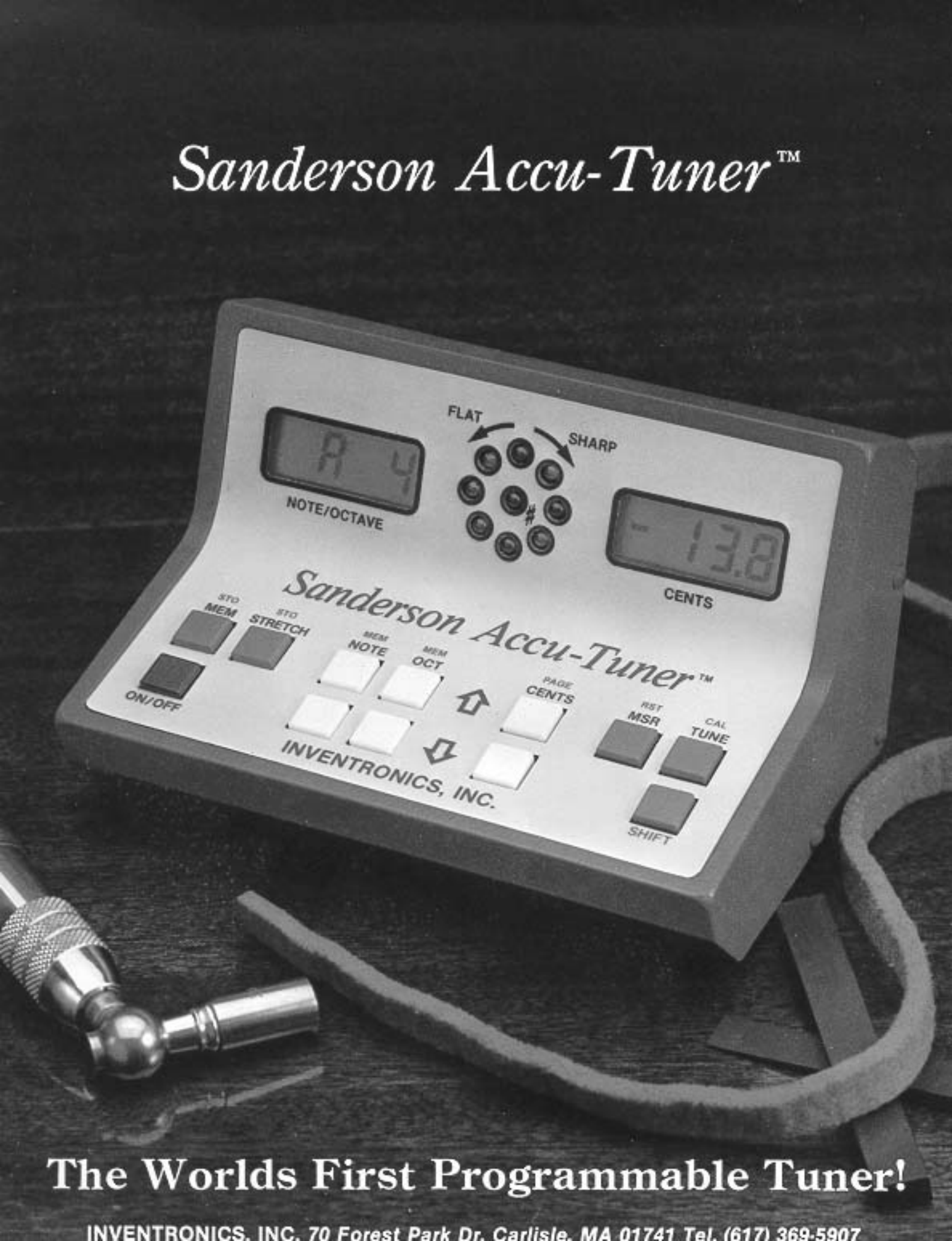
Piano Technicians

Journal

June 1984


Sanderson Accu-Tuner™
FLAT
SHARP
A 4
NOTE/OCTAVE
- 13.8
CENTS
Sanderson Accu-Tuner™
STO MEM
STO STRETCH
MEM NOTE
MEM OCT
PAGE CENTS
RST MSR
CAL TUNE
ON/OFF
SHIFT
INVENTRONICS, INC.
The Worlds First Programmable Tuner!
INVENTRONICS, INC. 70 Forest Park Dr. Carlisle, MA 01741 Tel. (617) 369-5907

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.

Piano Technicians Journal
Official Publication of the Piano Technicians Guild

June 1984
Volume 27, Number 6

4 President's Perspective
The cafeteria of life.
By Ernest S. Preuitt

6 Executive Director's Message
Why attend our convention? You can't afford not to.
By Barbara Parks

8 Indianapolis in '84
Here's more about our convention and institute, our host city and some of the convention activities.
By Dick Bittinger and Julie Berry

14 The Technical Forum
Favorite tuning temperaments, vertical rebuilding, the multipurpose tool contest and computers.
By Jack Krefting

20 A Simple Formula
The mathematics of a string.
By Dominick Venezia

23 The Grand Piano
A Multinational Accomplishment
The blending of four great traditions.
By Stephen H. Brady

27 On Pitch
Eighth in a series on the integration of aural and electronic tuning techniques.
By Rick Baldassin

30 Sound Background
Later 18th century music and tuning in Germany.
By Jack Greenfield

33 Von Der Werkstatt
The grand action stack.
By Priscilla and Joel Rappaport.

36 The Eclectic's Notebook
Now the acupuncture.
By Christopher Robinson

12 The International Scene
12 Coming Events
13 Industry News
40 Membership
42 The Auxiliary Exchange
44 Classifieds

About the cover:
The Steinway teflon-bushed action

PIANO TECHNICIANS JOURNAL (ISSN 0031 9562) is the official monthly publication of the Piano Technicians Guild, Inc., 9140 Ward Parkway, Kansas City, MO 64114. Second class postage paid at Kansas City, MO, US ISSN 0031 9562 foreign and domestic. POSTMASTER: Send address changes to PIANO TECHNICIANS JOURNAL, 9140 Ward Parkway, Kansas City, MO 64114.

Annual subscription price: $85 for one year; $155 for two years; $7.50 per single copy. Piano Technicians Guild members receive the PIANO TECHNICIANS JOURNAL for $45 per year as part of their membership dues.

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.

Letters

Greetings To The New Staff:

As a past contributor to the *Piano Technicians Journal,* I would like to compliment the new staff on the fine job it is now doing. I am sure it wasn't easy. Also, I would like to take note of the change that has taken place in the piano technicians of this country in the past 10 years or so. I am very much impressed with the quality, also the quantity, of new members coming into the Guild.

As most of the old-timers know, I have been pretty well involved in the training aspect of this organization. When I came into the ASPT back in 1946, it was not too difficult to become a member. Later, when ASPT and NAPT merged into one solidified organization, attention was gradually directed towards improving the standards of piano technicians. It took lots of work and sacrifice, but it steadily improved.

In those years, good tuning schools, (especially for the sighted,) were at a minimum. It was mostly an apprentice type of learning. Although that type of training was very good, it was not available except to a very few fortunate individuals. That worried me. What would happen to the profession if there was no future training? Personally, I was getting tired of those "fly-by-night" so-called piano tuners roaming the country, and messing up pianos. If a competitor was good, I really didn't have a legitimate complaint. However, I was distressed that anyone could purchase a tuning hammer, fork, a screw-driver and pair of pliers, and advertise as an expert tuner. This was very common in my earlier years in the business. I felt there must be another way of combatting this dilema. Proper training was the answer.

In the early 1970s, I was discussing this very problem with a music department director at Grayson County College, Denison, Texas. There was a concerted effort in those days to teach students a vocation. To make a long story short, a 1400-hour course was set in motion, with a set-up for about 30 students. Later, I came out of retirement and taught for more than two years in the school that I helped to set up. It must have made an impact on the tuning profession, because as a result of that effort, other schools have sprung up across the nation. I glanced through the Sept. 1983 issue of the *Journal,* and was pleasantly surprised to find nine tuning schools advertised, from coast to coast and from north to south. I know of possibly two others not advertising. Not all of those attending these schools will become top-notch technicians, but enough of them will certainly improve the situation. Some of us can remember when only correspondence schools were advertising. What a turn-about! I am glad I had a part in bringing this about.

Respectfully,
W. Jesse Lyons

The President's Perspective

Ernest S. Preuitt
President

Getting Inside

Isn't it odd, sometimes, that when one is trying to express an idea he can't come right out and say what he is thinking? You know the idea you want to convey, but the words and illustrations seem to evade your thinking process.

Just today, I was talking at the dinner table about an old flower. When it came time to mention Sweet William, the name escaped me completely. After not thinking about it, the name came suddenly to mind as I was getting ready for bed later that evening.

As soon as I get one column ready for the *Journal*, I immediately begin thinking about the next one. I know fairly well what I want to say, but can't come up with a good way to approach (or illustrate) it — when bang, bang — almost simultaneously several things happen to remind me of what I want to say and the way I want to say it.

Once a little boy saw a sign that read "Circus in town tomorrow. Admission 50 cents." This aroused the little boy's interest and his curiosity, for he had heard a little about a circus but had never seen one. He had heard that a band would come down the street on a big red and gold wagon drawn by six white horses. There would be all kinds of wild animals — tigers and lions — in brightly colored cages, big black bears, some walking on their hind feet. There would be pretty girls riding on horses, and clowns and even huge elephants.

The little boy earned the 50 cents required and early the next day, he was one of the first sitting on the curb to see the circus. Sure enough, after a wait that seemed an eternity, he heard the famous "Barnum & Bailey" march. The horses were beautiful, the wagon fairly glittered and the band music was so stirring that little boy had goose bumps all over his body. Such beautiful and graceful girls he had never seen before, and in addition, they were on such handsome steeds! The big cats were quite frightening but very exciting, and the clowns made everybody laugh and seem so happy. Then came the huge pachyderms (elephants to the little boy) that seemed to make the earth rumble when they came walking down the street, each one holding the tail of the one in front of him with his huge trunk.

When the last man in the parade came by, the little boy ran into the street and gave him his 50 cents, then ran all the way home to tell his parents and friends how much he had enjoyed the circus.

The tragedy here is that the young fellow never really saw the circus. What he saw was only the preliminaries, the introduction, the prelude. He didn't realize that the main show was under the big top. He never did get inside.

How sad that many people go to the trouble to learn a business, or educate themselves in some specialty work and then don't seem to have the foresight to go the extra mile and really get inside. Each of you reading these words probably know as many people as I do who have somehow had a beginning in the art and science of piano service, as well as other technical specialties. They struggle on and on, yet never take the time to improve themselves by further study or even by associating with their peers. They have seen the parade but they didn't know enough to get on the inside and see the real thing.

The story of little boy and the circus is, of course, pure fiction, but fables, parables and allegories have a place in our society as they do so often illustrate a point.

Now here is another illustration that is not fiction, one told by Emmet Fox in one of his Treasury volumes. When he first came to America, he passed an attractive restaurant. Fox went inside, selected a table, sat down and waited. He thought it strange that nothing happened, but he continued to wait. All around him people were eating and enjoying their food, and he was left there with nothing. After awhile, the truth of the situation dawned on him — this was a cafeteria, and establishments such as this had not at that time made their appearance in England. He quickly realized that although there was plenty of food of every kind, one had to go forward and claim it for himself, or go without.

"If conditions of your life are not to your liking," he said, "you must get to work on your own consciousness and, by raising that above the outer picture, cause those conditions to become something nearer to your heart's desire; and you must keep on doing this until you find your True Place." Truer words were never spoken.

One cannot sit back and expect to get very far in this world, except he gets in line and serves himself with those things he needs and desires. Life is a cafeteria; you must serve yourself and pay a modest fee if you want to see the whole show.

But first, you must go inside.

Profit from the craftsmanship of a Krakauer.

There is no more traditional piano made than a Krakauer. Since 1869, the dedication to quality and detail has remained a basic, unchangeable Krakauer characteristic.

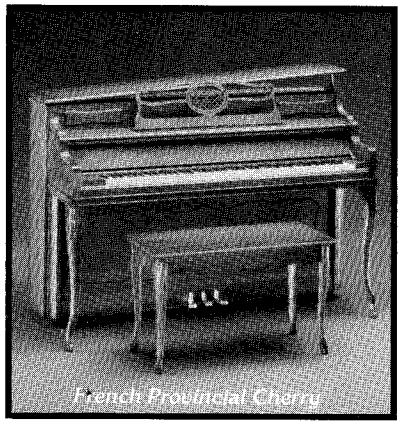
The skills, devotion to perfection and uncompromising pride of the old world craftsmen who are numbered among Krakauer's skilled technicians add still another aspect of tradition to every Krakauer piano.

At a time when your customers are interested in quality more than ever, it's good to know that quality is the Krakauer watchword for every step of every piano's design and manufacture. Hand selected quality wood veneers and solids. Hour after hour of hand rubbing of the cabinetry, lovingly done. Quality materials and workmanship throughout—from the solid spruce soundboard to the grand piano size keyboard. Beautiful, breathtaking styling down to even the smallest touch of hardware.

Additional superiority is evident in the quiet responsiveness of the Direct Blow action. And in the precision with which the action, dampers and hammers are assembled and regulated, as well.

It's no wonder that the sound of a beautiful Krakauer is beautiful. You'll find the sound of Krakauer profits in your cash drawer is beautiful, too.

Ask your Krakauer Sales Representative for more information about becoming a Krakauer Dealer. Or call Reggie Staples, National Sales Manager, at (812) 482-1600.



KRAKAUER

A subsidiary of Kimball International • 1600 Royal Street, Jasper, Indiana 47546

Executive Director's Message

Barbara Parks
Executive Director

Conventions: A Hallmark of Professionalism

Why travel halfway across the country to attend a convention? Why spend money for convention registration, lodging, meals and all the other incidentals when you could spend that week working and earning money? Because, quite simply, it's worth it.

Think of it as an investment. In many other professions, trades and industries, conventions are places to go to see and be seen, to check out the latest gizmos and to wine and dine. Not so with the Guild. Our convention is a learning experience. It's one of the things that makes us unique.

When you register for the Indianapolis convention July 2-6, you'll be stepping into the world series of piano technology. Name a topic, and chances are someone will be covering it in his or her presentation. Not only that, the instructor will take you by the hand and lead you through it, if need be. No other gathering anywhere in the piano industry offers the range of information and the quality of instructors that you'll find in Indianapolis.

I've seen a lot of conventions, but the recent Central West Regional Seminar in Lincoln, Neb., was an eye-opener for me. The thing that most impressed me was the enthusiasm of the instructors. The classes didn't end when the period was over. They ended when the last question had been answered. That's the great thing about the people who teach at Guild gatherings — they're absolutely top-notch, and they're dedicated to sharing their knowledge.

I know Dick Bittinger, this year's institute director, has put together a first-class learning experience for you. The list of instructors reads like a "Who's Who" of piano technology. As *Journal* Technical Editor Jack Krefting pointed out in last month's issue, much of the knowledge and expertise in this business is passed along verbally. That's why it's so important to go to the source.

Of course, if you want to socialize and wine and dine, there will be plenty of opportunity for that, too. After all, the learning doesn't stop when the class is over.

Odds and Ends

Cliff Johnson, RTT, of Minneapolis, passed along a couple of anecdotes you may enjoy.

It seems that in 1976, Johnson was tuning a piano in the Minneapolis hotel suite of Vladimir Horowitz. As he was working, Horowitz happened to be nearby and heard one chambermaid tell another. "He sure doesn't sound like the world's greatest pianist to me!"

Johnson also tells of the confusion a piano owner in Minneapolis experienced when she picked up the phone to call her tuner, David Knudtson, RTT, of Northfield, Minn. The voice at the other end was indeed a piano tuner, but it wasn't Knudtson. The woman had neglected to dial the area code and instead reached David Meissner, RTT, who has the same phone number as Knudtson.

YOUNG CHANG|The Evolution of Leadership

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.

YOUNG CHANG AMERICA, INC.
675 W. Victoria Street
Compton, CA 90220
213/637-1411

Mini-Classes — More Ways To Win At Indy!

