generally disdained by purists, who prefer to keep the dip and backcheck line uniform, and then adjust the checking distance by burning small amounts of felt off the backchecks of those notes whose hammers are checking too close to the strings. There is little doubt that the latter method is neater and more workmanlike, but whether it makes enough difference to really matter is another question entirely. It is so rare to see any vertical piano in a really fine state of regulation that extra effort in this area may not be appreciated sufficiently to justify the work involved.

There is one other alternative, and that is to compromise the backcheck line as required to retain evenness of dip and checking distance. This unevenness, illustrated in *Figure 5*, is due primarily to differences in catcher stem length which occur in the manufacture of the butt assemblies. Uneven backchecks would be cosmetically unacceptable on the showroom floor, but from a performance standpoint, if one is unwilling to go to the trouble of burning backcheck felt, it would be far better to live with an unsightly backcheck line than with uneven dip or erratic checking distance.

4. Letoff. Before making this adjustment, be sure the letoff rail is in the correct position and that it is securely fastened so that it cannot move. Set the letoff to spec, or to 1/8 inch if there is no known spec. Any setting significantly wider will result in loss of power on a hard blow and loss of control on a soft blow. Conversely, any attempt to set letoff too close, say in the 1/16 inch range, can result in blocking under certain conditions.

Letoff can be set by sight, but is more accurately set by feel, using something 1/8 inch thick as a gauge. The material favored by some is the magnetic, metallic "tape" of the type used to secure signs to the sides of automobiles. This tape is available at hardware stores in 1/16 and 1/8 thicknesses, usually in a four-foot strip. Cut the tape to a more usable length and lay it against the strings at the strike point. It will stick to the strings — to the treble strings anyway — and then letoff can be set by turning the screw counterclockwise until the hammer blocks against the gauge, with light downpressure on the key, and then clockwise until the jack just starts to escape.

Another method, described in detail by Carl Root on page seven of our May 1984 issue, involves blocking the hammers off the hammer rail with a straightedge so they are within 5/32 inch of the strings. The letoff buttons are then adjusted so that each hammer will wink 1/32 off the gauge when the key is depressed.

5. Backchecks. Before making the fore/aft adjustment, check for side/side alignment of backchecks to catchers, and that the backcheck heads are square to a straightedge.

The checking distance — face of strings to crown of checked hammer after a moderate blow — is specified as 5/8 inch in the vast majority of pianos made in the U.S. in recent years. The regulation for checking distance is made by tapping on the backcheck heads with the fingertips, not with a bending tool. Tap at an angle down and away for a closer checking distance, or down and toward yourself for a wider distance. Once samples have been set, the rest can be set by "drumming off," which means any adjustment that is set by comparison rather than by individual measurement. Hold one hand stiffly in such a position as to be able to strike three to five keys simultaneously and with the same force, and observe the position of each of that group of checked hammers. Adjust those that differ from the sample hammer and drum off again, as many times as are required to get them even.

It will quickly become apparent whether or not the backchecks will fall to rest in a straight line, and if so, fine; if not, and of course if one wants to be critical enough, it will never be deemed straight, we must either accept the line as it is or make an adjustment as described earlier under "key height and dip."

6. Damper lift. One of the most important things to remember

when regulating vertical dampers is that the procedure is the opposite of that for a grand. That is, instead of regulating the lift with the key first, on a vertical we first regulate the lift with the pedal. The procedure that I recommend for regulating dampers is explained in detail in our May 1980 issue, and to some extent in our April 1984 and June 1984 issues, so without repeating all of that here, this will be a quick overview.

First, be sure the dampers are lined up laterally, centered on their unisons; make bends in the wires if necessary for alignment. Next, make any necessary fore/aft bend at the bottom of the wire, for evenness of lift with the pedal. Then bend the tops of the wires (just below the damper heads) fore/aft if necessary to make the top and bottom of each damper felt touch with equal force on the strings. Correct any end-to-end unevenness of lift by bending hangers (May 1980, pages 9-10), and finally, bend spoons as required so the dampers start to lift when the hammer is halfway to the string. For greatest accuracy, the spoon bending must be done while the action is in the piano.

7. Pedals. The right pedal must have some lost motion, preferably 1/8 to 1/4 inch measured at the front of the pedal, otherwise the dampers will not follow the strings beyond the at-rest point, and "ringing harmonics" would be heard. Adjust by turning the prop nut, and if there is a problem with this adjustment holding, add a second nut as a locknut or glue the cloth punching to the trap lever.

The center pedal, if one is present, may have one of the following functions: a sostenuto, a bass sustaining lever, a practice bar, a special effects bar, or a non-functioning spring-loaded pedal. The latter is the easiest to regulate, of course, and the others aren't hard either. If it is a bass sustain, there must be lost motion just as in the right pedal, for the same reasons. If it is any of the others, there should be no lost motion.

The left pedal is almost always a soft pedal which moves the hmmer rail closer to the strings. There should be virtually no lost motion here, but neither should the pedal dowel hold the hammer rail off its supports, as this would shorten the hammer blow distance, increase lost motion between butts and jacks and increase the likelihood of rail warpage. There usually is some kind of blocking felt which stops the movement of the hammer rail, and this can be adjusted by adding or removing felt until the blow distance, with the left pedal fully depressed, is between one and 1 /14 inches.

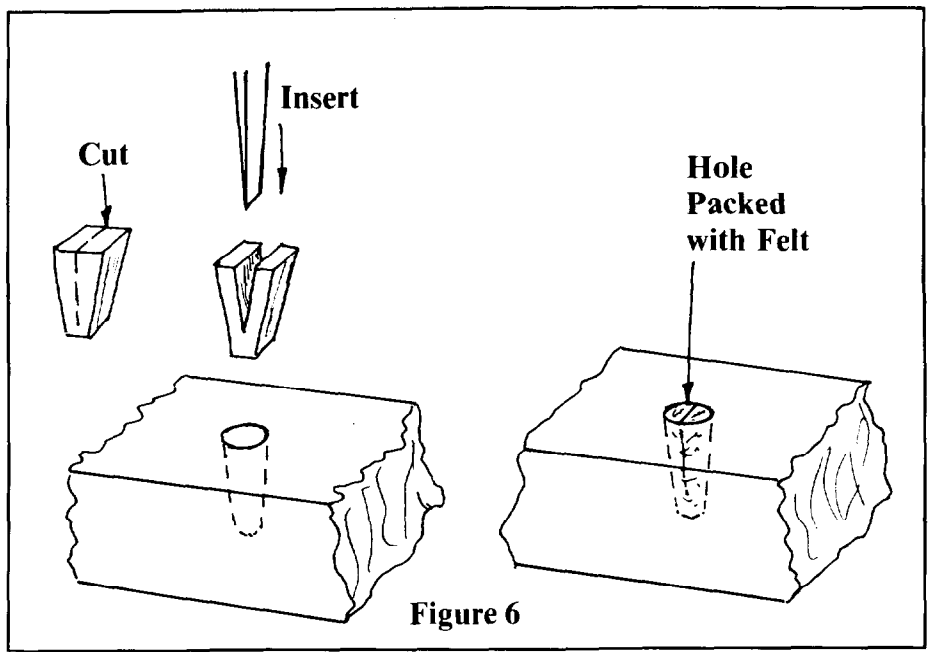


Figure 6

8. Bridles. The adjustment of the bridle tapes is another of the controversial aspects of vertical regulation, with some technicians insisting that the proper regulation assists in repetition and others maintaining that if you have to adjust the bridle to get repetition, there is another problem. Still others maintain that the only reason bridle tapes exist is to keep the jacks from falling under the butts when the action is removed from the piano.

The conventional wisdom suggests that the bridle wires be adjusted so that the tapes are *almost taut* when the left pedal is fully depressed. That means you can press the soft pedal all the way down and the keys won't dip, unless of course the pedal is depressed very quickly. There is ordinarily no stopping mechanism for the hammers — or the keys either, for that matter — so if someone is determined to use maximum force they will ultimately succeed in making the keys wink and the hammers hit the strings, but of course we must remember that we are talking about a musical instrument here and that if one so desired, he could presumably throw darts at a Rembrandt.

Our concluding remarks on the rebuilding of vertical pianos will appear in next month's issue.

Tech Tips

Hiram Hunnicutt of St. Louis has submitted the following, as shown in *Figure 6*:

Subject: stripped screw holes in wood. Some advantages of using pressed felt packing for stripped screw holes in wood:
1. Use the original screw.
2. The replaced screw will be accurately centered.
3. Packing with felt is quick and simple.
5. The screw can be turned home immediately.
5. If the felt plug is large enough, the screw will hold with a bulldog grip.

Used continuous strip mute felt is ideal. It is quickly cut with scissors.

Reader Comment

Dear Mr. Krefting:

In the June 1984 issue of the Journal you mentioned that you had previously asked people for their temperament methods and had really only received various versions of the two standard ones, namely the "Broadwood" or "Braid White" temperament, in which one tunes by fourths and fifths through the circle of fifths, checking thirds and sixths on the way; and the

"Thirds" temperament, in which the temperament is set mostly by comparing beat rates of major and minor thirds and sixths, beginning with F-A, A-C♯ and C♯-F. I have developed a temperament method which is quite a bit different from both of these, and may be of some interest.

At the outset, let me say that my inspiration came from a handout sheet prepared by Virgil Smith and Chris Finger, presumably for a class one of them gave. I didn't attend the class, but I did get ahold of the sheet. I made three or four changes in their "sliding fourth" temperament to produce a hybrid which I find works very well.

My procedure is as follows: tune middle C to fork. Tune F-C; G-C; D-G (it is assumed here and in the following that every fifth is narrowed and every fourth narrowed by an appropriate amount). Check F-D. The beat rate should be around eight per second, though a feel for the beat rate acquired through practice is more useful than the numbers. Tune A-D, check F-A (should beat about seven beats per second, or a little slower than F-D). So far we are tuning a "Broadwood" temperament, but from here on we change.