Dick Bittinger
Institute Director

When you go to the Indianapolis Convention, be sure to attend one of the fast-moving mini-classes scheduled each day. There will be four instructors, each with 20-minute topics, during each day's class. These 16 instructors are volunteering their time and talent to give you tips on doing a better job in all phases of piano technology. Each class will be moderated by Bob Smit, northeast regional vice president and a member of the Ottawa, Ont., chapter.

Robert Smit
Moderator

Here's the schedule for this potpourri of piano technology. Please note that the last day's classes are in the second period of the morning session, and they're in a different room, Regency B. There will be plenty of room for this class because it will be the only one pertaining to tuning on Friday.

Tuesday, July 3

Everglades Room (#10)
4th Period: 4-5:30 p.m.

4 p.m.	"Wood Behavior" — George Wheeler, Vermont Chapter
4:25 p.m.	"Stabilizing The Big Pianos" — Webb Phillips, Reading-Lancaster, Pa., Chapter
4:50 p.m.	"Tuning Hazards" — Walt Pearson, Daytona Beach, Fl., Chapter
5:10 p.m.	"Tips On Player Piano Repairs" — Norm Heischober, Long Island-Nassau Chapter

Wednesday, July 4

Everglades Room (#10)
4th Period, 4-5:30 p.m.

4 p.m.	"Institutional Pianos: Reclaiming The Dead" — Dean Thomas, Youngstown, Ohio, Chapter
4:25 p.m.	"T-NUT Lyre Repair" — Bob Russell, Cleveland, Ohio, Chapter
4:50 p.m.	"Glassing In Pin Blocks" — Bill Balamut, Twin City, Minn., Chapter
5:10 p.m.	"Mehaffey's Gadgets" — Francis Mehaffey, Pomona Valley, Calif., Chapter

Thursday, July 5

Everglades Room (#10)
4th Period: 4-5:30 p.m.

4 p.m.	"Voicing Mechanics" — Bill Connelly, Pittsburgh, Pa., Chapter
4:25 p.m.	"Replacing Sharps" — Scotty Welton, Connecticut Chapter
4:50 p.m.	"Tips on Bridge Repair" — John Bloch, Denver, Colo., Chapter
5:10 p.m.	"Special Tools For Restringing" — Willem Blees, St. Louis Chapter

Friday, July 6

Regency B (#2)
2nd Period: 10-11:30 a.m.

10 a.m.	"Basics In Tuning" — Leon Levitch, Los Angeles Chapter
10:25 a.m.	"Hammer Technique" — Walt Sierota, Philadelphia Chapter
10:50 a.m.	"Tuning Extras" — Put Crowl, Boston Chapter
11:10 a.m.	"Designing Your Temperament System" — Carl Root, Washington, D.C., Chapter

An Evening With 'The Mighty Wurlitzer'

When silent movies were in vogue during the late teens and early 20s, many movie theaters installed pipe organs to provide background music and effects for their stage shows and motion pictures. With the coming of the talkies, however, the need for theater organs diminished and most of these fine instruments fell into disrepair. Many were left silent in the orchestra pit, never to sound again.

The organ in the Paramount Theatre in Oakland, Calif., one of 20 Publix No. 1 style Wurlitzers built, escaped this grim fate. Originally installed in 1931, it was used regularly for feature presentations with the house orchestra and in solo spots. For awhile, it was the centerpiece of a restaurant in Los Altos, Calif., before being purchased and revamped by an Indianapolis firm.

Today, it holds proudly forth from the Paramount Music Palace, an Indianapolis family pizza restaurant and ice cream parlor. Guild convention participants will visit the restaurant Sunday, July 1 in a tour sponsored by the Indianapolis Chapter. The tour registration fee of $7.50 includes pizza and soft drinks, and tour buses will leave from the Hyatt Regency at 7 p.m.

According to the restaurant, the organ originally had a stock four manuals and 20 ranks of pipes. A total redesign of the organ increased the number of ranks to 42 and changed the coloration of the console from the original gold to black highlighted by art deco designs in gold, bronze, copper and silver leaf.

The organ is powered by a 15 horsepower Spencer blower which provides air for the pipes and percussions. Most of the percussions are located outside the chambers for visual interest, and the volume of the organ is controlled by glass shutters which allow the sound to project into the restaurant.

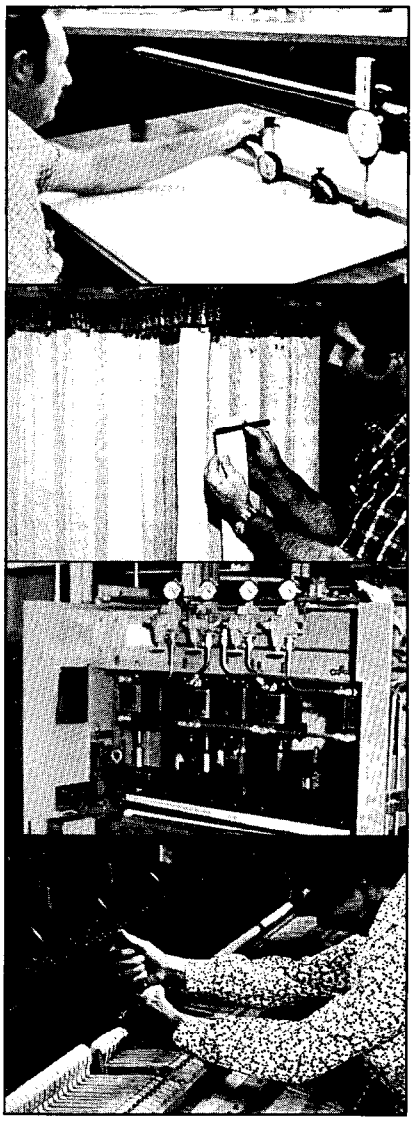
The Baldwin Piano...
You can see why it sounds better

We firmly believe that hammer making is one of the most critical of all piano building processes. That's why we spend significant extra dollars in materials and time in the manufacture of all of our own hammers for both vertical and grand pianos.

Our special concern starts with materials. We pay a premium price for 100% virgin wool felt made to our standards for weight, thickness, taper, size and hardness. To guarantee that all hammer felt meets our standards, we subject every sheet we receive to stringent testing before accepting it for production.

The same extra concern continues in our exclusive construction procedures. First felt is treated in our moisture-conditioning chamber until it reaches a prescribed moisture content. Then the felt is placed in a special hammer press, designed and built by our engineers. This press has preset closing pressure and automatic cycling for consistency. We use a special thermosetting glue to secure the felt to the moldings. And we check throughout the process to insure that the proper felt hardness is retained.

The object of all this extra care in design and construction of hammers is tone quality...and tone quality that is consistent from note to note.

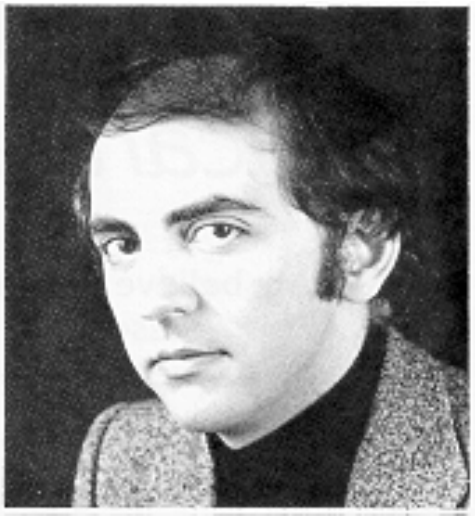


Fifth in a series of informative ads on piano tone published by Baldwin Piano & Organ Company exclusively for the benefit of piano technicians.

Baldwin® - *Leading the way through research*

BALDWIN SPECIAL SERVICE—You may order Baldwin replacement parts at any time our office is closed—nights, weekends, and holidays—by dialing direct (513) 852-7913. Your verbal order will be recorded on our automatic answering service and processed the next working day.

Russian Pianist To Perform At Banquet



Lev Natochenny, winner of the 1981 F. Busoni International Piano Competition and a graduate of the famed Moscow Conservatory, will be the featured entertainer at the July 3 Convention Banquet.

Natochenny, who emigrated to the United States in 1979, won the prestigious Gina Bachauer Award that year, as well as first prize in the "Young Artists In Recital" International Piano Competition in New York. Today he performs throughout the U.S. and Europe as a soloist and with various chamber groups, including a duo with renowned violinist Albert Markov.

The banquet is scheduled for 7:30 p.m., Tuesday, July 3. It will be preceded by a 6:30 p.m. social hour with a cash bar.

Meet Me For Dinner In Indianapolis

A few years ago, the names of only two or three major restaurants came to mind when people tried to decide where to go to dinner in downtown Indianapolis. Today downtown Indy is full of fine eating establishments.

It will be great fun for people who come to the convention to have dinner in a different restaurant every evening without having to wander more than a few blocks from the hotel. In fact, a person could choose from eight different restaurants without leaving the hotel at all.

The Hyatt Regency's three restaurants — Harrison's, the Porch, and the Eagle's Nest — offer a variety of menus and atmospheres. The Merchants Bank Plaza, which shares an atrium with the Hyatt, has a sandwich and ice cream shop called Delaney's, a Japanese steak house called Masa Ichi, a chili parlor called Charlie & Barney's, a place called the Hot Potato, and the ever-famous McDonald's.

Harrison's is an elegant place to go for a special dinner in Indianapolis. This intimate dining room is tucked away in a corner of the Hyatt Regency. The fresh-cut flowers, imported china and impeccable service reflect the understated elegance of Harrison's, a restaurant offering continental cuisine at lunch and dinner. House specialties include lamb, veal, duck, steaks, and fresh fish. Desserts range from a selection from the rolling dessert buffet to a Grand Marnier souffle which takes a half hour to prepare. Reservations are recommended at Harrison's.

Two blocks from the hotel is the granddaddy of Indianapolis restaurants, the King Cole. The King Cole has received the Travel/Holiday Fine Dining Award every year since 1964, and it has been a downtown landmark for more than 50 years. One could easily overlook the unassuming entrance at 7 North Meridian Street, but on descending to the restaurant below street level and seeing all the restaurant's original 16th and 17th century oil paintings, anyone would surmise that the King Cole is a special place. It is open for lunch and dinner daily, although it's closed Sundays. House specialties include pompano en papillote, relish tray, roast duckling, roasted rack of lamb grand'mere, and a wide variety of fresh seafoods.

> "You will find restaurants for every budget and every appetite close to our convention hotel."

If your mood is for more casual dining but you still want to have a memorable meal, you should check out one of our favorites, J. Pierpont's. Located about five blocks from the hotel, J. Pierpont's is a double-leveled establishment housed in a former bank building. All the brass and marble furnishings are still intact. On the street level, there is a fresh seafood bar, hearty sandwiches are served, and the atmosphere is casual. Upstairs on the balcony, diners are treated to house specialties like steak Diane, beef Wellington, and tournedos Rossini. J. Pierpont's is open for lunch and dinner, and closed on Sundays. Dress is casual.

This account offers only a hint of what awaits you in downtown Indianapolis. You will find restaurants for every budget and every appetite close to our convention hotel. Members of the Indianapolis chapter and its Auxiliary will be on hand to give you more details about these and other super places to dine.

If you would like to view menus from more than 85 Indianapolis restaurants in a book which describes lots of things to do in Indianapolis, you may order a copy of the 1984 edition of the "Indianapolis Dining Guide" by phoning 317/293-1500 or by writing P.O. Box 68110, Indianapolis, IN 46268.

Julie Berry

The International Scene: A Letter From Germany

Fred Odenheimer

Chairman, International Relations Committee

We have a nice letter from Jim Engelhardt which arrived at the same time as two wonderfully illustrated Schimmel brochures, one in German and one in English, which came courtesy of Jim and presumably Schimmel.

Mr. Engelhardt is the one who translated everything into English and as he writes, it was difficult to fit the English text into a predetermined area so it would match the layout of the German edition. He did an excellent job.

The 64-page book, richly illustrated with color photographs, takes you through the complete manufacturing process. The last four pages are a compilation of woods used in the manufacture of pianos, with places of growth, specific gravity and information on height and diameter of the trees. This alone would be a great addition to a piano technician's store of knowledge.

There is also a video cassette available with a tour through the Schimmel factory, which probably would be a nice addition to our Guild library if acquired.

We read with some amusement a "dialogue" in *Europiano magazine* between the younger and what I might call the middle-aged generation. It seems that the younger man does not find total fulfillment in his piano work. He wants to have some leisure to pursue his hobbies. Spending 65 percent of his time in service gives him a comfortable living but without luxuries — "a poor substitute for the hobbies." Naturally, I can well remember the time when one had to keep his head to the grindstone in order to equate income with outgo.

But many of us really enjoy our work. We are happy to have a hobby which is our beloved trade and art with ever-changing demands. We are meeting many interesting people and we have a profession that we can be proud of.

We will be leaving March 24 on a two-months-plus trip. We hope, to report first from South Africa and bring you some impressions from there. Later we will be in Europe and naturally will take in the PTG British tour.

Coming Events

Date	Event	Site	Contact
June 23-26	NAMM Summer Expo	McCormick Place Chicago, Ill.	Bob Russell 1414 Lander Rd. Mayfield Heights, OH 44124
June 30-July 1	1984 Council Session	Hyatt Regency Indianapolis	Guild Headquarters (816) 444-3500
July 2-6	1984 Guild Convention	Hyatt Regency Indianapolis	Guild Headquarters (816) 444-3500
October 19-21	Texas State Convention	Waco Hilton Waco, Texas	Martin Wisenbaker 808 Cordell Houston, Texas 77009
October 26-28	Central Illinois Seminar	Ramada Inn Champaign, Ill.	Cindy Genta 907 Anderson Urbana, Ill. 61801 (217) 328-2691
Nov. 1-4	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

How To Patent Your Invention

Piano technicians are always looking for a better way to do things. Frequently this curiosity leads to the development of a new process or piece of equipment which can and should be patented.

How do you patent a new invention? The easiest place to start, according to Guild General Counsel Sherman Jay Titens, is simply to contact the U.S. Patent Office for the proper procedures to follow. The mailing address is: U.S. Patent and Trademark Office, Crystal Plaza Buildings, Arlington, Va. 20231.

You may also want to refer to the book, "Patent It Yourself," a do-it-yourself guide for the amateur inventor. The book, written by D.R. Pressman, is offered through the *Piano Technicians Journal Business Book Service* and McGraw-Hill. It details the chronological steps for protecting, developing, patenting and marketing an invention. Order book number 50780-5 and enclose a check or money order for $21.56 plus $1.50 for postage and handling. Books may be ordered from *Piano Technicians Journal*, 9140 Ward Parkway, Kansas City, Mo. 64114. Allow six to eight weeks for delivery.

Correction:

In a Piano Shoppe, Inc., advertisement for videotapes in the May issue of the Journal, the price of a set of "Grand Rebuilding" tapes was printed incorrectly. The actual price of the tapes is *$225.75.*

"A Passion For The Piano," by Judith Oringer

There's Piano Passion In These Pages

Trivia buffs will like this paperback book, as will most people with an interest in the piano. The foreword is written by artist Andre Watts, who says the book "will hook everyone from the amateur who practices five minutes a week to the professional who puts in an eight-hour day."

Written as a tribute by a woman who began playing the piano at age six and now, as an adult, manages her concert pianist mother, the book contains a wide range of black and white illustrations, including photographs, poster reproductions, art reprints, line drawings and cartoons, all piano- or people-oriented. Many famous performing artists are pictured at the keyboard, and some illustrations are accompanied by the celebrities' quotations about pianos and piano-playing.

The volume's readers won't learn anything in depth, but it's a great beginning for those whose knowledge about pianos may be concentrated in one area.

The section on the instrument's development into today's piano and its electronic and acoustic versions concludes with a discussion on the classic versus the modern forms of the piano. A short section on manufacturing whets the appetite of the mechanically minded but satisfies those who want only a little surface knowledge about how pianos are built. The book tours manufacturers' companies by word and picture and provides a list of the electronic manufacturers as well.

"Passion For The Piano" talks about performing, shows artists in performance via pictures, and quotes their feelings about the business. Its discussion of piano study is approached with direct quotes from teachers and performers and enhanced by well-placed illustrations. A list of competitions is reference material for those whose ambitions take them in that direction. or whose romantic bent was pleased with the movie, "The Competition." Yes, there's a still photograph from the movie in this book.

Interspersed throughout the narrative material are self-contained sections dealing with topics such as how to buy a piano (with check list), "piano firsts," practicing extremes, and unusual shapes and uses for pianos.