Tune B♭-F, check B♭-D (should beat somewhat faster than F-D). Tune B-G, making it beat the same as F-D and faster than F-A. Tune F♯-B, check G♭-B♭ third. It should have a beat rate between those of F-A and G-B. The fourth F♯-B may be moved up or down as necessary to alter the relationships between the three chromatic thirds, hence the name "sliding fourth" temperament. At this point every effort should be made to ensure that all fourths and fifths tuned so far are acceptable and that all thirds and the sixth are in correct relationships with one another.

Having made any necessary adjustments, tune A♭-C, making its beat rate faster than that of G-B and slower than that of B♭-D. Tune C♯-G♯, checking F♯-C♯ and A-C♯ (should beat at a rate between A♭-C and B♭-D); adjust the fourth G♯-C♯ up or down as necessary. Tune E♭-A♭, check B♭-E♭, G♭-E♭ (should beat the same as A♭-C and slightly faster than F-D), B-D♯ (should beat somewhat faster than B♭-D). Tune E-A and F-B♭, making checks similar to those for E♭. These last five notes should fall into place without too much trouble if the preceding seven were set well.

There are several reasons why I like this particular procedure. In the first place, I don't really commit myself to the exact placement of any note except C until seven notes have been tuned. This gives me an opportunity to feel out the particular piano and decide how pure or impure the fourths and fifths need to be, and how fast the thirds will be. Adjustment of any note, throughout the tuning of the temperament, is a fairly easy matter, since each note follows a sequence of at most two or three others between it and middle C. The tuning sequences as follows: C-G-D-A-E; C-F-B♭-E♭; C-A♭-D♭; C-G-B-F♯.

This is in marked contrast to the "Broadwood" temperament, where each note is dependent on all *the notes tuned previously. Thus if, as often happens, one arrives at C♯* and discovers that the A♭-C and A-C♯ thirds don't progress as they should, all six of the previously tuned notes (F♯-B-E-A-D-G) may have to be shaded a bit sharp or flat. A similar objection might be made to the "thirds" temperament, in which one also commits oneself to each note before tuning the next, at least after the initial four have been tuned. My method is basically the same as the "Broadwood," except that I jump ahead into the middle of the circle of fifths before I have committed myself too far.

Of course, regardless of what method we use, we all aim at the same result, a temperament in which all fourths and fifths are acceptably pure and all thirds and sixths increase in beat rate up the scale. I certainly don't mean to say that any method of temperament tuning will produce better results than any other — that depends entirely on the care taken by the individual tuner. I did think you might be interested to know that there was at least one somewhat different method being used out-here in the "wilds" of New Mexico.

Fred Sturm, RTT
Albuquerque, N.M.

Dear Jack:

Your July article hit on the serious problem that will be facing us rebuilders concerning the removal of polyester finishes.

Our first experience was approximately a year ago with a Kawai grand piano that was scorched just a little in a fire but required and warranted a complete rebuilding. At the time, we really didn't realize what we were against, and since we explained the rebuilding to the customer, she in turn requested a change from the original ebony to a natural-finish product.

Nothing, and I mean nothing *penetrated this polyester, and we couldn't figure this thing out. So we contacted our refinishing supplier and explained the entire problem and he in turn contacted his manufacturer, Savogram Company, 85 Industrial Ave., Addison, Ill.*

Savogram's chemist, feeling the challenge, worked with a chemist in Boston and formulated a product coded S1-2 which is expensive but worth every cent, along with the experience. It takes approximately three to four hours setting on the polyester and was removed completely to the natural wood. Since then, we have done others. The cost must be accorded in contrast with the time involved.

Allen J. Macchia, RTT
Crown Point, Ind.

Please send all articles, technical tips, comments and questions to me at this address:

Jack Krefting, Tech. Ed., PTJ
c/o Baldwin
1801 Gilbert Ave.
Cincinnati, OH 45202

Tuning In Saudi Arabia

Nancy Burkhalter

No self-respecting piano would let itself be shipped to Riyadh, Saudi Arabia. Temperatures soar past 120 degress in the summer and humidity hovers around 13 percent year-round. What humidty is left in the air is extracted quickly and efficiently by the myriad air conditioners blasting night and day. Those unfortunate pianos that have found themselves in the middle of this desert have come to what tuners here call "the graveyard". The scalding climate in Saudi Arabia acts like a pottery kiln on everything. Screws become so loose that hammers sway to and fro like Hawaiian hula dancers. Pin blocks are so dry that after only a few years their laminations look like filo dough pastry. Pins, if they are able to stay in the block, have almost no cant at all, and only a memory of torque. All too often, a tuner has no choice but to inform the customer that he is now the proud owner of a piece of junk. Most pianos in Riyadh are around two to three years old, although one has been sighted of 1902 vintage. The majority are uprights that have not been tuned since they left the factory in America, Europe or Japan. British-trained tuner David Warren, who has been in the Kingdom for four years, feels that the American pianos suffer the most because of "too much overstringing," as he says with a grunt.

The tuning of thse dehydrated wrecks is really no different from their counterparts in the States. Take it sharp, bang the "bejeebers" out of it, and ease it back to pitch. On the worst pianos, the pitch drops about 10 percent in the middle and as much as 25 percent in the treble, so it is necessary to leave it sharp by that amount in the pitch raising. Another successful technique is to lower the string below pitch, then bring it sharp, pounding all the while. This helps to settle and stabilize the string. When servicing is possible, say, on loose pins, the easy way out is to pound the pins in, if the block will "bite." There is always sandpaper or emery cloth that can be wrapped around the offending pins, but that is tedious and expensive on a piano that oftentimes has whole sections that are bad. As a last resort, pin block tightener can be used, but what tuner likes to face the jumpy pins afterwards? Preventive maintenance dictates keeping moisture in the piano, so humidifiers are really necessary. The only catch is getting the customer trained to fill it regularly. The piano supply houses in America are cooperative about sending materials abroad. The problems rests on this end because the mails are agonizingly slow. David Warren has supplies sent from England's supply house, Fletcher and Newman, but the 'jet lag' is still the same. No one comes to Riyadh for the view, the climate, or the entertainment (there's no drinking, dating, or movies). What makes it worthwhile? Why, the money of course. Next to Kuwait, this country has the largest per capita income in the world, around $17,000. Salaries are sky high and tuners earn commensurately high wages for their efforts. For the first tuning, which is always a pitch raising, the fee is about $125. The hourly wage is about $45, and beyond five or six hours' work it drops to $30. Of course there are those who charge more, since the market will bear it. One noted tuner, for example, flies in once a year to service the clientele of princes and rich merchants: $285 per piano. A not-even-so-industrious tuner could bag up to $100,000 a year with a measly two pianos a day and weekends off. Sound inviting? Then imagine yourself sitting at your favorite spinet that hasn't been tuned since 1978. The Korean Corps of Ditch Diggers is hard at it outside the window with back hoes and jack hammers, beautifying Riyadh. A bored passel of children is in the next room blaring out the only legal source of entertainment, the video. And you, who are soaked from your drive to the villa, have mixed feelings about the cooling, yet deafening effect of the air conditioning. Warren uses an electronic tuner in these instances more as a defense against insanity than as an assurance of good tuning. Still not a bad deal, you say? OK, get in your car and head for your next tuning. You don't know what street it's on because the streets have no names, even if you know Arabic. You know that it's near the Circle Supermarket and the Al Thagar Travel Agency. When you turn right at the big mound of dirt, you go straight — or do you? You can't because they have made a detour overnight, an all-too-often occurence here because they are always ripping up the streets to install sewers, phone lines, and bridges. Punt. Now you get on a street that takes you south when you wanted to go north. Soon you find yourself miles from your destination. Finally you find the

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The scalding climate in Saudi Arabia acts like a pottery kiln on everything. Screws become so loose that hammers sway to and fro like Hawaiian hula dancers. Pin blocks are so dry that after only a few years their laminations look like filo dough pastry. Pins, if they are able to stay in the block, have almost no cant at all, and only a memory of torque.

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villa that is identifiable not because it has a number on it, but because it has pink elongated arches and is next to a villa with a blue door. You locate your client's house or palace via landmarks or, if they are especially well-to-do, you request a driver to come and pick you up. This is the only possible way to get there if you are a woman because the Kingdom doesn't allow women to drive. Many's the time I've been glad I couldn't drive because the Saudis are absolutely crazed when it comes to their cars. A recent traffic poll showed that there are four times more traffic accidents in Saudi Arabia than in the United States. They turn left from the far right lane, run red lights regularly, and cut you off in heavy traffic. Cheating death is a full-time job for expatriates. One of the big menaces on the highways are the mini-buses (affectionately called "Flying Coffins") that carry (only) men up and down the main thoroughfares of the city. The drivers have no fear of anything and have a heightened sense of security because the wheels have spurs that stick out about 10 inches, Ben-Hur style, that would easily destroy your tires if you get too near. The only people on the road carrying insurance are the expatriates, since Islam forbids any Moslem to carry it. They believe Allah will take care of them. Anyone wanting to avoid financial disaster would certainly arm himself with this precaution. The majority of piano customers are Lebanese, with some Palestinians and Koreans, besides of course the Americans and Brits. Saudi customers, fewest in number, are different from all the rest. The wealth is staggering among these people who only twenty years ago were roaming the desert. Oriental carpet on the floors and walls, plush armchairs and sofas befitting a king; glittering chandeliers encircled by a wooden staircase; swimming pools in bedrooms; silver, gold, and jewels strewn about the house like bonbons: all of it kitsch enough to be dubbed "Saudi gaudy." In Saudi Arabia men and women are always separated, whether it be on a bus, in a restaurant, or at the pool. The women are kept at home as much as possible. If they have to go out, they are hidden from men's eyes by their thick veils and robes, black of course. For any man to see a woman unveiled is extremely rare. But these Saudi women, once inside the high walls of their villas, take off their veils and robes to reveal some rather immodest attire. Warren was quite startled the first time the lady of the house propositioned him with "Come back and play for me when my husband isn't home." This he considered a bit bold, since the punishment for adultery in this country is beheading.

Although 1,000 pianos for a population of close to a million may not seem unusually high, consider these facts. First, pianos were banned here until 1973. In this strict fundamentalist Islamic country, music in general has a bad name, especially Western style. Even though Mohammed had music at his weddings (all 13 of them), singing girls in taverns became associated with prostitutes and a certain type of male professional musician in the Western section, who indulged in transvestism and nail painting. This caused the stricter Moslems to associate music with drinking and general naughtiness that Allah frowns upon. Even today, women's voices are not heard on the radio, either in song or speech.

The other reason it is odd to see so many pianos here is that there is no Arabic music written for the piano. Arabic music uses no harmony, but more importantly, it has quarter tones in its scale, and no equal-tempered piano tuner would remain that way if he had to tune a piano with intervals like that. There is a D minor scale that can be adjusted to sound "Arabic" by lowering the second note half a tone and raising the third note the same. These are the intervals that Hollywood uses to provide background music for any and all plots set anywhere between the Atlantic and the Persian Gulf. Cairo University has a specially-built piano that has a second manual for quarter tones, and Hoffman the piano maker made a special piano with a manual for quarter tones which can be played through a mechanism that is engaged inside the piano without shifting the manual. But since it hasn't been patented, there are no pictures or descriptions of it anywhere.

For those of you who are about to get up and make reservations to Riyadh on tonight's plane, stop. You can't get into this country without a sponsor. If you already know a Saudi, he can sponsor you, but be careful - these people are notorious for getting the better end of the deal. Then you have the dry heat and bad working conditions in exchange for very little. If you can get a job in the Kingdom doing something else, as has every other tuner here, then you can tune till the cows come home, or in this case, the camels. But beware, the high wages are not because it's easy!

SHOP TALK

Evaluating For Restringing

Susan Graham
San Francisco Chapter

Rebuilders require skill and concern for detail to install new components in old pianos. However, the way we first evaluate and then disassemble a piano is also important. We must determine if the job will yield good results and is time- and cost-worthy. Vital information particular to a given instrument must be recorded. I follow the same inspection pattern in both instances, once to estimate the job on location, and again in detail in my shop just prior to beginning work. In this article, I will outline this inspection as it is done to evaluate a candidate for restringing. Later articles will follow on recording information and tear-down.

To understand and remember important criteria, keep in mind why a piano is restrung. Some structural problems can only (or are best) repaired with strings removed, such as a fatigued pinblock or loose pins, soundboard cracks and rib delamination, or extensive bridge work. There may be problems with the strings themselves, wire breakage and corrosion affecting tone and tunability. This may include trouble at termination points, such as loose bridge pins, splits in the bridge, agraffe or cap bar condition causing noise, understring felt and counterbearings dirty, worn or misplaced. This leads to an immediate observation that there's more to restringing than just putting in wire, and a good job will include attention to these details.

If it is apparent that a piano *needs* restringing, the next question is, does it *deserve* it? Does the basic quality and condition of the instrument warrant extensive work? Is there sufficient interest and financing for a complete and satisfactory job, both restringing and any necessary action or damper work? Often customers wish to split the expense of a complete rebuilding by having restringing/structure work done at one time and action work at another. This is feasible if they understand that complete results will be apparent only when both phases are complete. It is a slightly inconvenient way to work, but it may allow you to avoid having to do a less-than-complete job of one phase in an attempt to make a total rebuilding affordable. Most dramatic results are obtained when you can have the entire piano in your shop and return it completely restored, but if this is out of the question, splitting the job into two phases may be best. In any event, even if new wire will solve some problems, it is important to consider the entire piano.

"If it is apparent that a piano needs restringing, the next question is, does it deserve it? Does the basic quality and condition of the instrument warrant extensive work? Is there sufficient interest and financing for a complete and satisfactory job, both restringing and any necessary action or damper work?"

If you are new to rebuilding, or, like me, tend to get absent-minded when enthusiastic about a potential job, make a checklist. A printed form looks very professional. As I estimate a job, I first give the customer a verbal report and an approximate figure, keeping written notes for my records. If they still are interested, I write out a detailed work order which they can sign and return with a one-third deposit when they want the work done. If the job is scheduled for the future, I include on the estimate a statement that the price may go up, and set a limit as to how much, usually 10 percent. It is in everyone's best interest to nail things down in black and white *before* work is begun.

In addition to the general conditions mentioned above, an inspection checklist should include the following:

Crown: The soundboard should be "bellied." This is checked using a piece of string stretched to form a straight line. It is held underneath the board with the ends touching the board and the case where they intersect, next and parallel to but not touching the longest rib. This is easiest with assistance, but can also be done by knotting the ends of the string and thumbtacking it firmly in place — it must be taut. If there is a gap between the string and the board, then the board has crown (it is arching above the straight line). If there is no gap, the

board is flat. If the board displaces the string in the middle, but shows a gap at the ends, the board has "oilcanned." Both conditions make a piano unsuitable for restringing, unless the board is replaced.

Assuming positive gap, how much is enough? There usually is not much, rarely as much as 3/16 inch in older strung pianos. The answer really is that some is enough, if other indicators are favorable. These include current humidity level (crown increases in damp weather — will there still be some when it is dry?), health of the board in general (wood-colored rather than gray), and whether there are cracks which can be shimmed to improve crown (not possible if the board is flat).

Sustain is a good indicator. The tone may be poor, but if the piano still "sings" it is healthy. Raise the damper and pluck a string and time the sustain. Do this in each section. Twenty seconds is good, 30 is great and less than 15 indicates board or bearing trouble. The important point about crown is that if the piano has none, restringing will not help and should not be done. Lowering the plate to get bearing on such an instrument will only hasten its demise, since the board is without the bellied configuration which normally withstands the downpressure of the strings. This leads to:

Bearing: While the terms are usually mentioned in conjunction and often erroneously interchanged, bearing is not the same as crown. Bearing refers to the relationship of the strings to the bridge. Whether the bridges, as supported by the soundboard, deflect the strings so that solid contact is maintained and vibration is transmitted to the board for amplification. A general condition of positive bearing can be checked using a rocker gauge. Accurate readings should be made at some point before and after unstringing. For estimation, however, first determine if there is bearing throughout the piano and, if not, how likely it is that the plate can be repositioned. See also "bridge roll."

Ribs: While under the board checking crown, inspect the ribs. They must be intact and tightly glued to the board. An unglued rib is usually associated with a crack or compression ridge in the board and can be detected by feeling across the crack for unevenness in the board surface where it has pulled loose. Loose ribs will buzz and are more important to repair than the crack, which is more of a cosmetic problem.

> "As I estimate a job, I first give the customer a verbal report and an approximate figure, keeping written notes for my records. If they still are interested, I write out a detailed work order which they can sign and return with a one-third deposit when they want the work done."

Bridge roll: is not something eaten during a card game. It is a condition to watch for while checking bearing. The strings must be seated more solidly on the front edge (speaking length side) of the bridge than on the hitch pin side — the top of the bridge has a slight backward slope. If it does not, it usually is indicative of a collapsed area of the soundboard which has allowed the bridge to roll forward, raising the back edge and decreasing or eliminating solid contact at the front. This indicates weakness in the board and in the termination of the speaking length, which results in poor tone. Such pianos are usually candidates for new soundboards. It is normal for the board to "roller-coaster" slightly but not so far as to allow this condition. Read both back and front bridge bearing. A bubble-type guage will show difference between the two, as will the use of feeler gauges with the rocker. It also can be checked by stretching a piece of fishing line from the front termination and sighting along the top of the bridge as the string is slowly lowered. If the string makes contact with the front side of the bridge first and does not contact the back until it is lowered further, then the front bearing is greater. Sanding or planing the bridge and lowering the plate is a dubious undertaking, since the problem really lies in the soundboard. Bridge roll may also be due to a failed glue joint, which can be repaired.

Bridge condition: Apart from relative position to the strings, condition of the bridge(s) is critical. Solid contact must occur between bridge pin and string, bridge pin and bridge, and bridge and board. Cracks around the pins or in the cap need repair, or, if severe, require recapping or replacement. It now is generally thought that "false beats" are the result of an unstable termination point, such as a loose bridge pin. This allows the actual speaking length to change as it vibrates, resulting in two interfering frequencies. Poor termination (either front or back) contributes to poor tone, zings, and other annoying "string noise." Needless to say, a deteriorating bridge also creates tuning instability and results in loss of tone and volume. It is sometimes difficult to detect delamination from the board since the plate is in the way, but some inspection can be made with a small mirror and a flashlight.

Front termination: Assume that the capo bar needs resurfacing and that agraffe replacement or resurfacing may be in order. Other counterbearing surfaces such as brass bars or individual pieces need cleaning. Care should be taken not to reduce the height of these pieces. It is important that they deflect the string strongly from the plane at which it addresses the initial termination (capo bar). Weakness in treble tone may be due to insufficient solidity at this point, although the angle cannot be too great or the string won't render in tuning. Approximately 20 degrees seems good — bend a piece of music wire with the aid of a protractor and use it for comparison purposes in the piano, since it is difficult to get in and measure accurately.

Pinblock: Condition of the block and tightness of the pins is of primary importance. A choice must be made between using oversized pins in the old block, or replacing (or plugging) it. A torque wrench can be used as a diagnostic tool for judging pin tightness, although I have always been able to rely on

the feel of the old pins. Whenever possible, tune the piano. This yields all sorts of interesting data about uniformity and holding power. An under-the-coil tuning pin gauge, which is available from several suppliers, is invaluable for quickly determining if the piano has already been entirely or partially restrung. Sad experience has taught me never to trust the customer's information on two points: the age and length of the piano and whether it has had major work done. If years have passed since a first restringing, it may appear to be an original factory job — don't get fooled.

Although cost, time and availability of shop space are factors in deciding whether to install a new block, they are *not* the most important. An old pinblock must be judged on its ability to match the quality and durability of the rest of the work and the rest of the piano. It is pointless at best and unethical at worst to do otherwise.