The book is an amusing mixture of the practical and the whimsical. There are two quizzes for the interactive reader: the piano knowledge quiz and a test which lets you know the true level of your passion for the piano. These balance the somewhat subjective lists such as "a handful of the top music stores in the U.S. and Europe," piano bars, concert halls and perennial (as the author calls them) recordings.

The Piano Technicians Guild is included in the "Taking Care of the Piano" section of the book, but that's not why a Guild member should buy it. The 170-page book will provide more than an hour's busman's-holiday-type relaxation, interesting information (although perhaps not the exact piece of information which you might be seeking), and conversation material for off-business hours when *Journal* readers are perceived as piano experts (like doctors at dinner parties who are supposed to be the experts in all medical specialties, aren't piano technicians

"Passion For The Piano"...is an amusing mixture of the practical and the whimsical."

supposed to know everything about their instruments?). And it will make a thoughtful gift for a steady customer or someone who could turn into a regular on your account list.

"Passion for the Piano" in both cloth and paperback is published by Jeremy P. Tarcher, Inc. Copies are available through the Guild offices, 9140 Ward Parkway, Kansas City, Mo. 64114.

Book critic Rosemarie Kitchin, a vice president of the management firm which provides headquarters services to the Guild, stole the Journal editor's review copy to read on a business flight.

THE
TECHNICAL
FORUM

Favorite Tuning Temperaments

Jack Krefting
Technical Editor

Two or three years ago we asked readers to submit favorite tuning temperaments for publication. We didn't publish the results immediately for a variety of reasons, including the fact that the actual variation in technique and approach was not as great as had been anticipated. Maybe some tuners using the more unusual temperaments didn't want to say so publicly, for one reason or another.

Most of the respondents said they use some variation of the basic Broadwood temperament, with or without a backup third/sixth temperament, and a few claimed to use the Stonaker temperament with possibly a variation here or there. An interesting facet of the study was the fact that most of the respondents credited someone other than the actual developer of that particular tuning system, usually someone who had taught tuning at a seminar. Several readers mentioned the stack-up of three contiguous thirds (F-A, A-C♯, C♯-F) as the basis for inharmonicity compensation, and that was that.

We did receive some interesting vignettes about the personalities and experiences of some of our longtime tuners, however. We will share them as space and time permit. One of the most fascinating of these was from Ralph Kingsbury, a former Guild president from Milwaukee, whose letter was dated July 20, 1981:

Enclosed find my favorite temperament. When I first started 46 years ago I only knew fourths, fifths and octaves for nine years. Then came PTG (before that NAPT & ASPT) and then Bill Stonaker, a member from New York, wrote his temperament on the blackboard at one of our conventions. It finally sunk in (I tried it many times until I got it right) ...then when I had a tuner's class at a seminar, Homer Wagman of Detroit showed me the second/seventh chord test.

Thanks to The Piano Technicians Guild, I now have three temperaments to check each time I tune, plus I not only tune octaves, I check double and triple octaves, 25ths. They increase in speed as you go up. I do not tune sharp, but I do expand the octave by these checks.

I estimate that in 46 years I have tuned for 4,368 concerts...

Concert pianists are more interested in touch, repetition, (and) feel of the keys and action than in a piano that is very well tuned. They generally play so many notes that they do not have time to listen to the tuning.

Burt Bacharach sent a letter to the Milwaukee Symphony asking that the piano be tuned to A-444. I told them not to worry when they called me about the problem. I tuned the piano the way I always do (A-440, don't tell anyone) and I asked him how he liked the piano and he said, "Fine, thank you." Isaac Stern, the violinist, told me, "I'm a violinist and I like the treble sharp, please tune it sharp for me." I tuned it the way I always do and he also said, "Thank you very much."

Concert tunings don't necessarily take a lot of time, especially if you tuned it yesterday or a couple of days ago. Even if I tuned the piano in the afternoon, and I have to tune it again in the evening I go over every string and try to improve on my own tuning...

Never argue with an artist. If you do prove you know more than he or she does, that's never acceptable to the artist. It is more important for a note to be in tune with its friends and neighbors than to be in tune with itself (same for people?)."

— Ralph Kingsbury
Milwaukee, Wisconsin

> "Thanks to the Piano Technicians Guild, I now have three temperaments to check each time I tune...I not only tune octaves, I check double and triple octaves, plus I check thirds, 10ths, 17ths, 25ths...I estimate that in 46 years, I have tuned for 4,368 concerts."

Ralph goes on to say that he had more or less expected to lose his hearing to some extent as he got older, but the problem is that arthritis is beginning to cripple his tuning — his hearing is just fine, thank you.

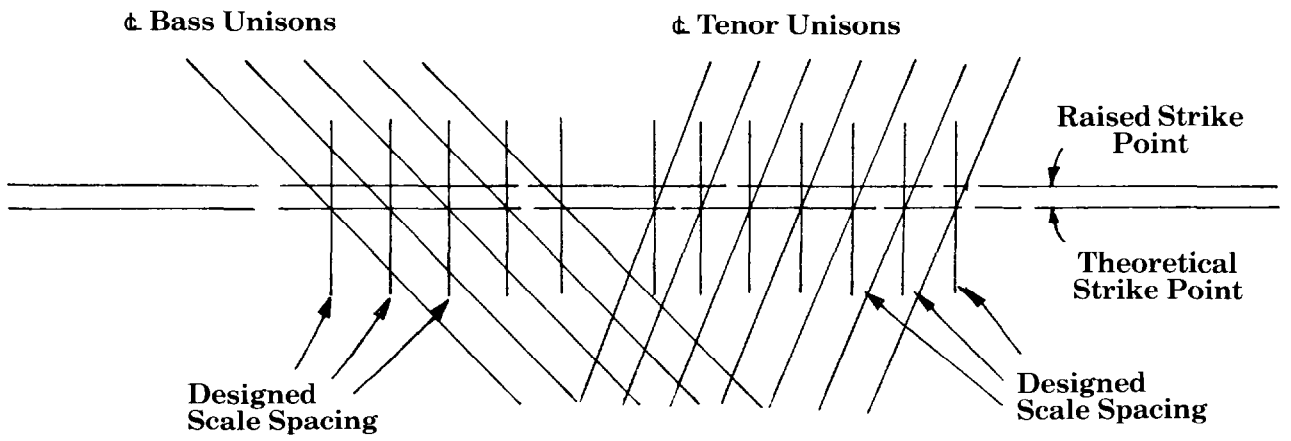


Figure 1 ⅄

Vertical Rebuilding

Last month we bored and shanked our hammers, and dry-fitted guides into their butts, having cut off the bottoms of all shanks to the length dictated by the strike point at note 88. The shanks have not yet been glued into the butts because we want to do all of the damper work, or at least all of it that involves the wires, springs, blocks, heads and felt, before cluttering the area with hammers and shanks.

The top of the damper felt should be as high as possible, especially in the lower half of the scale, but not so high that it could be touched by a hammer on a hard blow. The bottom of the felt must be in a position between partial nodes on the string, which could cause or encourage what is commonly known as "ringing harmonics." Be sure also that the action brackets are solidly seated on their mountings before installing hammers and dampers, otherwise regulation and alignment will be radically affected when the action is subsequently removed and replaced.

As a matter of fact, if any change in the compression of the brackets is made, not only will we have side-to-side spacing problems in the tenor and bass, but there also will be strike point problems in the treble. *Figure 1* shows that raising the action will have the effect of spacing the parts to the right in the bass and to the left in the tenor because of the angle of the strings. Lowering it will have the opposite effect, of course, and in either case the strike point will be affected. The reason that pressure upward from the bottom of the bracket moves the action parts upward is shown in *Figure 2*, where we see that the upper portion of the bracket is more flexible than the shorter part below the rail; hence the pressure causes the rail itself to rise, together with whatever is fastened to it. Some brackets will spring more than others, and some which are relatively stiff and straight are mounted at the top by long screws which will bend instead, being more flexible than the brackets. In any case, we can generalize to the effect that the action must be mounted firmly so that it cannot move in any direction under any performance conditions, and it sure helps the technician if it can be mounted so that it is easily removable and can easily

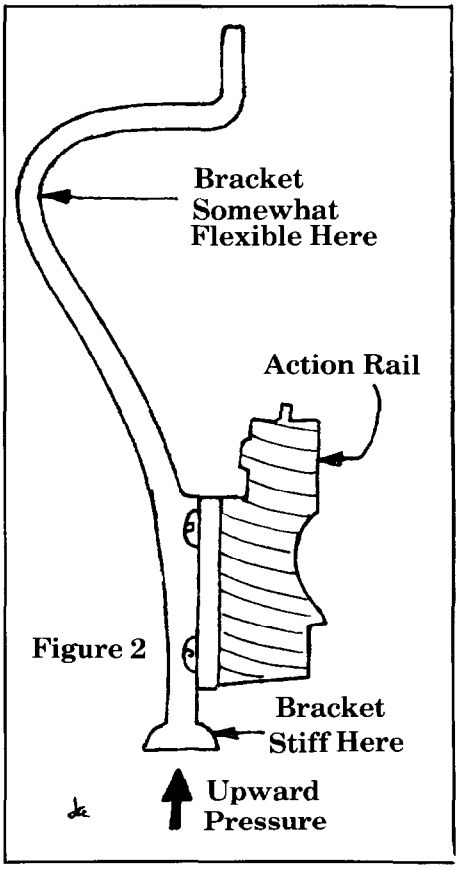


Figure 2

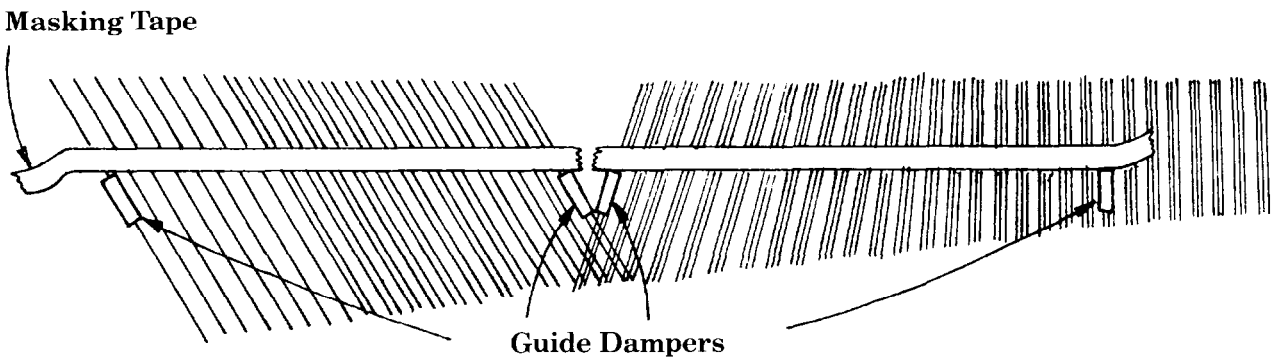


Figure 3

be replaced in its exact original position. This last is, of course, for alignment and strike point reasons as well as eliminating unnecessary re-regulating.

With the action set in place, temporarily dry-fit guide hammers into their butts and install guide dampers at the ends of each section. Allow the spring pressure to clamp the glue, and before proceeding be sure to verify that these guide dampers are indeed in the right place by plucking strings — all undamped strings must be muted out for this test, by the way — to be sure there won't be a problem with ringing partials because of incorrect damper height. If a good position cannot be found, the damper felt is probably too long or too short. Switch to a different set and try again. When the best compromise has been reached, place a piece of masking tape across the strings of each section, the lower edge of which indicates the position of the upper edge of the felt (see *Figure 3*) and install the remaining dampers.

If the treble dampers are already mounted on heads, apply glue to each head and place it in position between the block and the strings, allowing the pressure of the damper spring to clamp the glue. Use just enough glue for a good joint here, as excess glue could drip onto strings or bridges. If the existing heads will be re-used and the old felt has been cleaned off, simply apply glue to the back of the new felt and install as above. Line up the top edge with the masking tape and be careful to keep the sides of the felt parallel to the sides of the head. Check to be sure the felt is centered both on the strings of the unison and on the damper head, bending wires if necessary to get good alignment.

Since there is no head in the bass, just apply glue to the felt pad and glue it to the block or dowel. Examine the alignment closely while the glue is wet, as most vertical damping problems either occur in, or are caused by, the bichord section in the bass. The sparing use of glue in the bass is, if anything, even more critical than in the treble, because in addition to the problems above there is always the possibility of clicking caused by a glue run on the backing of the damper touching an adjacent wire when the note is played.

Remove the masking tape as soon as all dampers have been installed, and strum or pluck the strings to check for possible damping trouble. Any open string, meaning one that rings longer than its neighbors, is easily detected with this test. If there are trichord wedges in the tenor, these are most likely to cause trouble. Identify the

open string or strings and determine the cause now, so it can be corrected before the hammers are installed.

If the left or right string of a trichord is open, it usually means that either the string spacing is uneven within the unison or that the trichord wedge itself is asymmetrical. If both are open (ringing longer than the center string), the split in the felt needs to be deepened so the points of the trichord will fully seat. Be sure there is some "follow" — that is, when the strings are pushed toward the plate the damper moves with them, indicating that the lever isn't resting on the spoon or the lift rod — as these diagnoses are valid only if follow exists.

If the strings will not stay properly spaced, it usually is an indication of insufficient counterbearing, meaning that the pressure bar is too far out from the plate; or, worse, the V-bar is defective or the tuning pin location is erratic, or the action rail was misdrilled. Before doing any major surgery, check the height of the bass end of the action rail and compare that to the height of the treble end, using the keybed or the pinblock as a point of reference. A piano with uneven action height exhibits the symptoms of one with a misdrilled rail because of the overstring angle. This can occur even when there are no obvious problems with the strike point, because that is critical only in the high treble. Anyway, the action was probably installed that way to begin with. The rail should have been leveled earlier, but if the problem is not discovered until after the dampers are installed, the technician will be tempted to leave it that way and compensate by spacing parts. Whether such correction is absolutely necessary may be debatable. But it certainly would be more important to do so on some pianos than on others.

The problem here is not so much one of spacing parts, although that can be problematical beyond a certain point, but rather in the geometry of the keyboard and action. The least affected would be spinets and tall uprights, because of the sticker connection rather than the contacting profiles of a direct blow design which, while it has its advantages, also is subject to greater increase in friction if the action height is not precisely set. *Figure 4* illustrates the relative unimportance of the usual slide path in a sticker design — not that there is necessarily less friction with a sticker than without one, but that whatever friction is present will remain about the same regardless of the capstan adjustment needed to take up lost motion — compared to a direct blow design, whether the latter uses capstans or dowels.