I only repin a block if it has the original 2/0 pins in it and is otherwise in good condition. I don't ream, and, in general, if the original pins are still tight, I use one size larger — if not, two sizes (maintaining the same length). I go no larger than 4/0. If that is too loose, the block gets replaced. Such looseness suggests interior splitting or wood damage. A 5/0 pin may be tight initially due to compression of the wood, but the block will work itself against the pin during seasonal changes and quickly lose its grip. Driving a large pin into the old block further hastens delamination or splitting. It also is very difficult to achieve a fine tuning on such a large pin. Any block showing signs of contamination, doping, splits or delamination is unsuited for re-use. Watch also for little piles of sawdust on the action — termites do get in pianos.

"Although cost, time and availability of shop space are factors in deciding whether to install a new block, they are not the most important. An old pinblock must be judged on its ability to match the quality and durability of the rest of the work and the rest of the piano. It is pointless at best and unethical at worst to do otherwise."

In addition to good condition, an old block must be fitted properly or it is pointless to re-use it. If the block is not in solid contact with the plate flange it will "float" and the tuning will be unstable. Flange fit is checked with the action removed. Attempt to fit a business card between the wood of the block and the plate flange. It may be possible to insert the card at a given point, but it should not be free to slide along the face of the block. I like to see contact at least every inch on rock maple blocks, and at least every six inches on multi-laminate blocks. There may be more of a gap around the bass/treble break where there are no pins; the location of a larger gap also determines its effect on tuning instability. If you are suspicious, check for contact between the tuning pins and the plate holes, which indicates that the block is creeping forward (only possible to detect if there are no plate bushings).

History and location of the piano should be taken into consideration. This includes the phenomenon of east coast/west coast pianos. Having started in the midwest and then moved to the west coast, I can personally attest to vast differences in pianos from different regions. A 60-year-old grand from the east will show more wood deterioration — soundboard cracks and bridge and block problems. In the west, however, it is not unusual to see 60-year-old grands with beautifully intact boards and ribs, and pins almost as tight as in a new piano.

This is due to climate. Regions of the country with humid summers and cold winters requiring heated homes which become very dry subject pianos to drastic changes in wood moisture content. This cycle of extremes is damaging, as the

wood expands, crushing against itself or other parts (such as tuning pins) and then dries out, shrinking and splitting. Spared these radical changes, pianos in the moderate regions of the west fare better. Keep this in mind when judging the condition of a piano — and also, incidentally, in evaluating advice or expertise of any particular technician. Pianos of foreign manufacture may similarly exhibit effects of their home climate and/or a move to the states.

Finally, consider the overall quality of the instrument. We all know the top names. While any given piano can have problems, for some reason the good ones take a rebuilding better. Some of the lesser-known pianos are of excellent quality and can be even improved from their original design through rebuilding, but a little more caution needs to be used in reusing parts of these pianos.

This evaluation helps to make an educated report and cost estimate. However, I make it policy when I take a restringing job to stipulate that I must have discretion to replace the block if it appears unsuitable when I remove the plate. I include a figure for the additional cost if this is necessary. It is not difficult for a customer to understand why the pinblock, largely hidden by the plate, cannot be evaluated with complete certainty until the plate is removed. Similarly, if the customer is really interested in quality restoration and has faith in your integrity and ability, he or she will give you this option. If not, reconsider whether you want the job. I'm not the type to get high-handed and demand ultimate artistic control, but this is one area where I stand firm.

"It is not difficult for a customer to understand why the pinblock, largely hidden by the plate, cannot be evaluated with complete certainty until the plate is removed."

For the same reason I prefer to restring in the shop where I can hoist the plate. Occasionally I do an on-site restringing, but only if, first, I know the piano and the customer well enough to minimize the technical, ethical and personal risks (it requires "moving in" for several days — not every customer will tolerate this, nor can I necessarily tolerate them), or second, the piano is new and being restrung to solve string breakage or tone problems rather than pin looseness (usually a university or professional situation) and, third, I have had successful experience repinning pianos of this particular brand. If you lack the experience, try to consult with someone who has.

Although the hammer and damper actions are not part of a stringing job per se, evaluate them. They will affect the final perceivable result. Flat or hard hammers contribute to string breakage as well as poor tone. An action which cannot be regulated is not going to show results of stringing well. Old dampers may be hard put to quiet lively new strings. Communicate these things to the customer and keep in mind their effect on the market value of the result of your work.

As promised, this is a lot of words about looking at pianos. Caution at this stage saves a lot of trouble later, so it is worth the time to do well.

CONTINUING
EDUCATION

The Case Of The Squeaking Shift Pedal

Stephen H. Brady, RTT
Seattle Chapter

Several years ago, in fact, shortly after graduating from tuning school, I received a telephone call from the manager of a very popular local nightclub. He asked, "Would you be interested in taking care of the piano here on a regular basis?" I replied that I would and we set up an appointment.

Upon arriving to tune and service the piano, I found that the manager was not there, but one of the workers showed me to the piano. "Good luck," he quipped, as he left me to my task. I wondered what he could possibly have meant by that.

During the course of tuning the piano, a small grand, I noticed that the *una corda* (shift) pedal was extremely noisy to operate. Although this was one topic we hadn't covered in sufficient depth while I was in school, I decided I had better fix it if I wanted to keep that piano as part of my clientele. As soon as I finished the tuning, I began searching for the source of the squeak. Working the mechanism by pushing the rod, I found the squeak was still there, so I tried pushing the cast-iron shift lever itself. The squeak persisted, so I knew the problem was most likely somewhere above the keybed. Just to rule out the possibility of a squeaky lever pivot, I lubricated the pivot bushings and then proceeded to pull the action.

"Now," I thought, "the squeak is probably coming either from the areas where the glides and keyframe rails touch the keybed, or from the notch where the shift lever engages the keyframe."

With that, I pulled out my trusty artist's pencil and thoroughly graphited the notch in the keyframe. Looking at the keybed, I recalled hearing somewhere that talc was a better lubricant between keyframe and keybed than graphite, so I applied a liberal amount of talcum powder to the keybed points of contact.

To my surprise, the squeak was still there after I replaced the action and pressed the pedal. "Hmm-m," I muttered. "Guess I forgot the keyframe endpins." I quickly removed the cheek blocks and treated the pins and metal guide inserts to generous globs of petroleum jelly, then reassembled the piano and tried the shift again. The squeak was still there!

"

'Maybe I didn't use enough talc', I said, and dumped the remainder of my talc supply over the keybed. Before pushing the action back in, I considered the keyframe notch again and went over it one more time with the pencil.

'There', I declared, as I put things back together. 'Squeak now!'

It did.

"

Exasperated, I pulled the action again and surveyed the situation. "Maybe I didn't use enough talc," I said, and dumped the remainder of my talc supply over the keybed. Before pushing the action back in, I considered the keyframe notch again and went over it one more time with the pencil.

"There," I declared, as I put things back together. "Squeak now!"

It did.

At this point, the band entered and announced that they wanted to practice and my time was up. I left the squeak in the piano, collected my tuning fee and never heard from the manager again. This was clearly a case of my own ignorance costing me repeat business.

Since this early experience, I have gradually learned to solve this type of problem, and I'd like to summarize in this article some of the techniques I've come to trust.

First, it's always a good idea to try to diagnose and isolate the problem before attempting to treat it. In the foregoing experience, I did use the process of elimination and traced the problem to somewhere

above the keybed, but that was as far as I went. Admittedly, in this instance it would have been difficult to narrow down the problem any further without beginning to treat it in some way, but in most cases, the technician can pinpoint the problem to one or two possible sources. Let's assume for the moment that I'm not able to identify the source of the problem any better than in the experience I've described. What do I do next?

In virtually any situation where lubrication is called for, rule number one is *clean before lubricating*. In this case, I should have wiped the keybed and keyframe clean before attempting any lubrication. The keyframe endpins are rarely to blame, and when they are, the metallic screech they produce is readily identified with a little experience. If the shifting action still squeaks after being wiped clean, I would carry the cleaning process one step further and lightly sand both the underside of the keyframe and the contact surfaces of the keybed. These include the very front and back edges of the keybed and the glide support dowels, as well as any places where the keybed or keyframe appear to be dirty or contaminated. it's important to use a fine grit of sandpaper, say 220 or 320, for this procedure. After sanding, wipe both surfaces clean and reinstall the action, tightening the keyblocks down with the screws. At this point, check front rail bedding and adjust the balance rail glides to just touch the keybed. If the squeak is gone (and it should be, nine times out of 10), we can think about lubrication now.

When choosing a lubricant for keybed-to-keyframe, it is best to consult the manufacturer's service manual if it is available. Common sense dictates that we try to use the lubricant recommended by the manufacturer. It is not advisable to spread large quantitites of any lubricant over the keybed. In fact, rule number two could be *lubricate sparingly*.

When applying talc, rub it into the wood with a *clean* piece of hammer felt, then wipe away any excess with a clean cloth. During this lubrication process or before, the technician should polish the glides, using a mild polish such as Brasso or Glass Wax.

The shift should now operate noiselessly. Each time you check the operation of the pedal during the cleaning-lubricating process, be sure to install the keyblocks with the screws. In many cases, the squeaks won't show up until you do. Before installing the blocks the last time, though, it's a good idea to clean the keyframe endpins and keyblockinserts with 4/0 steel wool, to remove all previous lubricants. Then apply a thin coating of VJ Lube, car door lube or some other heavy-bodied metal-to-metal lubricant.

Finally, three other points are possible, though infrequent, culprits. First, the shift return spring and the hardwood block it bears against should both be cleaned, removing any accumulated grease

THE
ECLECTIC'S
NOTEBOOK

The Art Of Anticipating

Christopher Robinson
Connecticut Chapter

My dictionary has two definitions of the word "anticipate." One of these has to do with looking forward to or expectation, as we did toward the recent Guild convention in Indianapolis. The other, and actually primary meaning of the word, has to do with the ability to realize or feel beforehand; to foresee.

In doing piano-related work, the ability to anticipate the nature of the job; to anticipate difficulties; to anticipate operations or procedures that will be necessary as a result of something that has been done several steps beforehand in any work process, is more essential in the development of speed and accuracy than any other single capacity this writer can think of. The art of anticipating the nature of the job is a primary component of the skill required to perform it.

It probably is unnecessary to point out that a pitch-raising job is done in anticipation of a fine tuning, because the tuner knows *beforehand* that the instrument he or she is tuning will shift and redistribute its stress load if forced to adjust to more than a very few cents of tension level. It is no doubt equally superfluous to restate the proposition that any adjustment made in the action mechanism invariably affects the other components, requiring the immediate and corresponding compensation of other regulations. (Which is why, incidentally, you can no more regulate an action by going through it one time, than you can tune the instrument in the same way.) It is with a sense of amusement that we note the perennial discussion about "glass top" or "slate top" or even "steel top" regulating benches. What a perfectly rigid or flat top work table has to do with the interior (keybed) of a grand piano is difficult to understand. Since this rigid surface does not properly anticipate the actual conditions inside the subject piano, it is literally guaranteeing that significant rework will have to be done in order to properly fit the action into its resting place; or lacking that, that the job will be of poor quality.

Most professional piano technicians know that the final regulation of the action mechanism must be done in the actual piano and not on the bench. Most of us also know that the more accurately we have anticipated the nature of the job while the frame and stack assembly was on the bench, the less time and aggravation we are going to have to expend in getting a precise alignment to the piano superstructure. The workbench which has been relegated to action work in my or crud from the spring with 4/0 steel wool, and sanding the block with 220 or finer sandpaper. In case of severe dimples in the block, plane the wood down to remove them and follow the planing with a cabinet scraper. Lubricate the contact points on the wood block with a graphite stick. Second, the keyframe notch should be lightly sanded and regraphited, and previous lubricants, if any, removed from the shift lever with steel wool. Third, lightly sand the points on the backrail which fit under the dags, and the corresponding surfaces of the dags themselves, following with graphite.

"In doing piano-related work, the ability to anticipate the nature of the job... is more essential in the development of speed and accuracy than any other single capacity this writer can think of. The art of anticipating the nature of the job is a primary component of the skill required to perform it."

If the problem has been sluggishness of shift operation, whether with or without a noise problem, the technician must go through the whole procedure of cleaning, adjusting and lubricating as described above. If sluggishness persists, try reducing down-pressure on the keyframe endpins by shimming under the front edge of the cheekblocks or backing out the adjusting screw in the keybed if the piano is so equipped. The limit to this adjustment, of course, is that the ends of the front rail must not knock against the keybed. If the action is still reluctant to return

after shifting, and if all the above procedures have been followed, it may be that the return spring is simply too weak.

The spring can be strengthened, if necessary, by removing it and clamping the portion with the screwholes firmly in a bench vise. With pressure on the ends of the spring arms, bend the spring slightly to increase the arch. It will take a substantial effort to make the spring slightly stronger, but a small increase is all you need.

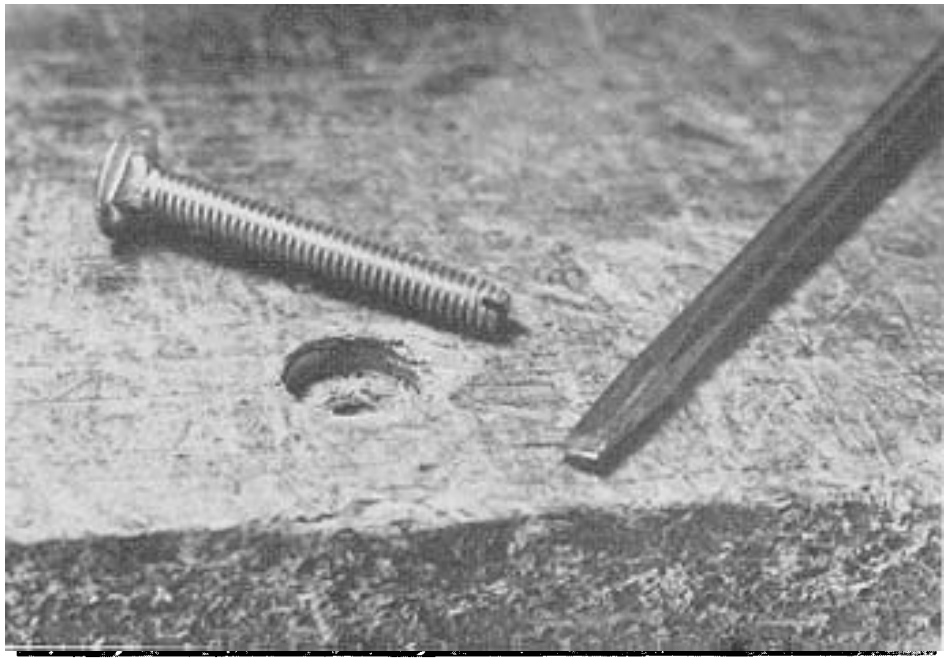
Conversely, to weaken a return spring that is too strong (where the pianist complains that the shift is hard to operate or hold down), simply place the spring face down on the floor and apply body weight by placing one foot on the middle of the spring arch.

Remember, this article has dealt with only those noises and problems which occur above the keyboard. I hope to cover problems from the pitman down (applying particularly to the sustaining pedal) in a future article.

own shop is a very simple affair. It has a frame of 16-gauge steel and a composition board top wich is a country mile from being anywhere near flat. However, it does have a couple of very simple features which render it highly accurate as a regulating bench, and a very good anticipator of actual conditions within the piano. Take a look at *Picture one.*

What we see here is a ¼-20 carriage bolt with a slot hacksawn into its end, the tip of a screwdriver, and a counterbore in the front of the aforementioned workbench. *Picture two* shows this arrangement installed in the top of the workbench.

Most of you have already perceived that the carriage bolt is going to serve as a kind of upside-down keyframe glide bolt. There is another one of these installed in the middle of the workbench. What these reverse glidebolts enable us to do is to *fit the workbench to the keyframe!* After the keyframe has been properly bedded to the subject piano, key height, key level and key dip (touch depth) measurements are taken. If any adjustments or samples (guides) are required, they are established at this time. Then, the keyframe and action stack assem-



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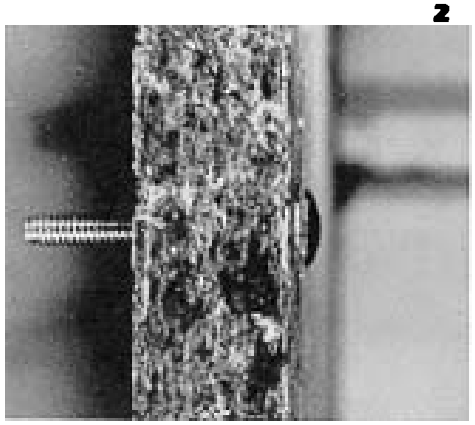

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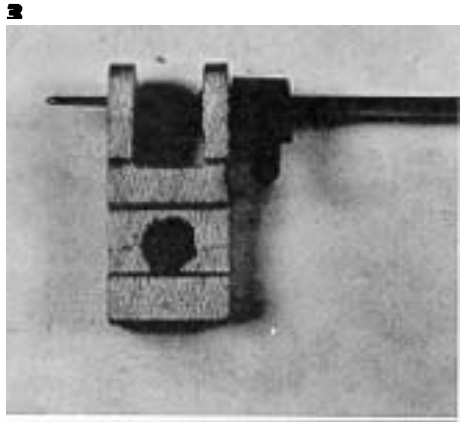

3

bly are removed and placed upon the bench. Using the reverse glide bolts that have been installed in our workbench, the aforementioned key measurements are *accurately* re-established. Please keep in mind that it is also important that the mechanism retain the same aftertouch that it had before it was removed from the keybed gap.

Once the technician has learned to work with these reverse glides, he or she will be astonished at the ease with which it is possible to anticipate what the action assembly will actually do when it is reinstalled into the piano.

The trick to making this system work is learning to duplicate the essential key measurements and aftertouch on the workbench just as they had existed when the piano was in its assembled state.

The June 1984 *Journal* has a very nice article by Gerald Foye on page 39 which features his regulating bench. A very tidy and well-organized arrangement, it, like my own bench, has a particle-board top. The addition of the two reverse-glides discussed in this article would complete what is already an excellent piece of equipment and allow the technician to more accurately anticipate the nature of his or her work.

Quickie

Picture three shows a standard flange bushing taper-reamer equipped with a depth stop. Ray Zeiner, who took this picture, asked why I had gone to the trouble of making one out of brass when all that was needed was a damper-wire socket! For those of you who use a tapered reamer for this type of work, the depth-stop will provide uniformity and consistency to your work. The reamer, of course, *must* be entered from *both* sides of the subject flange so that both arms of the yoke are the same bore.

HAMMERS AND MUSIC

A Perfect Hammer

Ari Isaac
Toronto Chapter

It is a bright sunny day at the end of the summer, the meadows where the sheep graze stretch as far as the eye can see. It's sheep shearing time and it's here that the wool fibers are separated and sent over to the felt making plant. This is the starting point of the hammer - the one part of the piano which will determine the musical quality of its tone. Why is wool the one fiber so intimately associated with piano tone, why not cotton, silk, or some other fiber - natural or artificial?

There are two qualities possessed by wool and unmatched by any other fiber - the capacity of being compressed and holding that compression combined with the capacity for repeated flexing or spring. It's not that these two qualities are unknown, it's just that they are, for the most part, ignored in the making of today's hammers. Let's assume that we wish to build hammers relying for their tone producing capacity only on the wool fibers we choose, on the moldings and on the pressing process but never on the vinyl, shellacs, lacquer, varnish, or any of the other stiffeners or hardeners so dominant in today's hammer making.