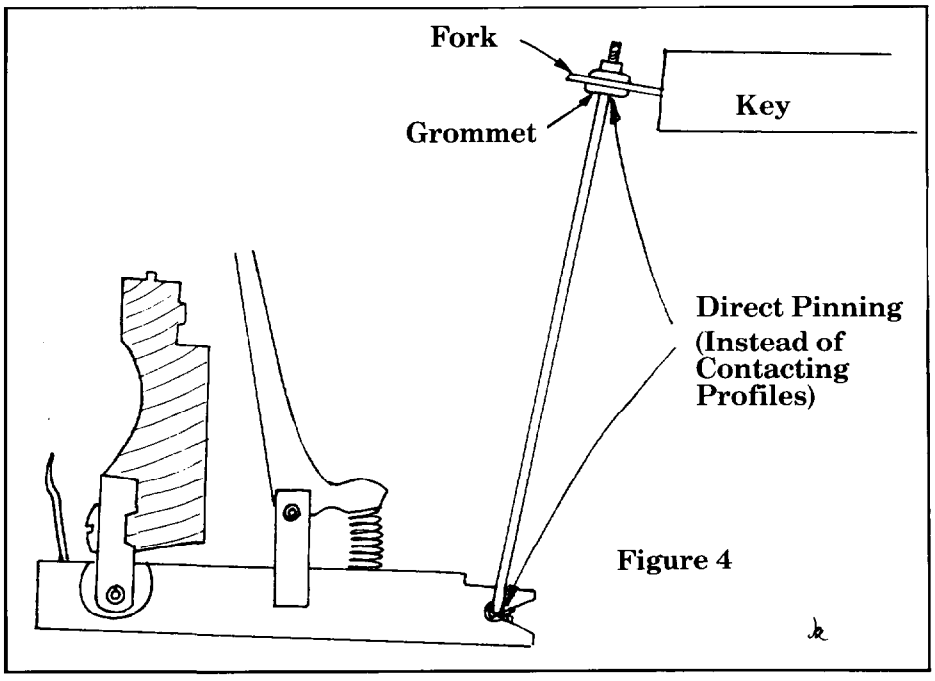


Figure 4

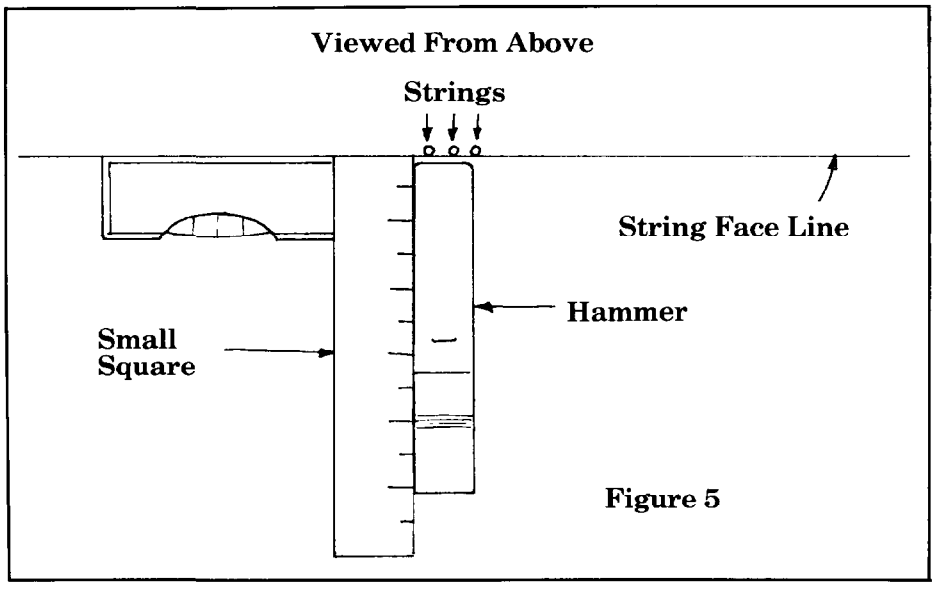


Figure 5

Since we have covered damper regulating in detail recently, we will omit that now but merely point out that the wires must be bent *before the spoons* and that any adjustment of damper timing with the key must be done by bending the spoon, not the wire. The wire-bending is to align the felt to the strings and to make all dampers lift evenly with the pedal, nothing more.

Dry-fit each hammer/shank assembly, previously assembled and cut to length, into its respective butt, making sure that it will line up laterally with its unison without being twisted. In other words, if the hammer won't hit all three strings when it is perpendicular to the string line, it cannot be twisted but must be spaced or leaned over as required. *Figure 5* demonstrates the use of a small square to verify that the hammer is indeed perpendicular. It need not be used on every hammer, but could be used to advantage periodically as a check

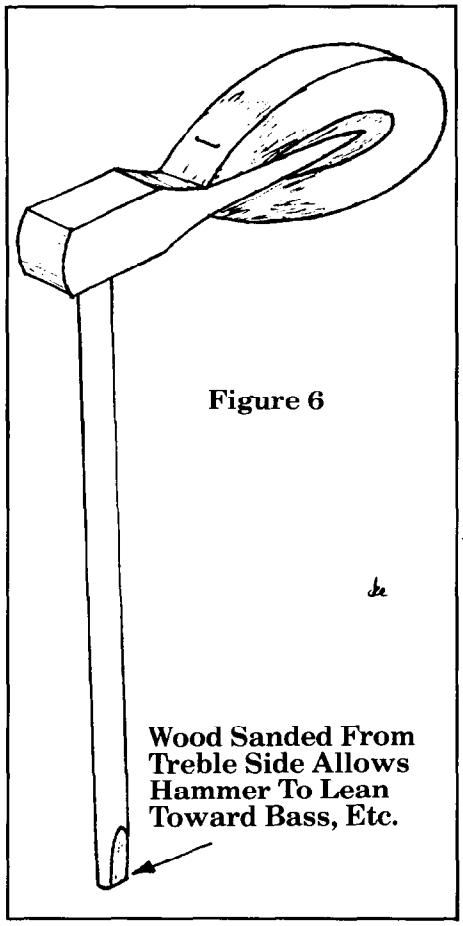


Figure 6

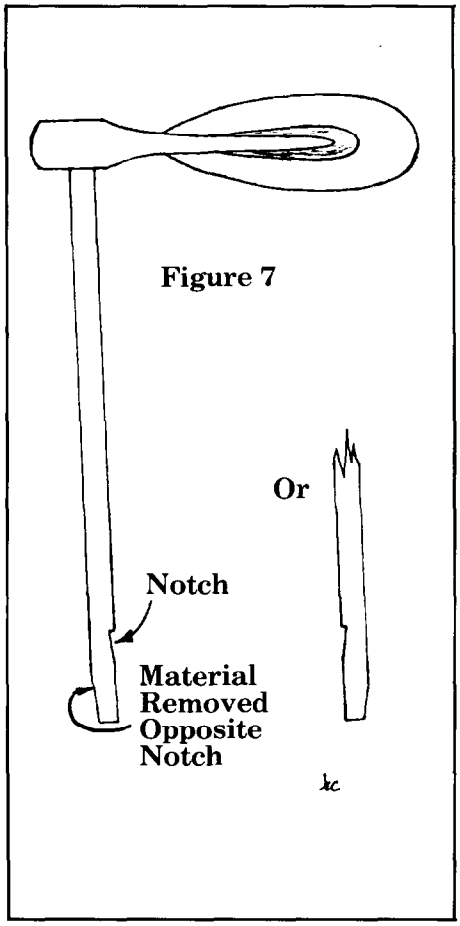


Figure 7

arguably the single most important strictly mechanical part (as opposed to mechano-acoustical parts like hammers and dampers) in the entire action or in the entire piano, for that matter. For the jacks to perform efficiently, the butts must be lined up at least to the extent that they must all reseat after a slow release of the key and yet have no discernible lost motion.

When compromises must be made, they almost inevitably involve a reduction in the blow distance, with a corresponding loss of power. At least there is a semblance of evenness which would not be present if some of the butts were angled too low, requiring lost motion for reliable repetition. Experience suggests that such an action will show rapid wear under conditions of normal to heavy usage. What we are saying, however reluctantly, is that if the action cannot be made to stride swiftly and surely, it must forever tiptoe along to avoid tripping. Disgusting as that may sound, it probably represents the current state of the art in vertical actions.

to be sure the spaces between hammers don't start to fan out one way or the other.

If the hammer must be moved to the side, the first thing to try would be loosening the butt flange screw and trying to space the butt. Sometimes there is enough space to do this. If not, the butt flange can be spaced with a bit of shim material under one corner. Another way is to burn the shank — not to twist it, now, but to bend it — but still another method is shown in *Figure 6*. This is the standard factory method, where the butts are drilled to a larger diameter than the shanks, and then in case further side-to-side movement is desired, the bottom of one side of the shank is tapered by sanding off some wood.

When the technician is satisfied that the hammer will be centered on its unison and still be perpendicular to the string line, it is time to dip the shank in glue and install it, lining it up quickly while the glue is wet. Hot animal hide glue is probably the best for this, although there are certainly others, such as the aliphatic resins. Avoid using cyanoacrylates or epoxies in this application, though, because if it should ever be necessary to break the joint we want to be able to do so.

If there is appreciable fore/aft play in the shank hole, it is possible to glue the shanks into the butts in such a way that the catcher stems are not in vertical alignment when the shanks are on the rest rail. Purists will note that the alignment of catchers is important, and will even notch the hammer shanks as shown in *Figure 7* to achieve a level catcher line. Obviously, if carried to the extreme, this technique could seriously weaken the shanks, so the rebuilder will have to choose whether or not to attempt such alignment. For example, it may well be important, for the catchers to be in line for evenness of checking, but if they were glued in unevenly, aligning them by notching the hammer-shanks would ensure the same angle of shank to catcher stem at the expense of the butt angle. Which is more important?

The butt angle, as has been previously discussed, is vital for performance of the jack, which is

Multipurpose Tool Contest

Dan Sponenburg of Pottsville, Penn. has sent a couple of ideas, one of which is pictured in *Figure 8*. Dan calls it his "Combination Grand Hammer Blow Distance Gauge and Pencil." One wonders whether his tongue was firmly implanted in his cheek or only partly so, because at first glance the tool appears to have real problems.

For one thing, it won't work as a blow gauge in the bass because it tends to measure from the centerline of the string. How one can compensate for this without a lot of guesswork is one of the questions that come to mind. But the most remarkable part of the entire idea is that if the pencil portion of this multipurpose tool is used, the blow gauge portion of the tool suddenly is no good because part of the point is worn away. It is somehow disconcerting to think that someone's piano could be regulated with excessive aftertouch simply because his or her technician had worked a crossword puzzle at lunchtime. I think we'll enter this idea in the humorous category, at least for now.

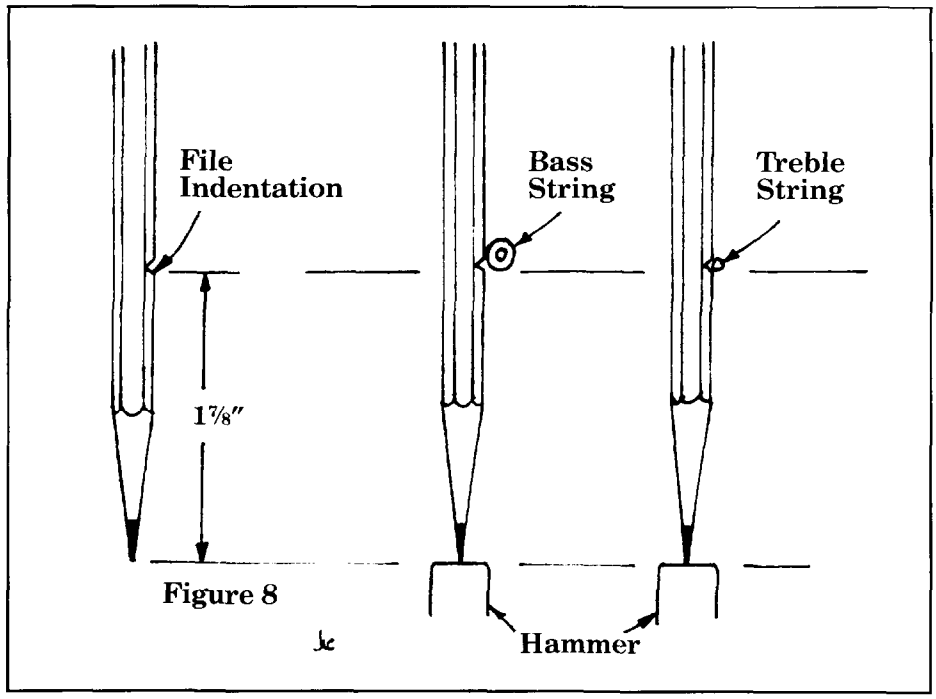


Figure 8

Computers

We have all seen the technological explosion of the past few years, from the room-sized units of the 50s to the efficient, tiny, fast hardware available today. Apple has just announced their new IIc model for home use, said to have double the capability of the IIe that was so great last year, and just a month or so ago IBM announced a breakthrough in chip technology which allows one of their new chips to store a megabyte of information — four times as much as had been thought possible — on a tiny piece of silicon, ready for instant retrieval.

What this means to the owner of a small business is that the hardware is available to keep track of client information, inventory of supplies, paying bills via telephone lines, tax information and so on. Now the software is becoming available in a form that makes it unnecessary for the technician to write a program to suit his needs. Mark Anderson, one of our members from Mesa, Ariz., informs us that he also deals in computers for businesspeople and has written programs specifically for piano technicians. He is planning on exhibiting at the National Convention next month, where he will be offering a complete computer package, including a dot matrix printer and programming.

Having no experience with this equipment myself, I want to make it clear that I am not endorsing it or suggesting that anyone buy it. But I also think that computers are here to stay and that we owe it to ourselves to at least consider the possibilities that are opening up in this area. The problem, says Mark, is that some systems will not do what is wanted of them, simply because the user didn't realize just what he wanted until he bought a computer that couldn't do it. Then it was too late. Those who are considering the purchase of such a system would be well advised to consult fellow technicians who already own them, and find out what is good and bad about each make and model.

For example, if all client information can be stored on a single disk, then theoretically it should be possible to retrieve that information in several forms that would be helpful. If the technician has to make an unexpected trip to a nearby city, it may well be possible to tune along the way or to pick up an action that would otherwise have required a separate trip. Another possibility is that those clients who were undecided about a regular six-month commitment could be enticed by a special promotion, sent automatically by the computer only to certain people who had been coded into the program in a certain way. The possibilities are many, and the more imaginative among us will do a lot more than that with computers in the coming years.

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

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

A Simple Formula

For Tension In Single And Double Copper Wound Strings

Domenick Venezia

I am going to describe a very simple, accurate formulation of the Taylor equation for the tension of copper wound strings. My background lies in mathematics and computer science. However, several close friends are technicians and over the years I have become familiar with some areas of the profession. After repeatedly observing the problems associated with wound string design I turned my attention to a simple formulation of the Taylor equation.

Over 250 years ago a great mathematician, Brook Taylor, (1685-1731), developed his law of strings. As originally formulated by Taylor, the equation is not of much use for scale design, but with a bit of algebra we arrive at the now famous 675356 form of Taylor's equation:

$$T = \frac{f^2 L^2 W}{675356}$$

where: f is note frequency in hertz
L is speaking length in inches
W is inch-weight of the string in grains
T is tension at pitch in pounds

The number 675356 is a conversion factor to allow us to use inches, pounds, and grains. Regrettably, grains are a bit unfamiliar, but they easily convert to pounds (7000 gr. = 1 lb.) and allow us to work with standard linear wire weights.

The above formulation is straightforward and agreed upon by all. Where the controversy and confusion arise is in the calculation of W, the inch-weight term. Specifically, W is the weight in grains of one linear inch of the wound string.

Two different approaches have been used to determine this weight. I propose a third.

Klaus Fenner[1] takes the approach of determining the volume that the string occupies and then determining an average combined density for the wrap and core. For this he calculates the copper to steel ratio, and then acknowledges that this ratio is *never* constant, that it is different for every string. Mr. Fenner then proposes using an average value for this ratio, and spends much time justifying this approach. Personally, I find the uncertainty inherent in this approach unacceptable.

John R. Van Wye[2] takes a different approach. He calculates the length of the copper winding per inch of core wire, and adds it to the weight of the core wire per inch, yielding the total inch-weight of the wound string. The expression he derives for the inch-weight is a bit cumbersome, but theoretically accurate.

The following approach to the calculation of W, the inch-weight, is a synthesis of both Mr. Fenner's and Mr. Van Wye's approaches.

For the calculation, we divide the string into two regions, the copper wrap and the steel core. We then determine the inch-weight for each region and add them.

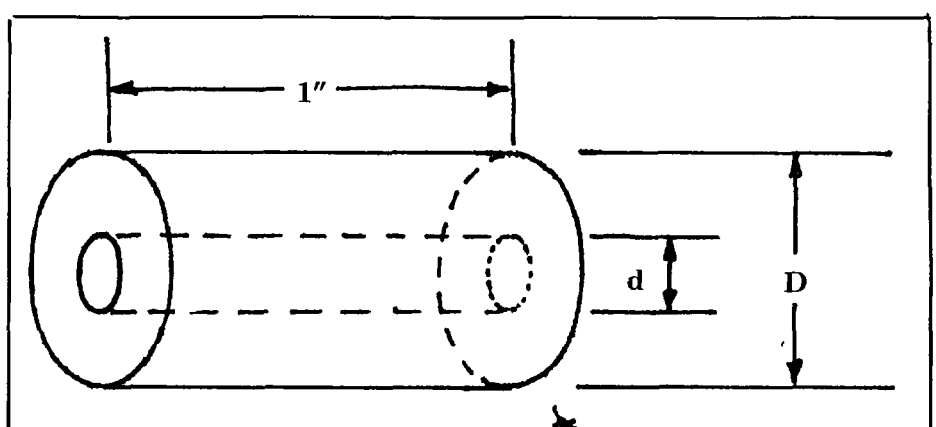


Figure 1

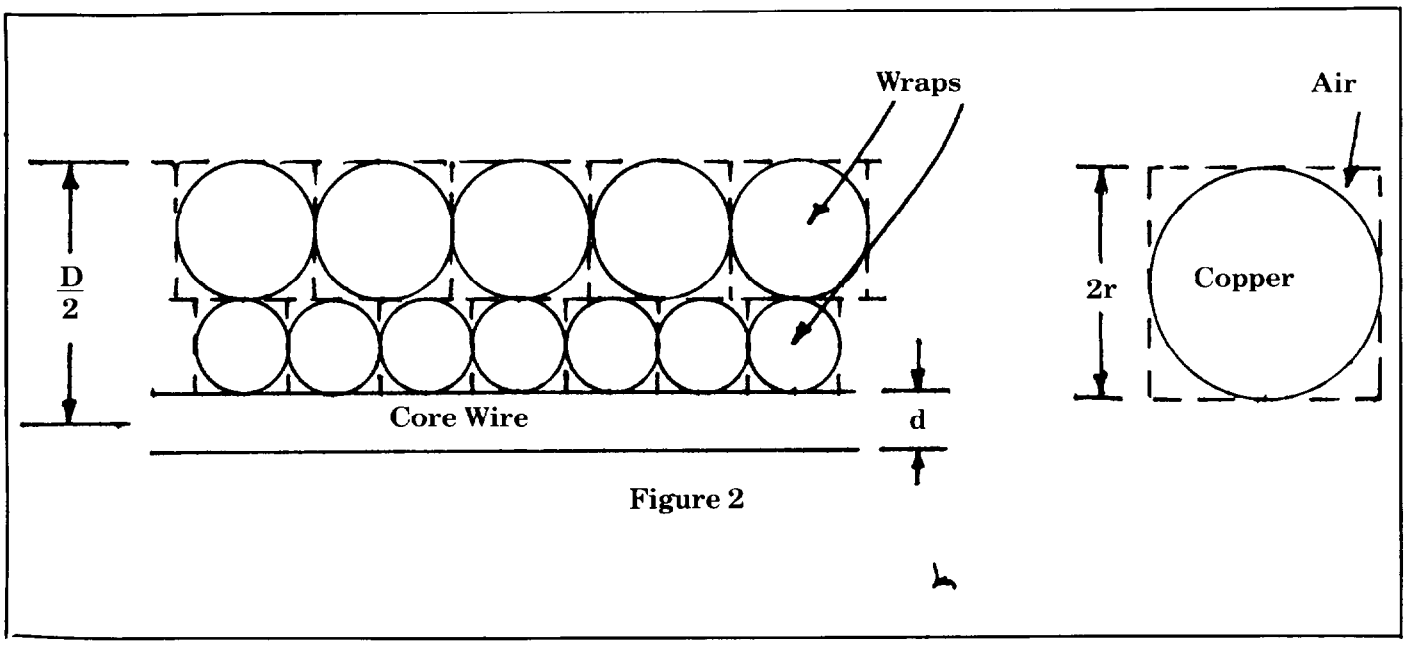


Figure 2

The copper wrapping, whether single or double wound, occupies a hollow cylindrical volume. See *Figure 1.*

To determine the volume of this hollow cylinder, we first calculate the volume of the solid cylinder, then subtract the volume of the core wire.

Volume of cylinder = $\pi r^2 L$

where: π is 3.1416
r is radius of the cylinder
L is length of the cylinder

For the volume of the solid cylinder in question, $r = \frac{D}{2}$, L = 1, and so its volume is:

$$V_D = \pi\left(\frac{D}{2}\right)^2 = \frac{\pi}{4} D^2$$

For the volume of the core wire, $r = \frac{d}{2}$, L = 1, and so its volume is:

$$V_d = \pi\left(\frac{d}{2}\right)^2 = \frac{\pi}{4} d^2$$

Then, the volume of the hollow cylinder is:

$$V = \frac{\pi}{4} D^2 - \frac{\pi}{4} d^2 = \frac{\pi}{4}\left(D^2 - d^2\right)$$

This hollow cylinder is not solid copper for it contains much air, but fortunately the copper/air ratio in the cylinder is constant regardless of the wrap scheme.

From the string section in *Figure 2* we can see that each copper turn's cross section occupies a square region, and the ratio of copper to total area is constant for every region and hence constant for the cylinder as a whole.

Area of occupied square = $4r^2$

Area of copper section = r^2

The ratio of copper in the cylinder is:

$$\frac{\pi r^2}{4r^2} = \frac{\pi}{4}(1) = 0.7854$$

Therefore, the actual volume of copper contained in the winding per inch of string is:

Volume of copper in cubic inches = $\frac{\pi}{4}(D^2 - d^2)(0.7854)$

(note: for reasons soon to be clear, $\frac{\pi}{4}$ was evaluated in the last term but not in the first term)

To determine the inch-weight of the copper we note that one cubic inch of 99% copper (density = 8.92 g/cc) weighs 2253.8 grains, then multiply:

$\frac{\pi}{4}$ $(D^2 - d^2)$ (0.7854) (2253.8) =

$\frac{\pi}{4}$ $(D^2 - d^2)$ (1770)

To determine the inch-weight of the core wire we note that one cubic inch of its steel weighs 1981 grains, then multiply:

$\frac{\pi}{4}$ (d^2) (1981.0)

For the total inch-weight of the string we add these two values:

$W = \frac{\pi}{4}$ $(D^2 - d^2)$ (1770) +

$\frac{\pi}{4}$ (d^2) (1981)

Factoring out the $\frac{\pi}{4}$, multiplying through by the numerical constants and adding the d^2 terms yields:

$W = \frac{\pi}{4}$ $(1770D^2 + 211d^2)$

Next we factor out 211 and evaluate the resulting numerical constants we get:

$W = 165.72\ (8.39D^2 + d^2)$

(note: we should pause here and give thanks for our electric calculators)

Finally, we are in position to put this value for W into the 675356 form of Taylor's equation. We evaluate the numerical constant, $\frac{165.72}{675356}$, yielding:

$$T = \frac{f^2L^2W}{675356}$$

$$= (0.0002454)\ (f^2\ L^2)\ (8.39D^2 + d^2)$$

Some interesting things are noted when one plays with this equation. First, we note that if we have a plain string, D = d, the equation becomes:

$$T = (0.0002454)\ (f^2\ L^2)\ (9.39\ d^2)$$

$$= (0.002304)\ f^2L^2d^2$$

which is the accepted formula for the tension of plain strings. Second, when the values for the tension of wound strings, both single and double, generated by this simple formula are compared to the values generated by Mr. Van Wye's formulation, we find they differ by only a few tenths of a pound.

When designing a scale, it often is useful to chose a core wire and pitch tension, and calculate the outside diameter in order to choose the wrap(s). This formula can be rearranged to yield outside diameter (OD) as:

$$OD = \left(\frac{T}{(0.0020589)\ (f^2L^2)} - \frac{d^2}{8.39}\right)^{1/2}$$

(note: raising a quantity to the ½ power is the same as taking out its square root)

During string fabrication the soft copper winding must be held under considerable tension to get it to wrap tightly about the core wire. All authors agree that the resulting stretch of the copper winding introduces a factor of uncertainty into the tension formula, because less copper is added than predicted by the formula. My experience, based perhaps upon limited quantities of data, shows that the actual outside diameter of a wound string is less than that predicted by a straight sum of core, and wrap(s). I have found this variation to be generally less than three percent of the straight sum regardless of wrap scheme. However, I would advise that unless you are doing research or have access to a computer, the whole question of wrap stretch can be ignored with very satisfactory results.

Looking back at Taylor's formula we see that it is the weight factor, W, that we are actually trying to predict. My formulation converts weight into consideration of core size and outside diameter. Recently I have returned to Taylor's formulation and by using a computer, I am attempting to predict the inch-weight of hypothetical strings. The strings are then ordered from a stringmaker and weighed. Only very preliminary findings are in, so I have no reliable results to report, but I hope that from this approach an accurate and reliable method to take wrap stretch into account may evolve.

I wish to thank Chris Trivelas, the late Don Galt, John Van Wye, and especially Darrell Fandrich, for their valuable assistance.

1. Fenner, Klaus, "On the Calculation of the Tension of Wound Strings." The *Piano Technicians Journal,* Feb. 1963, continued in March 1963.
2. Van Wye, John R., "Wrapped String Weights and Tension Calculations." The *Piano Technicians Journal,* Oct. 1965.

CONTINUING
EDUCATION

The Grand Piano Action: A Multinational Accomplishment

Stephen H. Brady
Seattle Chapter

Prior to the invention of the piano, European chamber keyboardists faced a choice between the weak, though expressive, sounds of the clavichord and the inflexible, though adequately loud tones of the harpsichord. At some time during the late 17th century, instrument builders began searching for a mechanism which would permit the coupling of hammers to keys, creating a keyboard instrument with both the stroke-responsive dynamics of the clavichord and the tonal capacity of the harpsichord.

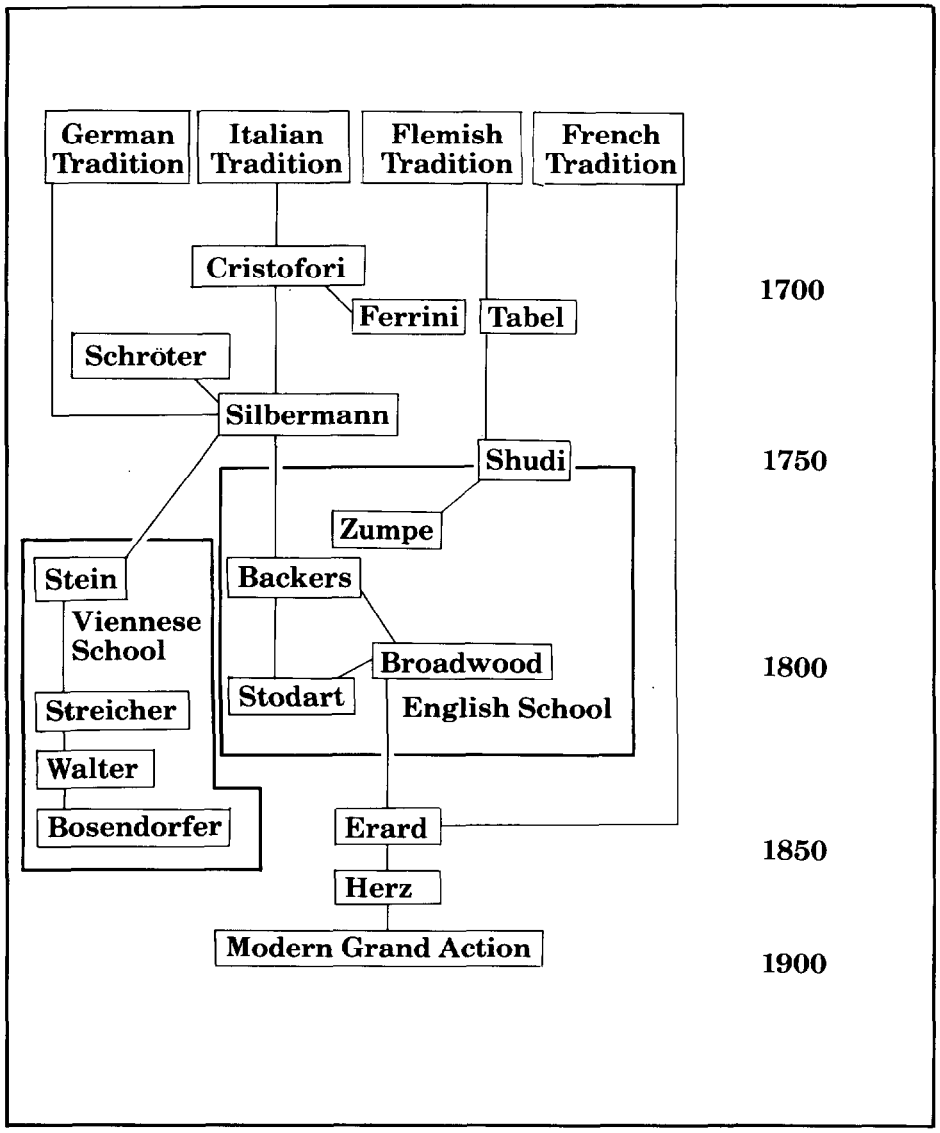
During this time, keyboard instrument builders flourished in four great schools or traditions: the Italian, the Flemish, the German and the French. Each of these schools comprised skillful and innovative craftsmen who produced instruments embodying distinctive traits and who solved the problems common to their craft in ways typical of their traditions. Builders from all of these schools applied their talents at various times to the hammer-action problem, and after a gestation spanning a century and half, the ideal mechanism finally materialized. The modern double-escapement grand piano action is the result of Flemish, German, and French traditions converging to develop Bartolomeo Cristofori's basic invention, itself a product of the Italian tradition.

As a leading exponent of this Italian harpsichord tradition, Cristofori followed famous builders such as Domenico of Pesaro in producing long, light instruments with a dry and penetrating quality of tone.[1] Italian harpsichords were regarded as having somewhat noisy actions,[2] although the key dip was fairly shallow and the actions were not burdened with lead weights in most cases.[3] He undoubtedly learned his craft in his native Padua, and by the age of 35 had achieved such a reputation that Prince Ferdinand de Medici asked him to move to Florence and assume stewardship over the Medici instrument collection. We surmise from the Medici court records that this happened in 1690, since this is when Cristofori's claims on the prince's treasury begin to appear.[4]

Although the traditional date for Cristofori's invention of the pianoforte has been 1709, based on the journalist Maffei's account of seeing four of these new instruments during a visit to the court in that year, recently-uncovered evidence suggests that Cristofori had completed at least one pianoforte by 1700. In 1969, Vicenzio Gai published a copy of the Medici instrument inventory of 1700, in which entry number 30 is "un Arpicembalo di Bartolomeo Cristofori, di nuova inventione, che fa il piano e il forte..." The instrument contained hammers to produce the soft and loud sounds.[5]

Occasionally, reports of pianofortes existing prior to 1700 have surfaced, but these have thus far proven of little significance in the actual development of the modern action. The oft-sounded implication that the mysterious "chekker" may have been a very early form of piano has been effectively discredited by Cristopher Page,[6] and Dolmetsch's description of a Dutch pianoforte dating from 1610 must be viewed with suspicion since no successor to this instrument (which was purportedly made for a French nobleman) was found in either Flanders or France till over one hundred years later. This lack of connective evidence is augmented by the fact that not even Dolmetsch will hazard a guess as to who built the instrument in question.[7]

Cristofori's pianos are the more remarkable when one considers the extent to which they foreshadowed our modern grand piano. For example, the 1726 Cristofori piano now kept in Leipzig has one lever for lifting the dampers and another for shifting the action to obtain an "una corda" effect.[8] These devices are directly analogous to the damper and "soft" pedal on the modern grand. Even more amazing was the action itself. In all of Cristofori's actions of which we have records, the hammers are mounted on an independent rail above the keys, and the hammers extend away from the player. Such is the arrangement in the modern piano action. Cristofori's early actions, as



seen in the drawings which accompanied Maffei's article, include such conceptually advanced features as intermediate levers (wippens), spring-loaded jacks, individual dampers, and even rudimentary backchecks. All these features are found in today's piano actions.

Cristofori's later actions such as those still extant in Leipzig and New York, include these same features in a different arrangement, so we can assume that Cristofori refined the action to improve its function. That the earliest actions were not wholly satisfactory is suggested by an estate inventory of Queen Maria Barbara of Spain. The inventory includes five Florentine pianos, two of which had been turned into harpsichords, implying that they were inadequate in mechanical design.[9] That the later actions were more favorably received is suggested by the fact that by 1731, Cristofori's countrymen had begun writing music specifically for the new instrument.[10]

For all of Cristofori's genius, however, and for all the impact his invention would have on future generations of piano builders, he himself derived little profit from it. He built few pianos and eventually had to go back building harpsichords.[11] Although Rosamund Harding lists three builders as Cristofori's chief pupils,[12] only one, Giovanni Ferrini, can be shown to have followed his master into the piano-building craft.