If, to repeat, we want a hammer with an inner core of highly compressed felt surrounded by outer layers of felt under high tension we would pick those fibers possessing these two qualities to a greater degree than other fibers. Such a choice will determine the diameter and the length of the fiber we want but here we encounter the first snag in our attempt. Maximum compressibility and maximum spring are not always found in the same fiber — this means a blend of different fibers from different parts of the sheep's body or from different varieties of sheep. The finest fibers, in fact, were made from blends of three or more types of wool fibers. We want as fine a fiber as we can get for compression since the finer the individual fiber, the smaller the space between the compressed fibers. For a density which would render unnecessary the use of hardeners we want an 18-micron fiber of 1.5 inch in length. For maximum spring we would pick about 10 or 12 percent content of mohair, which is, strictly speaking, not a wool fiber at all but for spring is better than wool. Once again, the finest hammers did have a mohair content. Most of today's hammers are made from one grade of fiber, usually a 21-micron fiber of half-inch length and up.

The production of a bass tone requires many times the energy required for the production of a treble tone. The hammer - string impact, therefore, will have to vary on a graduated basis from one end of the scale to the other. We will, thus, have to pick more than one grade of wool fiber and adjust our blend on a graduated basis from one end of the sheet to the other. In the treble, where the requisite impact time is short and the flexing is minimal we will require a very fine, long fiber to produce a highly dense felt. In the bass, where the impact time required is longer and the degree of flexing is significant, our blend will have to include a substantial constituent of coarser fiber and mohair - always 1.5″ long and up. The two quite different ends of the sheet will have to be bridged by careful graduation of our blend. If we wish to be extra responsive to the musical needs of our customers we can vary the graduation somewhat to correspond to the varying stiffness of sounding boards.

Most of today's hammer felt sheets are not so carefully made. As a rule, one grade of fiber is used throughout allowing for no variation in felt density over the length of the sheet and forcing the hammer maker to substitute hardness or stiffness for natural density; here come the hardeners and stiffeners. We should bear in mind that for each single grade of fiber only one maximum of density can be obtained.

To maintain the spring-like quality of the wool, nature has provided a lubricant and constant conditioner - lanolin. For some reason we have come to expect that good hammers ought to be white, as testimony to their pristine innocence. Unfortunately innocence is not a quality conducive to musical piano tone. Lanolin is yellow and with today's felt making process using detergents instead of soaps to wash the wool most of it is quite literally flushed down the drain with two unfortunate results; first, the single

variety of wool fiber of which most hammer felt is made up is rendered even less flexible than it already is and second, beyond a certain point the lanolin starvation robs the wool of the ability to felt successfully, thus adversely affecting the compressibility of the felt.

In the making of our pretend hammer, we shall use soap instead of detergents in the wool washing process leaving the hammer a little less white and a little less innocent looking but a lot better sounding for all that. We have now made a sheet of felt in which the wool blend is graduated so that a cubic unit, inch or centimeter, in the treble will have approximately double the mass of the same cubic unit in the bass. We will make the sheet of felt heavy enough not to require underfelt and yet to have enough felt between the molding and the string to avoid the woody or impact noise when playing fortissimo. Since we are essentially building a compression spring, the further we have to bend the felt to meet the molding in the press - the greater our mechanical advantage. The underfelt merely enlarges the molding reducing the amount we have to bend the felt towards the molding. The use of a single thickness of felt to make our pretend hammer rather than the use of top felt and underfelt means a heavier sheet by an amount commensurate with the underfelt we're not using. The extra thickness of our single felt combined with the extra distance required to bend the felt to meet the molding will result in a considerable increase in the compression level immediately above the molding and in greater stretch in the outer circumference. Using a single thickness of felt to make our hammer will require a stronger press, stronger adhesives, and perhaps a somewhat longer press time but the results are worth it.

Since felt, because of its spring-like quality tends to relax or to decompress, it will be necessary to secure the tension around the outer circumference by the use of some positive locking device such as a twisted wire going right through the hammer or a cotterpin clinched both top and bottom. Our hammer is now virtually complete and will need no hardeners to produce as much brightness as we want.

Transition In Temperaments

Jack Greenfield
Chicago Chapter

Temperaments Between Meantone And Equal

Many accounts of the history of musical temperaments indicate that the transition from meantone to equal temperament as the main system of keyboard tuning took place early in the 18th century. The type of meantone temperament usually considered is that which has pure major thirds, 1/4-comma. Such accounts are based on a misinterpretation of the term "wohltemperirt" applied to the first volume of preludes and fugues, dated 1722, by Johann Sebastian Bach. As a result of more revealing studies by specialists published during past decades, especially Barbour's 1951 *Tuning and Temperament*, we are positive that "well-tempered" intonation of Bach was not equal temperament. Previously overlooked references show that the transition from 1/4-comma meantone to equal temperament started much earlier and was substantially completed much later than Bach's time. During this period, there were at least a half dozen other significantly important keyboard tuning systems used.

The transition followed several different paths, through regular temperaments — those with intervals of uniform size, and more important, through irregular temperaments — with intervals varying in size. The gradual widening of the fifth in progressing through regular 1/5-comma, 1/6-comma, etc. meantone temperaments gave corresponding expanded major thirds culminating in 1/11-comma (syntonic) meantone, for practical purposes the equivalent of 1/12-comma (ditonic) or equal temperament. Besides 1/4-comma meantone temperament, 1/5-comma and 1/6-comma were used to some extent during the first half of the 18th century, but the succeeding regular meantone forms with still larger fifths are of interest primarily from a theoretical standpoint. (*Journal*, Feb. 1984, page 21).

Irregular temperaments were the most-used systems of keyboard tuning throughout the 18th century. Jorgensen has estimated that patterns classified as well-temperaments were used at least 50 percent of the time (*Journal*, Jan. 1978, page 18). Many Baroque composers and musicians valued the differences in shading and color in different keys due to variations in interval size and did not want to sacrifice these qualities for the uniformity of equal temperament.

Irregular Temperaments With Symmetrical Tuning Cycles

The more popular well-temperaments had their tempered fifths grouped in clusters or spaced unevenly so as to favor keys with few sharps and flats. Irregular temperaments with symmetrically placed fifths were later used forms closer to equal temperament. These retained some key coloration and allowed more freedom of modulation. Since the symmetrical irregular temperaments do not favor keys with few sharps and flats, they are not classified as well-temperaments. Jorgensen refers to them as "quasi-equal" temperaments.

In books published in 1724 and 1732, Neidhardt, a contemporary of Bach, included the symmetrical temperaments "Fifth Circle Number 3" with six 1/6-comma fifths and "Fifth Circle Number 4" with four 1/4-comma tempered fifths distributed among the remaining fifths tuned pure. One of the German theorists prominent later in the century, Freidrich Wilhelm Marpurg (1718-1795), presented other symmetrical irregular systems. His 1776 temperament "I" with three 1/3-comma reduced fifths served the needs of the Romantic composers who were not ready to accept equal temperament yet wanted even greater freedom to write in sharps and flats than could be tolereated with the popular well-temperaments.

Marpurg's Influence

Marpurg was a musical journalist as well as an able theorist in his own right. Before his musical writing career, he spent several years during the 1740s in Paris as secretary to the diplomatic representative of Frederick the Great. Here Marpurg became familiar with the work of Rameau and other French music theorists. After returning to Germany, he made his living independently from 1749 to 1763 writing and editing books and periodicals about music.

In 1763, because his income as a writer was inadequate, he took an administrative civil service position and worked for the state for the remainder of his life. He could continue some writing and editing however and produced some of his more important works during this later phase of his career. Marpurg wrote on a wide range of topics from ancient musical history to music of his day, in brief installments for periodicals as well as in single books. His *Versuch uber die Musikalishe Temperatur* published in 1776 is an important document on tuning and temperament containing a survey of the work of others as well as his own systems. His extension of Ptolemy's Diatonic Syntonon tuning into the symmetrical pattern ($E^{\flat}$-$B^{\flat}$)+1-(F-C-G-D)0-(A-E-B-$F^{\#}$)-1-($C^{\#}$-$G^{\#}$)-2 is considered the model form of just intonation.

Marpurg developed temperaments that can be considered links between well and equal temperaments. Instead of graduated arrangements favoring the diatonic keys, he spaced the tempered intervals symmetrically. While this meant a loss in distinctive tone color for individual keys, some contrast remained distributed more evenly, and keys with more sharps or flats were improved. He used fifths of various sizes including some that were widened.

Marburg Temperaments "A" to "F" are arrangements in which one to six 1/6-comma tempered fifths are balanced by equal numbers of pure fifths and the remainder of the fifths are tempered 1/12 ditonic comma, the same as in equal

temperament. His Temperament "F" had appeared previously in 1732 as Neidhardt's "Fifth Circle Number 3." Among the remaining temperaments in the series extending to "L," "I," with three 1/3-comma tempered fifths, is of most interest.

While Marpurg presented various irregular temperaments and his Temperament "I" achieved some importance in practical use, he was an ardent advocate of equal temperaments. He believed that the continued invention of new temperaments would lead to chaos. In his opinion it would be preferable to accept the limitations of equal temperament and establish it as the one universal tuning system. His arguments were very persuasive in finally bringing about such a change.

Use Of Marpurg Tempermament "I"

Marpurg's Temperament "I" has been revived recently for historic performance of early 19th century keyboard music. It is simple to tune because it contains only three tempered fifths, all others are pure. The major thirds are all tempered equally, and the increasing beat rates of ascending major thirds is a check on tuning the same as in equal temperament. Temperament "I" provides the enhanced sonorous sound of equal or proportional beating major thirds in the triads formed with any of the nine pure fifths. The three tempered fifths can be shifted but with spacing the same to give different patterns of intonation. Following is a simple aural tuning procedure:

1. After setting the pitch to C, establish the F3F4 octave pure to C and form the equally tempered major thirds FA, AC$^{\#}$, and C$^{\#}$F.
2. Tune the three series of pure fourths and fifths F-C-G-D; A-E-B-F$^{\#}$; *and* C$^{\#}$-G$^{\#}$-D$^{\#}$-A$^{\#}$.
3. Check by observing increase of beat rates of ascending major thirds and 5:4 beating ratios of conjunct major thirds as in equal temperament. The calculated difference in beat rates for the same major thirds in equal temperament and Marpurg Temperaments "I" is less than 0.1 beat per second.