The first national tradition to join the Italian school in this confluence of contributors was the German, or more specifically, the Saxon tradition. Saxony's most important representative in this respect was Gottfried Silbermann, the famous organ builder who was a friend of J.S. Bach. Silbermann, learned the trade of building keyboard instruments in the workshop of his brother, Andreas, and settled on his own in Freiburg in 1710.[13]

Little is known about the German harpsichord-building tradition prior to the 18th century, since almost all extant German harpsichords date from 1700 or later. We can, however, draw certain conclusions from these later instruments. According to Hubbard, the Saxon harpsichord builders were less likely than their Hamburg counterparts to build complex and refined instruments. Instead, they apparently preferred simplicity in both mechanism and appearance. "This group of makers also showed less initiative in the more adventurous dispositions," says Hubbard.[14]

Silbermann, however, did not shrink from building the first successful German pianoforte. By 1736, he had been appointed organ builder to the Dresden court, and had built two pianofortes which he showed to J.S. Bach when Bach was visiting Dresden. The story of Bach's dissatisfaction with these early pianos is well known, as is his approval of later Silbermann models. These pianos of Silbermann's resembled the improved model which Cristofori had made in 1720, Silbermann adopting Cristofori's ideas without significant alteration.[15]

A number of Silbermann's pupils left Saxony for England in 1760 because the Seven Years War had halted piano-making in Saxony. Of these, Americus Backers and Johannes Zumpe were to become the most important, but for different reasons. Zumpe, with the combined Italian-German heritage received from Silbermann, worked in England under Burkat Shudi for a time. Shudi had been trained in the Flemish tradition.

In 1766, Zumpe simplified the Cristofori mechanism to its crudest form and built small "squares" which resembled clavichords. These instruments became the first commercially successful pianos in England, and Zumpe eventually retired a rich man. Backers, meanwhile, refined and streamlined Cristofori's action by removing some elements while retaining good function. Backers, together with his assistant Robert Stodart and John Broadwood (another pupil of Shudi), thus developed what is still referred to as *the* English action.

Silbermann's importance in the early history of the piano is

enhanced by the fact that both of the famous piano-building schools, namely the Viennese and the English, sprang from his workshop. In addition to the Cristofori-type actions which were adapted in the English school, Silbermann built actions of a different concept, which later evolved into the Viennese actions of the late 18th century. The basis for this alternate action was probably an action model constructed by the Saxon organist Gottlieb Schröter in 1717.[16] Silbermann had improved on this action as early as 1728, and the Viennese action was subsequently refined by one of his pupils, Johann Andreas Stein.

The Schröter-Silbermann-Stein action concept is distinguished by one basic feature: the hammer assembly is fastened to the key and pivots on it.[17] In most cases, the hammer also extends from its pivot back towards the player. As noted earlier, the Cristofori-inspired actions featured hammer assemblies mounted on an independent rail above the keys, with the hammers extending *away* from the player. The Schröter type is usally referred to as a "bouncing" or "bumping" mechanism, while the Cristofori type is called a "pushing" mechanism.

The thesis of this paper is that the modern action evolved from Cristofori's through the English school (see chart). Implicit in this view is the corollary that the Viennese school was not a structural link in the chain of action development, but that it was instead a separate line of development which finally conceded superiority to the main line and then adopted the action-design principles of that line.

To view the contributions of the English builders in proper perspective, one must consider the roots of the English harpsichord-making tradition. The most famous of the late English harpsichord builders were Kirkman, Broadwood, and Shudi. Shudi, as noted earlier, was trained in the great Flemish tradition of Ruckers and Couchet. Although Shudi was Swiss, his teacher, Hermann Tabel, was a Dutchman who brought the Ruckers methods to England in about 1700.[18] Kirkman was another of Tabel's apprentices, and Broadwood, a Scot, learned the trade from Shudi. In essence, the English school of harpsichord building represented a second flowering of the Ruckers tradition of Flanders.[19]

In general, the Flemish harpsichords were constructed with a longer string scale than either the Italian or German instruments. The string c'' in Flemish harpsichords is usually about 14 inches long, compared with about nine to 12 inches on the other types.[20] An interesting point here is that today's pianos have a scale of 13 to 14 inches, suggesting that one of the Flemish contributions to the modern piano is the scale itself, which is a prime ingredient in the tone-quality recipe. The tone of Flemish instruments is characterized as being smoother but somewhat less defined than that of Italian harpsichords. This is probably due to the heavier structure of the case, which in turn is demanded by the longer scale and consequent higher string tensions.[21]

John Broadwood emerges as the dominant figure in the English school of piano-building. Broadwood drew on the German and Italian influences received from Americus Backers, as well as on the Flemish philosophies of Shudi and Tabel. Broadwood's instruments were the first to incorporate the new English single action of Backers, and his firm led the way in the addition of pedals to the piano.

Although neither the Viennese nor the English school had established itself as the mainstream line of action development during the period when the two schools flourished (1750-1850), the seeds of the English school's ultimate triumph were planted with the invention of the double-escapement grand action by Sebastien Erard in 1821.

Erard, although born in Strasbourg and originally named Erhard, moved to Paris before beginning his training as an instrument maker, and must therefore be regarded as a practitioner of the French tradition. Erard apprenticed to a Parisian harpsichord maker in 1768 at the age of 16, but according to William Leslie Sumner, Erard's desire to "explore the fundamental principles of instrument construction led to a dispute with his master and he transferred his services to another instrument maker who more properly appreciated the talents and energy of his brilliant assistant."[22]

Among the skills handed down to the young Erard was the French tradition of making excellent actions through clean and accurate workmanship.[23] Tonally, the French harpsichords seemed to combine the worst qualities of the Italian and Flemish instruments, producing a tone which was "percussive and thin with very little sustaining power or majesty of effect."[24] The French, then, were considered master action builders rather than tonal titans. It was perhaps this assimilated tradition, plus Erard's native brilliance for things mechanical, which led to his groundbreaking invention.

The need for a major improvement in piano actions became apparent with the general trend toward larger, heavier, louder pianos. More volume was required to fill larger halls, and larger instruments with bigger hammers were needed to provide this power. As piano actions got bigger, they functioned less and less efficiently, failing to repeat reliably. This was true of both the English and the Viennese actions, but the problem was more pronounced in the English variety at this point.

Erard, seeing this need for an improved form of piano action, began experimenting with modifications of the English action. We know that Erard was familiar with both of the major action types and had built both kinds. That he gravitated to the English type is perhaps due to the presence of numerous English pianos in France at that time,[25] as well as the fact that he spent several years making pianos in London in the 1780s.[26]

In his invention of 1821, Erard reestablished the intermediate lever (wippen) used in Cristofori's earliest actions (this lever had been removed by the English builders), and also incorporated a second lever, the repetition lever, whose function it was to keep the hammer close to the string while the escapement mechanism reset itself between quickly-repeated blows. The result was fast, reliable repetition in a large action.

While this action represented a great conceptual advance, it was

far from perfect. According to reports, the action "involved such an intricate assemblage of parts that the first examples of it went easily out of order. Moreover, the mechanism was noisy."[27] Perhaps this last defect can be traced back to the Italian proclivity for building noisy actions, since Erard's new mechanism was dramatically similar to Cristofori's first actions.

Erard worked to improve the action, and by 1830 it became standard equipment in all his grands, and began to enjoy eager acceptance by pianists. The pianist and inventor Henri Herz simplified and refined the Erard mechanism in 1850, bringing it to the form on which virtually all modern actions are based. Erard's action was also modified by several other makers, notably Kriegelstein, Bord, and Langer, but none of these versions endured.

Without Erard's invention or one similar to it, the growth process of the piano would quite probably have halted early in the 19th century. It was clear at the time that pianos could be made no larger without sacrificing a great deal of playability. Not only might the piano have stopped evolving without Erard's breakthrough, but so would virtuosity have been severely curtailed. The 19th century virtuoso Ignaz Moscheles foresaw the impact of Erard's perfected mechanism after playing on one. He said, "This quicker action of the hammer seems so important that I prophesy a new era in the manufacture of pianos." Moscheles was right.[28]

In Erard, we see the nexus of the four great traditions; with his contribution, the confluence was complete. Since the time of Herz the action's development has been one of small modifications and refinements, consisting mainly of variations in the type of repetition spring used.

The final proof of the preeminence of the Cristofori-English line was the decision by Bösendorfer in 1909 to cease production of the Viennese action in favor of the Schwander-modified double-escapement action. Bösendorfer, plagued by the lack of reliable repetition and the bumpy feel of a too-large Viennese action, saw the move as necessary to their survival as manufacturers of leading concert instruments. They were the last major firm to make the change.[29]

With Bösendorfer's acceptance of the double-escapement action, the Viennese school was virtually terminated, and the Cristofori-inspired actions emerged as the mainstream of grand piano action development.

Notes

[1] Hubbard, Frank, *Three Centuries of Harpsichord Making* (Cambridge: Harvard University Press, 1965), p. 13.
[2] Ibid., p. 15.
[3] Ibid., p. 14.
[4] Russell, Raymond, *The Harpsichord and Clavichord* (New York: Norton, 1973), appendix I.
[5] Gai, Vicenzio, *Gli Strumenti Musicale della Corte Medicea* (Firenze: Licosa, 1969), p. 11. Translation: "a harpsichord of Bartolomeo Cristofori, of new invention, which plays soft and loud."
[6] Page, Cristopher, "The Myth of the Chekker," *Early Music,* 7 (1979), 482-87.
[7] James, Philip, *Early Keyboard Instruments* (London: Peter Davies, Ltd., 1930), p. 47.
[8] Hollis, Helen Rice, *The Piano* (New York: Hippocrene Books, 1975), p. 66.
[9] Russell, *The Harpsichord and Clavichord,* p. 38.
[10] Sumner, William Leslie, *The Pianoforte,* 3rd ed. (London: MacDonald, 1971), p. 41.
[11] Closson, Ernest, *History of the Piano* (London: Paul Elek, 1947), p. 81.
[12] Harding, Rosamund, *The Pianoforte: Its History Traced to the Great Exhibition of 1851* (Cambridge: University Press, 1933), p. 29.
[13] Boalch, Donald, *Makers of the Harpsichord and Clavichord* (Oxford University Press, 1974), p. 163.
[14] Hubbard, *Three Centuries of Harpsichord Making,* p. 174.
[15] Hollis, *The Piano,* p. 67.
[16] Dolge, Alfred, *Pianos and Their Makers* (Covina, 1911; rpt. New York: Dover, 1972), p. 42-44.
[17] Pfeiffer, Walter, "The Bumping Action," *Piano Technicians Journal* (Trans. James Engelhardt), 22, No. 1 (1979), p. 11.
[18] Boalch, *Makers of the Harpsichord and Clavichord,* p. 155.
[19] Ibid.
[20] Hubbard, *Three Centuries of Harpsichord Making,* p. 45.
[21] Ibid., p. 71.
[22] Sumner, *The Pianoforte,* p. 54.
[23] Hubbard, *Three Centuries of Harpsichord Making,* p. 124.
[24] Ibid., p. 104.
[25] Ehrlich, Cyril, *The Piano: A History* (London: J.M. Dent and Sons, 1976), p. 16.
[26] Loesser, Arthur, *Men, Women and Pianos* (New York: Simon and Schuster, 1954), p. 321.
[27] Hollis, *The Piano,* p. 62.
[28] Swan, Annalyn, "Englightenment's Gift to the Age of Romance," in *Lives of the Piano,* ed. James R. Gaines (New York: Holt, Rinehart and Winston, 1981), p. 67.
[29] Pfeiffer, "The Bumping Action," p. 16.

ON PITCH

Eighth In A Series of Articles Dealing With The Integration And Equation Of Aural and Electronic Tuning Techniques

Rick Baldassin
Utah Valley Chapter

Last month we began our discussion on why different types of octaves are tuned in particular areas of the piano. There are two primary reasons for this. First, different partials are louder than others in different areas of the piano, and second, varying the level of partial matching causes varying degrees of out-of-tuneness (beating) in neighboring pairs of partials.

When a piano string is struck, not only is the fundamental frequency (f) present, but frequencies nearly representing 2f, 3f, 4f, etc., also are present in varying amplitudes. They constitute what is known as the "spectrum" for the particular note. A "spectrum analyzer" can give a visual representation of the relative partial strengths for the different notes.

The spectra for seven C's on the piano were examined individually and then in pairs to see which pairs of partials had the greatest amplitudes.

The accompanying chart illustrates our findings from last month.

This month we will discuss how varying the level of partial matching causes varying degrees of out-of-tuneness (beating) in neighboring pairs of partials.

Although certain partial matchings have greater amplitudes in different areas of the piano, other partial levels will be audible at the same time. These other partial levels may be beating, or out of tune. This is of course due to inharmonicity, which for the most part allows us to tune only one partial level pure at a time, leaving beats in the rest. The job of the piano technician is to eliminate beating in the loudest pair(s) of partials, and at the same time, to minimize beating in the neighboring pairs, thus allowing the piano to sound as good as possible.

To study the out-of-tuneness in neighboring partials, I went to a large grand piano and did some measuring. I took an octave and tuned it as a pure 2:1 octave. I then measured it as a 4:2, 6:3 ... and 12:6 octave, in each case recording the cent width, plus or minus. The octave was then tuned as a pure 4:2 octave, and measured as a 2:1, 6:3, etc. This procedure was repeated until the same octave had been tuned as a 12:6 octave, and measured like all the rest. This entire procedure was repeated for seven octaves in the piano: C1-C2, C2-C3, C3-C4, C4-C5, C5-C6, C6-C7, and C7-C8.

Having recorded the cent widths, I could then calculate beat rates. In some cases, there are inconsistencies which I am not certain should be attributed to room noise, the nature of the instrument, or the fact that it was getting closer to lunchtime. In the case of the cent widths, all are assumed to be positive unless otherwise noted. The "—" indicates no reading was available, either due to the fact that the partial amplitude was too small to read, or that my measuring device did not read that high.

Let us first examine the C1-C2 low bass octave. Reading the Cent

Note	Partials with the Greatest Amplitudes	Octave	Pairs with the Greatest Amplitudes	General Matching
C1	3,4,5,6,10,12	C1-C2	6:3, 8:4, 10:5, 12:6	same
C2	2,3,4,5,6	C2-C3	2:1, 6:3	6:3
C3	1,3,4,5,6,7,10	C3-C4	2:1, 4:2, 6:3	4:2, 6:3
C4	1,2,3,4	C4-C5	2:1, 4:2	4:2
C5	1,2,3	C5-C6	2:1, 4:2	2:1, 4:2
C6	1,2	C6-C7	2:1	2:1
C7	1,2	C7-C8	2:1	2:1

Width chart is somewhat misleading because a cent width of 10 cents at the 2:1 level is considerably less in terms of beats per second than a width of 10 cents at the 12:6 level. Take for example the case where the octave is tuned as a 10:5 octave and measured as a 2:1 octave. The Cent Width chart shows the 2:1 octave is 7.5 cents wide. This seems like quite a bit, but the Beats Per Second chart shows that this translates to merely 0.28 BPS. On the other hand, let us take the example of the octave tuned as a 4:2 and measured as a 10:5. The Cent Width chart shows a width of -7.4, which translates into 1.41 BPS. It is obvious that for our purposes here, the Beats Per Second chart will be the one to analyze. I have included the Cent Width chart to show what measurements were actually taken.

Evaluation of the Beat Per Second Chart shows that when this octave is tuned as a 10:5 octave, there is less than half a beat per second in any of the neighboring pairs. Tuning as 12:6 results in less than one beat per second in any of the other partials.

If this octave were tuned as a 6:3, there would be beats of 1.06 at the 10:5 level, and 1.85 at the 12:6 level. Reviewing our findings from last month, both the 10:5 and 12:6 pairs have large amplitudes, so these beats would be very audible. In this case the 10:5 octave would be the best choice, considering both amplitude of the partials and beating in the neighboring pairs. The 12:6 would be another good choice. This would create more of a low "rumble" which some technicians find desirable. Before we proceed, it must be stated again that this was a large grand piano. Smaller pianos with shorter strings and therefore higher inharmonicity would more than likely be tuned as 6:3 or 8:4, and the remaining beats at 10:5 and 12:6 would have to be lived with.

I have spoken with some technicians who feel that the 10:5 octave is not a good choice because it leaves the note too flat, but on the other hand like tuning 12:6 octaves in large pianos. I find here an inconsistency, since the 12:6 tuning would leave the note flatter than the 10:5 tuning. I believe this misconception stems from the fact that when the 10:5 octave is tuned electronically, the cents dial must be turned about 14 cents flatter than the previous setting. This change merely compensates for the equal tempering of the note dial, and has nothing to do with the absolute pitch which results from tuning a 10:5 octave. It also follows that if 4:2 is wider than 2:1, and 6:3 is wider than 4:2, etc., than 12:6 will be wider than 10:5.

Let us look now at the charts for the C2-C3 octave to see what the best choice for this octave would be.

Evaluation of the Beats Per Second chart alone would seem to indicate that 10:5 would again be the best choice, with all beats about a half beat per second or less. Re-

CENT WIDTH

Measured As

Tuned As	C1-C2	2:1	4:2	6:3	8:4	10:5	12:6
	2:1	0	-2.6	-3.7	-6.4	-8.1	-11.7
	4:2	3.9	0	-2.3	-4.2	-7.4	-9.4
	6:3	3.3	3.0	0	-2.5	-5.6	-8.3
	8:4	3.4	3.1	2.5	0	-3.0	-6.3
	10:5	7.5	5.1	3.7	2.2	0	-2.2
	12:6	10.6	9.5	8.7	5.1	2.5	0

Tuned As	C2-C3	2:1	4:2	6:3	8:4	10:5	12:6
	2:1	0	-3.6	-3.6	-4.4	-4.5	-5.1
	4:2	1.2	0	-0.4	-0.9	-2.3	-3.1
	6:3	1.5	0.8	0	-0.5	-1.9	-2.7
	8:4	1.9	1.2	0.9	0	-1.8	-2.8
	10:5	3.5	2.5	2.3	1.5	0	-1.0
	12:6	4.0	3.5	3.0	2.6	1.3	0

Tuned As	C3-C4	2:1	4:2	6:3	8:4	10:5	12:6
	2:1	0	-2.7	-2.4	-3.1	-4.3	-6.2
	4:2	1.2	0	0	-0.8	-2.0	-3.0
	6:3	0.6	0	0	-1.5	-2.7	-3.9
	8:4	2.3	0.9	0.9	0	-1.6	-2.8
	10:5	3.9	2.3	2.2	1.3	0	-1.3
	12:6	4.3	3.6	3.4	2.7	1.2	0

Tuned As	C4-C5	2:1	4:2	6:3	8:4	10:5	12:6
	2:1	0	-1.3	-2.1	-3.7	-6.2	-9.3
	4:2	2.4	0	-1.2	-1.2	-3.2	-6.0
	6:3	1.9	0.9	0	-2.1	-4.0	-7.1
	8:4	3.9	2.1	1.5	0	-2.6	-5.8
	10:5	6.9	5.4	4.8	2.7	0	-2.7
	12:6	10.5	7.8	7.6	5.5	2.9	0

BEATS PER SECOND

Measured As

	Tuned As	C1-C2	2:1	4:2	6:3	8:4	10:5	12:6
C1-C2		2:1	0.00	0.20	0.42	0.97	1.54	2.64
		4:2	0.15	0.00	0.26	0.63	1.41	2.12
		6:3	0.12	0.23	0.00	0.38	1.06	1.85
		8:4	0.13	0.23	0.28	0.00	0.57	1.42
		10:5	0.26	0.39	0.42	0.33	0.00	0.50
		12:6	0.40	0.72	0.99	0.77	0.48	0.00

	Tuned As	C2-C3	2:1	4:2	6:3	8:4	10:5	12:6
C2-C3		2:1	0.00	0.54	0.81	1.33	1.71	2.31
		4:2	0.09	0.00	0.09	0.27	0.88	1.40
		6:3	0.11	0.12	0.00	0.15	0.69	1.22
		8:4	0.14	0.18	0.20	0.00	0.69	1.27
		10:5	0.26	0.38	0.52	0.45	0.00	0.45
		12:6	0.30	0.53	0.68	0.79	0.50	0.00

	Tuned As	C3-C4	2:1	4:2	6:3	8:4	10:5	12:6
C3-C4		2:1	0.00	0.82	1.09	1.87	3.27	5.60
		4:2	0.18	0.00	0.00	0.48	1.52	2.71
		6:3	0.09	0.00	0.00	0.91	2.05	3.53
		8:4	0.35	0.27	0.41	0.00	1.22	2.53
		10:5	0.59	0.70	1.00	0.79	0.00	1.18
		12:6	0.65	1.09	1.54	1.63	0.91	0.00

	Tuned As	C4-C5	2:1	4:2	6:3	8:4	10:5	12:6
C4-C5		2:1	0.00	0.79	1.90	4.47	9.43	16.80
		4:2	0.78	0.00	1.09	1.45	4.87	10.85
		6:3	0.57	0.54	0.00	2.54	6.09	12.89
		8:4	1.18	1.27	1.36	0.00	3.96	10.52
		10:5	2.09	3.27	4.35	3.27	0.00	4.89
		12:6	3.18	4.73	6.90	6.66	4.42	0.00

ferring to the chart of our findings from last month we see, however, that the loud pairs are 2:1 and 6:3. Because of this, the 6:3 or possibly 8:4 matching would be best as they minimize beating in the louder pairs. Earlier it was mentioned that it would be shown why 2:1 would not be a good choice in this region, although it is a loud pair. Notice that when the octave is tuned as a 2:1 that a beat of 0.81 results at the 6:3 level, which is also a loud pair. If the octave is tuned as a 6:3, there are only 0.11 beats per second at the 2:1 level. The 6:3 is therefore the better choice.

Evaluation of the Beats Per Second chart for the C3-C4 octave indicates that either the 4:2 or 6:3 would minimize beating. The chart with last month's findings confirms that 2:1, 4:2, and 6:3 are the loud pairs, so either 4:2 or 6:3 would be the best choice for this octave. Because the strings in this piano are very long, and the inharmonicity is very low, the result of tuning either a 4:2 or 6:3 octave here would be nearly the same. In a smaller piano, this probably would not be the case.

Evaluation of the Beats Per Second chart for the C4-C5 octave indicates that 4:2 is the best choice for minimizing beats in the loud pairs, which are 4:2 and 2:1 according to last month's findings.

Evaluation of the Beats Per Second chart for the C5-C6 octave indicates that 4:2 or somewhere between 4:2 and 2:1 is the best placement for minimization of beats in the loud pairs, which are 2:1 and 4:2 according to last month's findings. Staying as wide as possible will help to keep the double octaves from becoming too flat.

Let us now evaluate the C6-C7 charts to choose the best alternative for the upper treble.

Evaluation of the C6-C7 Beats Per Second chart indicates that 2:1 or somewhere between 4:2 and 2:1 is the best placement for minimization of beats at the loud pair, which is 2:1. Again, staying as wide as possible will help to keep the double octaves from becoming too flat.

The C7-C8 charts show that there is not much to evaluate. 2:1 is the obvious choice, again staying as wide as necessary to keep the double octave from being too flat.

In conclusion, it has been shown that there are two primary reasons why different types of octaves are tuned in particular areas of the piano. This month we have evaluated the effects of varying the level of partial matching and its effects on beating in neighboring pairs of partials, and so trying to minimize beating in the pairs which were discovered loudest last month.

Next month we will discuss how to execute compromises between various types of octaves and double octaves.

CENT WIDTH
Measured As

Tuned As \ C5-C6	2:1	4:2	6:3	8:4	10:5	12:6
2:1	0	-3.9	-9.7	-16.4	—	—
4:2	4.6	0	-4.6	-10.5	—	—
6:3	10.3	6.1	0	-5.9	—	—
8:4	17.1	12.2	6.5	0	—	—
10:5	—	—	—	—	0	—
12:6	—	—	—	—	—	0

Tuned As \ C6-C7	2:1	4:2	6:3	8:4	10:5	12:6
2:1	0	-5.4	-14.6	—	—	—
4:2	8.3	0	-8.6	—	—	—
6:3	16.8	8.0	0	—	—	—
8:4	—	—	—	0	—	—
10:5	—	—	—	—	0	—
12:6	—	—	—	—	—	0

Tuned As \ C7-C8	2:1	4:2	6:3	8:4	10:5	12:6
2:1	0	—	—	—	—	—
4:2	—	0	—	—	—	—
6:3	—	—	0	—	—	—
8:4	—	—	—	0	—	—
10:5	—	—	—	—	0	—
12:6	—	—	—	—	—	0

BEATS PER SECOND
Measured As

C5-C6

Tuned As \ C5-C6	2:1	4:2	6:3	8:4	10:5	12:6
2:1	0.00	4.71	17.52	39.47	—	—
4:2	2.73	0.00	8.32	25.31	—	—
6:3	6.24	7.39	0.00	14.24	—	—
8:4	10.39	14.80	11.79	0.00	—	—
10:5	—	—	—	—	0.00	—
12:6	—	—	—	—	—	0.00

C6-C7

Tuned As \ C6-C7	2:1	4:2	6:3	8:4	10:5	12:6
2:1	0.00	13.04	52.66	—	—	—
4:2	10.06	0.00	31.08	—	—	—
6:3	20.41	19.39	0.00	—	—	—
8:4	—	—	—	0.00	—	—
10:5	—	—	—	—	0.00	—
12:6	—	—	—	—	—	0.00

C7-C8

Tuned As \ C7-C8	2:1	4:2	6:3	8:4	10:5	12:6
2:1	0.00	—	—	—	—	—
4:2	—	0.00	—	—	—	—
6:3	—	—	0.00	—	—	—
8:4	—	—	—	0.00	—	—
10:5	—	—	—	—	0.00	—
12:6	—	—	—	—	—	0.00

Later 18th-Century Music And Tuning In Germany

Jack Greenfield
Chicago Chapter

Financial Support of Musical Activities

By the middle of the eighteenth century, musical activities in Germany were supported mainly by patronage of the nobility. Courts in the larger cities maintained large staffs of professional musicians and vocalists while smaller courts employed a small nucleus of full-time musicians who were supplemented by members of the court staff with other duties who could also play an instrument or sing. Standards of musicianship in the great courts were high. The orchestra with the reputation of being the finest in Europe was the one at Mannheim. Salaries paid to leading instrumentalists were well above the average in other orchestras. Visitors to Mannheim were dazzled by the precision of style and discipline of the orchestra.

Several hundred composers were employed in Germany with no duties other than writing music full time. Most of this was stereotyped "occasional music" written to order. Court composers did not rank high in the social scale and had the status of upper servants. When Mozart visited the court at Salzburg, the city in which he was born, he was expected to eat with the valets who were considered his equal in rank. Bach, when holding the post of Kapellmeister or musical director, ranked higher socially than he would have as a composer or clavierist alone.

The position of music in the church had declined greatly and the use of orchestras for religious music was not common. Music now came to be looked upon as an art to be performed for the purpose of providing pleasure, whereas about a century before, the main purpose of music was considered service in the church.

Increase In Performance For General Public

A further change in the support of music began to take place as social conditions reduced the power and wealth of the aristocracy. Musical organizations such as those in Leipzig in 1763, Vienna in 1771, Berlin in 1790, and others elsewhere in Europe were formed to sponsor public musical performances. The expanding middle classes provided growing audiences. The rising general interest in music encouraged development of musical journalism devoted to news, reviews, and criticism of musical activities, as well as increased publication of books on musical history and theory.

"Court composers did not rank high in the social scale and had the status of upper servants. When Mozart visited the court of Salzburg, the city in which he was born, he was expected to eat with the valets who were considered his equal rank."

Change In Musical Style

During the interval between the death of Johann Sebastian Bach in 1750 and the mature compositions of Joseph Haydn and Wolfgang Amadeus Mozart around the start of the last quarter of the century, musical composition went through a great transition from the Baroque to the Classic style. Lengthy interwoven contrapuntal melodic lines gave way to shorter, expressive, homophonic themes supported by almost purely harmonic backgrounds. In keyboard composition, the suite, prelude, fugue and toccata gave way to the sonata now established as a specific musical form. However, there was no change from the elemental harmonic structure and tonal system of the late Baroque.

Pre-Classic Composers

Although their music is performed little today, several of the sons and pupils of Johann Sebastian Bach were among the most popular clavierists of the third quarter of the 18th century, the Pre-Classic period. Wilhelm Friedemann Bach (1710–1784), the second

child but the first son, wrote more like his father than the others. Carl Phillip Emanuel Bach (1714–1788), the second, most gifted son and the most prolific writer, wrote over 400 pieces for solo keyboard instruments and at least 50 concertos, many still in manuscript. Carl Phillip Emanuel experimented with many new ideas such as unusual modulations and key changes and was one of the most influential composers of his generation. Johann Christian Bach (1735–1782), the youngest son, studied in Italy for several years after early training at home and then settled in London for the last twenty years of his life. He wrote about 70 sonatas for keyboard alone or accompanied by another instrument, and some Italian operas. Several were very successful in performances in England. Johann Christian was the only member of the family who showed a preference for the piano which then was first beginning to compete with the harpsichord in popularity. Some of his sonatas appear to have been written for piano. Mozart, Haydn, and Beethoven each were influenced by the work of Johann Christian Bach.

During the third quarter of the 18th century, it became a common practice to indicate keyboard compositions "for harpsichord or pianoforte." While this was continued for some time, the harpsichord and clavichord were nearly obsolete by 1775. Haydn and Mozart wrote most of their keyboard compositions for piano.

"During the third quarter of the 17th century, it became a common practice to indicate keyboard compositions 'for harpsichord or pianoforte.'"

Later German Theorists

German authors of significant writings on keyboard tuning and temperament after Neidhardt include Jakob Adlung (1699–1762), Friedrich Wilhelm Marpurg (1718–1795), Johann Sebastian's son C.P.E. Bach, and his pupil Johann Philipp Kirnberger. Adlung studied with Johann Nikolaus Bach, an organist and builder of organs and harpsichords in Jena, another of the 53 Bachs who were professional musicians during a span of more than three centuries. Adlung worked as an organist and wrote books giving technical information on German Baroque tuning. The other three authors mentioned were contemporaries among a group of leading theorists active later and centered in Berlin who devoted much attention to equal temperament which was still used very little in musical performance. Kirnberger's writings contain his thoughts on equal temperament and in addition his views on the more popular practical tuning systems.

Kirnberger was born in Central East Germany. During his early years he received training on the violin, harpsichord, and organ. At the age of 18 he went to Leipzig where he studied composition and performance with J.S. Bach for two years. He then began his career as an instrumentalist, teacher, composer, and music director. After a number of different court and church positions in Poland and Germany from 1741 to 1758, he entered the service of Princess Anna Amalia of Prussia where he remained for the rest of his life. He started to issue theoretical works on harmony, counterpoint, and composition and musical compositions including solo keyboard music in 1757 and continued such writing until the end of his life.

Kirnberger regarded Johann Sebastian Bach with reverence. He devoted much effort trying to bring about greater public recognition of Bach's music. In his own teaching and writing, he presented what he considered Bach's methods. However, he did not agree with Bach in all matters. Although he stated firmly that Bach had instructed him to tune all major thirds larger than pure, he recommended some Baroque temperaments with pure major thirds.

Kirnberger Temperaments

Kirnberger II, a simple ½-syntonic comma well temperament in a 1779 book by Kirnberger, may have been used as far back as the early 16th century, according to Jorgensen. In Kirnberger's version, the series runs from D^{b} to $F^{\#}$ as shown in the table. All fifths are pure except DA and AE, each tempered ½-syntonic comma (11 cents), and $F^{\#}$ D^{b}, tempered two cents to make up the difference between the ditonic comma in a Pythagoriean tuning circle. Figures for tempering of the major thirds were calculated by subtracting from 22 cents the total reduction in cents of the component fifths. This gives zero tempering for the major thirds CE, GB, and $DF^{\#}$ which are pure with a value of 386 cents. Except for two of intermediate size, the remaining major thirds are the wide Pythagoriean size or close to it. Minor thirds, which are not shown, are tempered narrower than just in a similar pattern. A large number of major and minor triads formed are proportional beating because of the equal tempering of the major and minor thirds they contain. A few pure triads are also produced.