With the above procedure, the tempered fifths are DA, F$^{\#}$C$^{\#}$ and A$^{\#}$(B$^{\flat}$)F. For comparison with other temperaments in the C to C octave, the following table gives figures for the intonation with the tempered fifths transposed to FC, AE, and C$^{\#}$G$^{\#}$.

Link devotes an entire section of his book *Theory and Tuning* (Tuners Supply Company, Boston, 1969) to a discussion of Marpurg Temperament "I", Jorgensen's *Tuning The Historical Temperaments* and Tittle's "Equal Temperament: Its Rivals and Successors" (*Journal*, August, 1977, pages 14-16) give additional information including directions for tuning.

Comparison Of Tuning Cycles

Table I shows the patterns of tempered fifths included in some of the most used irregular temperaments. All other fifths are pure. In variations of the temperaments, the tempered fifths are shifted toward the sharps or flats depending on the tonalities to be favored. In Kirnberger III, also known as the Aron-Neidhart temperament, the fifth or diminished sixth that closed the tuning circle is tempered by a schisma, the historial difference between the ditonic and syntonic commas. The 1/6, 1/12-comma temperament named "Young-Barbour" is a pattern now used for some historic performances (*Journal* March, 1982, page 12). In the original form by Young, the fifths on C, G, D and A were tempered by approximately 1/12 syntonic comma. The changes suggested by Barbour simplify the mathematics.

There are only two differences in the intonation of the notes of the Valloti-Young and Young-Barbour temperaments. Replacing the 1/6-comma tempered fifths FC with the 1/12-comma tempered fifths FC and B$^{\flat}$F lowers the pitch of F approximately 2 cents. A similar replacement made for 1/6-comma tempered fifth EB with 1/12-

DIFFERENCE IN INTONATION (¢) BETWEEN EQUAL TEMPERAMENT AND MARPURG'S TEMPERAMENT "I"

Note	C	C$^{\#}$	D	E$^{\flat}$	E	F	F$^{\#}$	G	G$^{\#}$	A	B$^{\flat}$	B	C
Deviation From Equal Temperament	0	+6	+4	+2	0	+6	+4	+2	0	+6	+4	+2	0

TABLE I IRREGULAR TEMPERAMENTS

Reduction of Fifths in Fractions of Ditonic Comma (unless otherwise indicated)

AUTHORS	TEMPERING	TEMPERED FIFTHS
Marpurg "I" 1776	1/3-comma	FC, AE, C$^{\#}$G$^{\#}$
Kirnberger III 1779 (Aron-Neidhart)	1/4-comma (syntonic) schisma	CG, GD, DE, AF F$^{\#}$C$^{\#}$/D$^{\flat}$
Werkmeister III, Correct No. 1 1691	1/4-comma	CG, GD, DA, BF$^{\#}$
Valloti-Young 1754–1800	1/6-comma	FC, CG, GD, DA, AE, EB
Young-Barbour 1800–1951	1/6-comma 1/12-comma	CG, GD, DA, AE B$^{\flat}$F, FC, EB, BF$^{\#}$
Rameau Modified Meantone 1726	1/4-comma (syntonic) Raised fifths to complete tuning circle	B$^{\flat}$F, FC, CG, CD, DA, AE, EB, G$^{\#}$/A$^{\flat}$E$^{\flat}$, E$^{\flat}$B$^{\flat}$

comma tempered fifths EB and BF# raises the pitch of B approximately 2 cents. The only change in tuning procedures is in tuning 1/12-comma tempered fifths to beat the same as in equal temperament. The beat rates of other test intervals containing F and B in directions for the 1/6-comma temperament would of course be different.

Seven of the fifths in the Rameau temperament are the same size as the fifths in 1/4-comma meantone temperament. In all the others, at least half are Pythagorian fifths.

Comparison Of Major Thirds

The size of the major thirds is one of the most significant indexes to the musical character of a temperament. *Tables II* and *III* contain figures for the diatonic major thirds in the temperaments discussed. The "Well-Ideal" is a theorectical arrangement designed by Barbour to give uniform variation in tempering ranging from 1/6-comma meantone in the keys with few sharps and flats to Pythagorian major thirds at the other extreme. While it is impractical to tune aurally, it is useful as a basis for comparison. The Young-Barbour temperament comes closest to the Ideal but the difference from the Valloti-Young is insignificant. The Kirnberger III is quite far from the Ideal but is served the needs of the composers who still wanted some pure major thirds. The Rameau temperament, with the widest variations in interval size, is specifically applicable for French Baroque music composed on the basis of such intonation.

The tables illustrate the wide difference in shading afforded by the well-temperaments as compared to the regular temperaments with uniform diatonic intervals. Marpurg "I" is a compromise with uniform major thirds the same size as in equal temperament but still with some interval shading provided by the use of some tempered fifths among the pure fifths.

TABLE II IRREGULAR TEMPERAMENTS

Tempering of Major Thirds (¢ above just)

INTERVAL TONIC	E♭	B♭	F	C	G	D	A	E	B	F#	C#	G#
Well-Ideal	16	16	12	6	6	8	12	14	20	22	22	20
Marpurg "I"	14	14	14	14	14	14	14	14	14	14	14	14
Kirnberger III	22	22	11	0	0	0	9	20	20	20	22	22
Werkmeister III	16	10	4	4	10	10	16	16	16	22	22	22
Valloti-Young	14	10	6	6	6	10	14	18	22	22	22	18
Young-Barbour			8		8				20		20	
Rameau Modified Meantone	12.5	0	0	0	0	5.5	11	16.5	29	36	30.5	25

TABLE III REGULAR TEMPERAMENT

Uniform Tempering of Diatonic Major Thirds.

Temperament or Tuning	1/4-comma Meantone	1/5-comma Meantone	1/6-comma Meantone	Equal	Pythagorian
Above Just (¢)	**0**	**4.5**	**6**	**14**	**22**

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Getting The Organizational Spirit

M.B. Hawkins
Vice President

Really, what should an organization expect from its membership?

Naturally, it is expected that members will be on time with the payment of their dues because that is the means by which our organization sustains itself. Aside from the dues, I believe a good place to start our discussion is the Code of Ethics.

Not too many months ago, we all received our new directory. If you are like most people, you commented on the much-improved appearance and immediately checked to see if your name and address was correct, along with your chapter's as well. Beyond checking your name, I would hope you spent some time reviewing the Bylaws, Regulations and Codes. If you did not, then this is something I would think an organization should expect from its membership. You will find much valuable information which should never be taken for granted.

There are some, I'm sure, who will say "Yeah, I've read all that stuff before" and let it go at that. Believe me — we would all benefit more by taking a few moments from time to time in order to review some aspect of our organization you may not have seen for awhile. The Code of Ethics would be a great place to start. Guaranteed as you read, the energy within will become restless and you will begin to feel some of what you felt when you first joined. When people first join an organization, they get all fired up and want to talk about the organization. Chances are good that as you communicate, you will find yourself passing along information people need to know about the Piano Technicians Guild. There also is a good chance you will share this information with someone who will be interested in membership.

You will remember that you committed yourself to contributing to the upgrading of our profession as a whole. That includes encouraging and assisting other members in the development of knowledge and skill. While this is perhaps most effectively accomplished through chapter meetings and seminars, I would think some type of contact with another member or members between meetings is a must to develop and maintain a healthy organizational spirit.

So far, we have paid our dues on time and reviewed the directory including the Bylaws, Regulations and Codes. What else should an organization expect from its membership? Most demand and expect your full loyalty. On this point, the Guild is no different. We also expect loyalty. Although opinions may vary as to what constitutes loyalty, one can be sure that loyalty is much more than simply not being disloyal.

Next month we will discuss how we can be loyal in a positive way. Meanwhile have a good month and be on the lookout for that person you can develop into a stronger member.

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Coming Events

Date	Event	Site	Contact
Sept. 30-Oct. 2, 1984	South Florida Regional Convention	Ft. Lauderdale	Mort Zack 3210 Holiday Springs Blvd., Apt. 304 Coral Springs, FL 33065
Oct. 5-7, 1984	Ohio State Seminar	Ohio State University	Mark Ritchie 5784 Linworth Rd. Worthington, OH 43085 (614) 436-5907
Oct. 19-21, 1984	Texas State Convention	Waco Hilton Waco, Texas	Martin Wisenbaker 808 Cordell, Houston, Texas 77009
Oct. 26-28, 1984	Central Illinois Seminar	Ramada Inn Champaign, Ill.	Cindy Genta 907 Anderson Urbana, Ill. 61801 (217) 328-2691
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

The Auxiliary Exchange

From The President

It is always a joy to share these few moments with you - our Auxiliary. My desire is to share something that will be interesting, and something that will be helpful. In my desk drawer is a file - filled with "favorites" - things that help me "grow." Above my desk (I keep it there day in and day out) is one of my very favorites. Let me share it with you this month.

Be *kind*! It's nice to be important - but it's more important to be nice!

Have a *sense of humor*! A sense of humor is to a man what springs are to a wagon. It saves him jolts!

Do not *argue*!

Compliment more than *criticize*!

Love people - not just use them. The greatest thing in the world is a person!

Practice what you preach!

Do not get *angry*! If you are right, you don't need to; If you are wrong, you can't afford to! (Great, isn't it?)

Smile! No man is completely dressed unless he has a smile on his face.

Develop *understanding*!

It goes on to say, "It would be well for us to go back to the old-fashioned values and life-style of our grandparents who were *sturdy* in character, *vigilant* in spirit, and *well-balanced* in their outlook in life. Unlike our present undisciplined and egocentric age, the respected leaders of our Barangays in the days of old and the Pilgram Fathers who founded American knew and appreciated the value of time: the need of perserverance, the pleasure of serving; the dignity of simplicity; the obligation of duty; the wisdom of economy; the virtue of patience and the nobility of labor." Think about it! Doesn't it just make you feel like we could slow down a bit, get our priorities straightened out in life? Perhaps you feel as I do—you would not enjoy giving up a modern car - a dishwasher - a clothes dryer and all the conveniences we have - yet, on the other hand, if we could have those, plus simplicity. Is it possible to have progress and still love our brothers and sisters - (all mankind)? Is it possible to really believe that the "greatest thing in the world — is a person?"

I believe so!

Belva Flegle
President

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400 Groveland Avenue #1011
Minneapolis, MN 55403

MARY LOUISE (Mrs. Donald) STRONG
Vice President
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Rome, GA 30161

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Edinburg, PA 16116

BERT (Mrs. Walter) SIEROTA
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79 Furnace St.
Robesonia, PA 19551

JULIE (Mrs. Ron) BERRY
Immediate Past President
6520 Parker Lane
Indianapolis, IN 46220

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

Treasurer's Report

Two of the duties of the treasurer are to compile a directory and to mail out dues notices.

I know there were quite a few inaccuracies in the directory last year, but I could only go by the address on file, so I need your help. Will you please check your address in the directory of March, 1984? If it's incorrect, please drop me a post card.

I will be mailing the dues notices out by bulk mail again this year to save postage. There again, I need your correct address as they do not forward letters that are mailed by bulk.

Remember your officers are not clairvoyant (nor are the Home Office Staff for the Guild). Please let us know of any change.

Welcome To New Members

Twin Cities, MN, Chapter
Kathleen White (D.-Charles)
Route 1, Box 134
Alma Center, WI 54611
Betty Schroeder (Steven)
10630 Joliet Avenue, N
Stillwater, MN 55082

Indianapolis Chapter
Janice Porter
8206 Autumn Mill Lane
Indianapolis, IN 46256

Philadelphia Chapter
Joyce Helzner (Alan)
11008 Philmont Place
Philadelphia, PA 19116
Arlene Onesti (Ralph)
6 Roxborough Place
Willingboro, NJ 08046

Members At Large
Ellen Adair (John)
105 Cyclamen Court
Columbia, SC 29210
Rebecca Heneberry (Alan)
2310A E. Randolph Avenue
Alexandria, VA 22301
Herbert Reed (Susan)
202 Belmont Avenue
Bridgeton, NJ 08302

Kathryn Snyder

A Busy Year

Ruth Pollard reports on how the Houston Auxiliary Chapter is solving a problem for the parent organization in Texas. Other chap-

ters might want to try this in their areas. The Guild has been working on this problem for some time without very good results, I'm told.

While the other girls are checking addresses, I'll write to tell you that the Houston Chapter of the Piano Technicians Guild Auxiliary has had a busy year.

Each year, the Texas Association has a state convention. They have been mailing lists of Guild members and have had good attendance. But, they knew they were missing many piano servicemen who were actively working at the business. They needed a list of non-members.

Auxiliary to the rescue! **Beva Jean Wisenbaker** went to the library and photocopied Yellow Page ads of piano servicemen from the telephone directories all over the state. Texas is a big state, about 800 miles north and south and the same for east and west. It covers a lot of territory! Taking those pages, we have, in six meetings, checked for duplications and correct addresses. We have from 3 to 5 women working at each meeting. We have come up with 308 names which have not been on the mailing lists before. The file cards are now alphabetized, duplicates removed and addresses complete down to the last zip code. The whole bit!

It has been quite a project which we hope will pay off in our future conventions — beginning with Waco in October!

Ruth V. Pollard

Needlework - An Ancient Art

Do you have a hobby? Do you enjoy doing needlework? Some people are collectors, others prefer to design their very own handmade creations. I believe needlework is the most relaxing and satisfying. Are you ready for some background on needlework?

The art of ornamental needlework has existed since the earliest civilization. It was mentioned in the Bible; examples have been unearthed from Egyptian tombs and it was practiced by American Indians. Some types of needlework, usually used to enrich garments and other personal possessions, has been found in every civilization.

Canvas work or needlepoint, as it is now most frequently called, is stitchery of varying sizes worked on woven fabric, canvas or linen. In early centuries, it was most often used pictorially to reflect the social mores and culture of the time. Dating from the 14th century, Coptic pieces still in existence depict rather primitive renditions of birds and animals. Led by Mary, Queen of Scots, needlewomen of the day found stitching a useful means of occupying their hands while enriching and decorating their large homes.

The American colonies utilized needlework as a major method of recording the scenes of a new land. This personal approach produced a fresh feeling in the depiction of fruits, flowers, birds and animals. The 18th century brought further change to needlework. Chair seats worked by Martha Washington can be seen at Mt. Vernon.

No one knows exactly when knitting first began. However, there are legends, one of which is that Christ's seamless garments were knitted. The Arabs are responsible for the spread of knitting from the East (where it originated) to the Coast of Europe and eventually to America. As was the case with macrame, it was the men (sailors and traders) who knitted. But in Europe, it became women's art as well.

In the 15th and 16th centuries, the weavers and knitters formed guilds and the men who worked in the industry had to pass rigid testing in order to qualify. Embroidery is one of the oldest art forms. Bone needles were found in caves dating to 5000 BC.

It is possible that it started in Babylonia and Egypt and then traveled from the East into Europe reaching its greatest heights in Italy. Italy was the undisputed center for embroidery. The Popes collected it. Queen Elizabeth I was an accomplished needlewoman.

Long before the arrival of the first settlers, American Indians were doing beautiful embroidery on the whitest and softest of doeskins. White settlers later brought the European patterns and stitches.

Crochet dates back to the 16th century, where French nuns used hooks for making beautiful lace. The word "crochet" comes from the French term for "hook". Although modern crochet dates back to 16th century France, various crude forms of the art have been found in many earlier societies (as far back as 2000 BC).

Crochet was refined into a craft in the French convents, but not until the 19th century was crochet recognized as one of the "womanly arts" on the level of popularity with knitting and embroidery.

Macrame, the art of knotting, has been practiced since the times of pre-historic peoples. There is much evidence that artistic knotting existed as early as 3000 BC. Ancient Egyptians went into battle with knotted trim on their uniforms. Although knotting began as a utilitarian function, it developed into one of the earliest forms of art decoration. Sailors and seamen, for several hundred years, have been working with "sailors knotting" also known as "McNamara's Lace". By the mid-1900's, the best knotters in the world were the British and American sailors.

Today articles are made by hooking loops of yarn into a woven fabric (called punchwork or latch hook).

As you can see, needlework of all types has been popular for many centuries. Men were the professionals who produced their craft in industry. Women only plied their craft for their families use.

In modern times, needlework has become an important method of expressing oneself. Individuals designing their own articles, and at times proving to be a cost-saving art. The satisfaction of creating your very own article, be it clothing, decorative wall hangings, rugs or pictures, is the reason enough to discover this art form. Both men and women enjoy creating special articles.

In researching this article, I was amazed by what I learned, and I hope you are too. I never realized the impact needlework has had on civilization. Anyone with a hobby, whatever it is, will tell you that it relieves the pressure of everyday business matters, and offers them a soothing diversion for maintaining their sanity.

If you do not already have a hobby, develop one. You won't be sorry.

Bert Sierota

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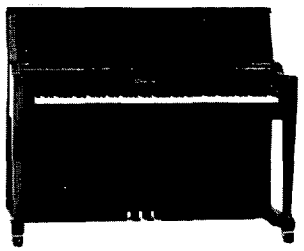

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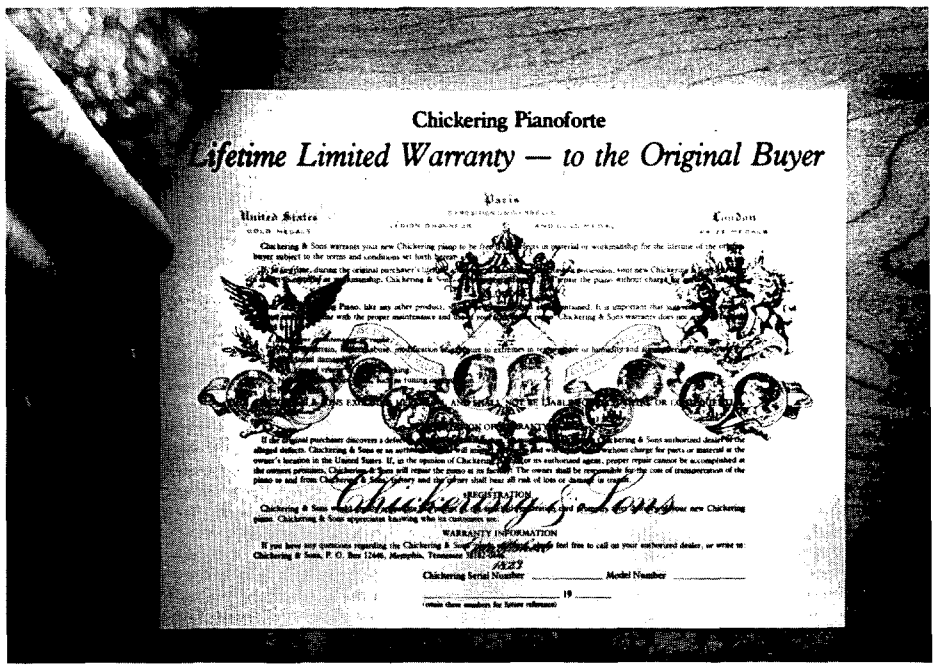

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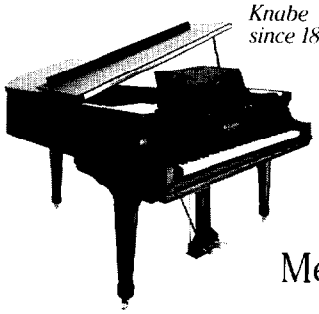

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