Because the Kirnberger ½-comma temperament was not suitable for keys with many sharps and flats and the objections to the amount of tempering of the two reduced fifths, Kirnberger also advocated a ¼-comma temperament in which the syntonic comma was divided among the fifths CG, GD, DA, and AE. This gives only one pure major third but an increased number of thirds of intermediate size and more acceptable tempered fifths. References designate this temperament as either "Kirnberger III" or "Aron-Neidhardt Well Temperament" because of its development from earlier temperaments of these men. Jorgensen considers the Aron-Neidhardt-Kirnberger ¼-comma temperament to have been the leading temperament of the 18th century (*Journal*, January 1978, p. 18-19). Other ¼-comma well-temperaments by Werkmeister, Neidhardt, Marpurg, and others, differing in placement of tempered fifths with resulting variations in size of thirds, were fairly popular also.

"Because the Kirnberger 1/2-comma temperament was not suitable for keys with many sharps and flats and the objections to the amount of tempering of the two reduced fifths, Kirnberger also advocated a 1/4-comma temperament in which the syntonic comma was divided among the fifths CG, GD, DA and AE."

The Aron-Neidhardt-Kirnberger temperament is relatively easy to tune and is used today for performance in historic temperament when applicable — for keyboard music composed between 1722 to 1809 indicated by Jorgensen. The procedure for the theoretical temperaments consists of the following which can be done in any sequence:

1. Tune E_4 pure to C_4; tune C_3-D_4-A_3 to give a series of equally tempered narrow fifths or wide fourths as in ¼-comma meantone. Jorgensen's beat rate figures are: G_3 C_4-2.4, G_3 D_4-1.8, A_3 E_4-2.0, A_3 D_4-2.7.
2. From C_4, tune F_3-B_3-E_4-A_3-D_4 to give a series of pure fourth or fifths.
3. From E_4, tune B_3-F_3 to give a series of pure fourths. The interval F_3-D_4, theoretically equivalent to an equal temperament fifth, closes the circle.

Jorgensen's *Tuning The Historic Temperaments by Ear* contains additional data on interval beat rates as well as instructions for the Equal Beating Aron-Neidhardt method which is also given in Martin Tittle's "Well Temperament" (*Journal*, July 1977, p. 16).

Kirnberger Well-Temperaments

Tempering of Intervals (cents from just)
Intonation (cents from C)

Interval / Tonic	D^{b}	A^{b}	E^{b}	B^{b}	F	C	G	D	A	E	B	$F^{\#}$
II. ½-comma (syntonic)												
Fifth	0	0	0	0	0	0	0	=11	=11	0	0	=2
Major Third	22	22	22	22	11	0	0	0	9	20	20	20
Intonation	90	792	294	996	498	0	702	204	895	386	1088	590
III. ¼-comma (syntonic)												
Fifth	0	0	0	0	0	=5.5	=5.5	=5.5	=5.5	0	0	=2
Major Third	22	22	16.5	11	5.5	0	5.5	11	14.5	20	20	20
Intonation	90	792	294	996	498	0	696.5	193	889.5	386	1088	590

VONDER

WERKSTATT

Grand Action Stack

Priscilla and Joel Rappaport
Austin, Texas, Chapter

Restoring the action stack to new condition is an important part of rebuilding. In older instruments especially, the stack and its parts are often extremely dirty. There may be moth damage to felts throughout the wippens or we may find the residue of a liquid that was spilled in the piano. In restoring an action, we prefer to use the original parts if this is both possible and practical. Using new replacement parts is recommended only if the original parts are damaged or the wood is too brittle.

Discounting the hammer shank "rest" rail which is easily removed, there are three rails in the standard action stack: hammer, wippen and let-off button. Many times the hammer rail will have sandpaper glued onto the top to keep the flange positioned after hammer spacing. Sometimes there will be a small pin driven into the rail at the back of each flange for the same purpose. There will be a small half circle cut out there in the flange to accept the pin. It is still possible with this method to make minor adjustments to the hammer spacing without removing the pin.

The wood in both rails should be checked to make sure that the screw holes are in good condition. There should be no cracks going from hole to hole. If so, the screws will never hold and the rail should be either repaired or replaced.

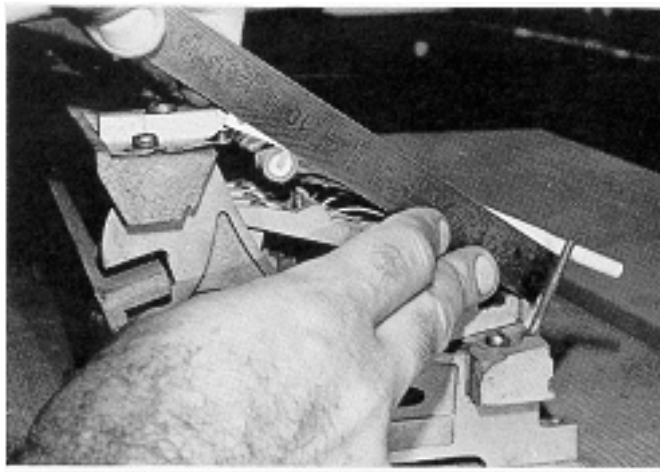
Before taking anything apart, we want to make sure we can get it back together again correctly. One of the most important measurements in the stack is the action spread. This is the distance between center pins of the hammer flange and the wippen flange. Usually it is between 111 and 115 mm or around 4 7/16 inches. If this measurement is questionable, the action spread measurement should be available for that model of piano from the manufacturer's service department. Another way to estimate this is to align the back edge of the jack with the back edge of the core wood in the knuckle. First set the jack (front and back) adjustment screw in the middle so that later fine adjustments are possible. The long part of the jack should be perpendicular to the hammer shank length when both back edges of the knuckle core wood and the jack are aligned correctly.

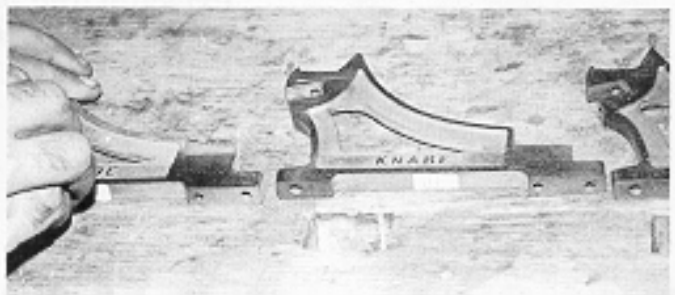
Another thing to do before disassembly is to number the wippens in an inconspicuous place, like right next to the saddle felt. If the flanges will be removed and repinned, number them also. Many times, the wippens will have springs of different sizes to compensate for the difference in weight of the hammers from bass to treble. Therefore, it is best to keep the wippens in the original order. If a replacement wippen is present, try to measure the diameter of the spring with a micrometer and put that wippen in the correct section. We like to match up the wippens with the same flange in case they have been worked over to get a good fit between wippen birds-eye and flange. It may save trouble later on.

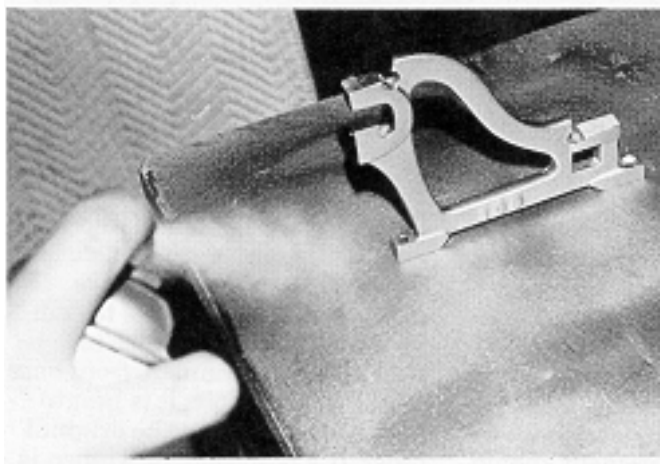
> "Before taking anything apart, we want to make sure we can get it back together again correctly. One of the most important measurements in the stack is the action spread."

A shop hint is in order here: When removing screws and washers from an action, put them in small cans labeled with the name of the piano or owner and their place in the action. Sometimes the hammer screws will be a different size from wippen screws. If screws are put in a pile on the workbench, some have a habit of disappearing for weeks or months. This has happened to us so often that we have a small plastic box in our shelves with miscellaneous action screws marked the "panic box." This is exactly what happens when we try to put things back together and come up short a couple of screws.

The accompanying photos show the work done to the rails and brackets of this action stack. Next month we will cover the repairs on the wippens.







1 *Measure the action spread carefully and make a note of it. Measure both bass and treble ends.*

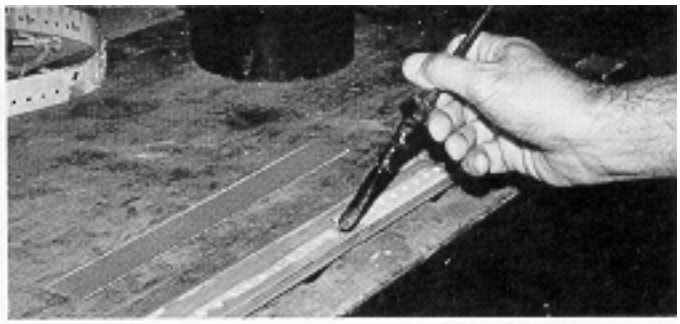
2 *Number the brackets from bass to treble. Sometimes bracket feet are shaped differently to get between the keys and the correct order is important. Either scratch the number into the bottom of the bracket or write it on a piece of masking tape attached to the bracket as shown here. Also note any shims the factory has placed by a bracket. Mark where they go if they are not glued on and put them back later. They are there for a purpose.*

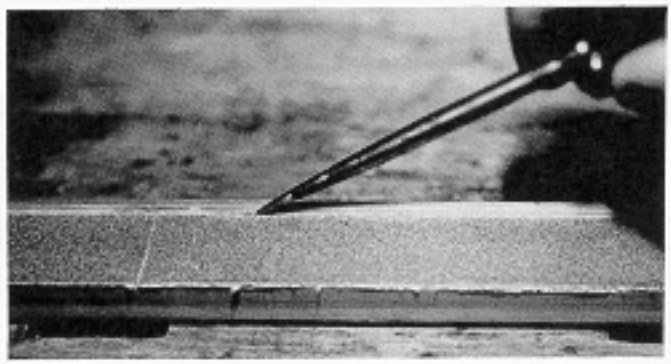
3 *Remove the rails from the brackets. Clean the brackets with steel wool to remove dirt and grease. If they are nickel-plated and look good, they are ready.*

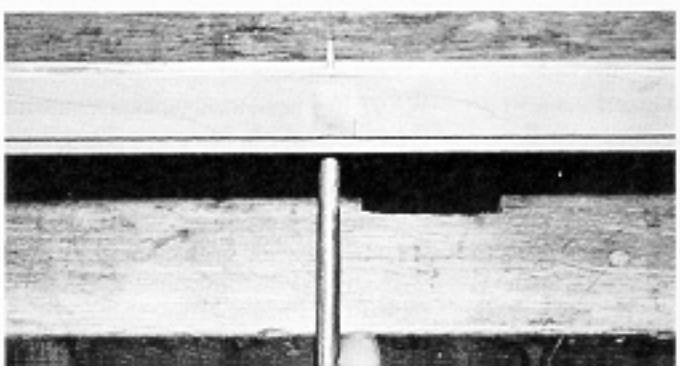
4 *If you want, spray the clean brackets gold. It really sharpens the appearance of your work.*

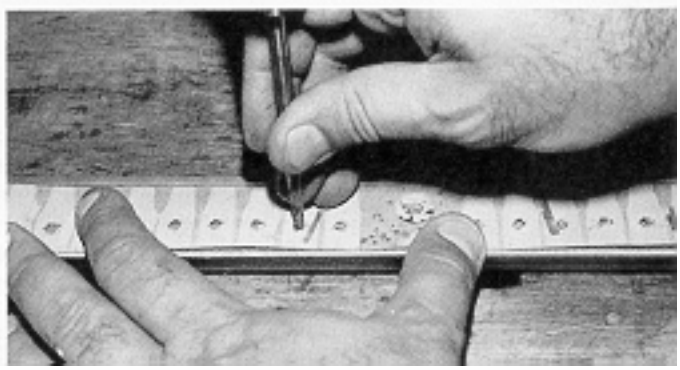
5 *Leave the original sandpaper on the hammer rail. With a sanding block, clean the wood of the rails and spray the rails with a couple of coats of sealer or clear lacquer for protection and looks.*

6 *When the lacquer is dry, carefully remove the old sandpaper using a sharp chisel. Avoid taking away any wood from the rail. The rail under the old sandpaper has been kept free of lacquer. Try to keep the old sandpaper intact; it will be used later as a pattern.*









7 *Use the width of the old sandpaper as a pattern and cut several strips of new sandpaper. 120 to 220 grit is used. Match the thickness of the old sandpaper as closely as possible.*

8 *Glue the new strips of sandpaper onto the top of the rail. Avoid lumps of glue that will tilt flanges later. Keep glue out of the flange screw holes.*

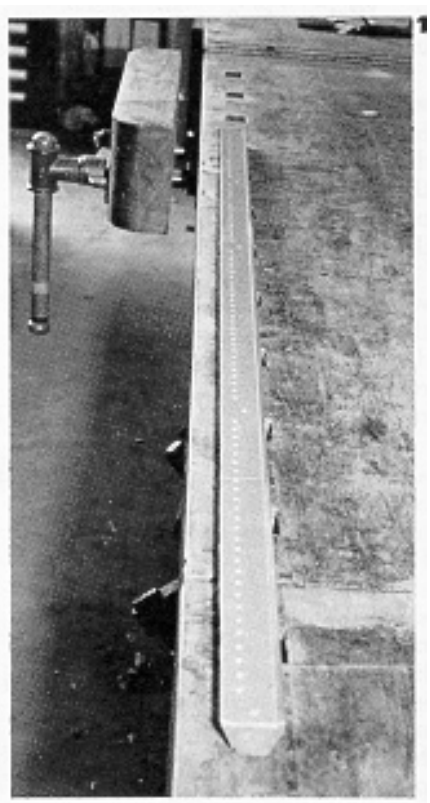
9 *Press the new sandpaper using a flat piece of wood. We like to use hot glue because it sets up quickly. Contact cement can be used, but you must be very accurate at first contact.*

10 *Clean out the excess glue from the corner at the back of the rail. If this remains, it will interfere with the flange. Sand the other edge of the rail clean so that nothing interferes with the repetition lever or drop screw.*

11 *From underneath, open the holes for the machine screws that go through the rail. Position the old sandpaper over these holes and you have a template that allows you to easily find the old flange screw holes.*

12 *Quickly and accurately use an awl to poke through the new sandpaper for the flange screw holes.*

13 *The rail is clean, lacquered, fitted with new sandpaper and is as good as new!*



THE
ECLECTIC'S
NOTEBOOK

Now, the Acupuncture

Christopher S. Robinson
Connecticut Chapter

Last month we discussed the proposition of removing non-active material from the piano hammer to make it lighter, thereby enabling it to reverse its direction more rapidly so that energy is not removed from the vibrating string during the rebound process. In re-reading that material, it has occurred to me that some illumination of the actual processes involved might be in order.

Please look at *picture one.* Here we see the excess wooden molding being removed on a nine-inch disc-sander. The picture looks as though the felt is being filed also, but that is a two-dimensional illusion.

In *picture two,* we see the tail-weight being removed. If you think that this photograph depicts a dangerous operation, you are correct! The use of a holding-fixture is recommended.

At this point, it is advisable to answer the question of what might be done with older hammers which are in service on an existing piano. Please refer to *picture three,* which shows a worn hammer being shaped with a moto-tool. Please note that there is no guide on the little drum sander and that it is being used to eliminate excess material on the *shoulder* of the hammer. Their crown, or striking-point has not been touched.

In *picture four* we see the hand-filing process taking place on the same hammer as its final form and finish begin to emerge. My suggestion to the reader is to try this with a set of hammers which has been designated for replacement. You will be surprised at how easily free-hand control of the small drum sander can be mastered!

Ok, as our esteemed colleague Ernie Juhn would say, "now, the acupuncture." One thing that your writer likes to do when installing a new set of hammers is to do any needling that he *knows* they are going to require *before* the units are glued onto their hammershanks.

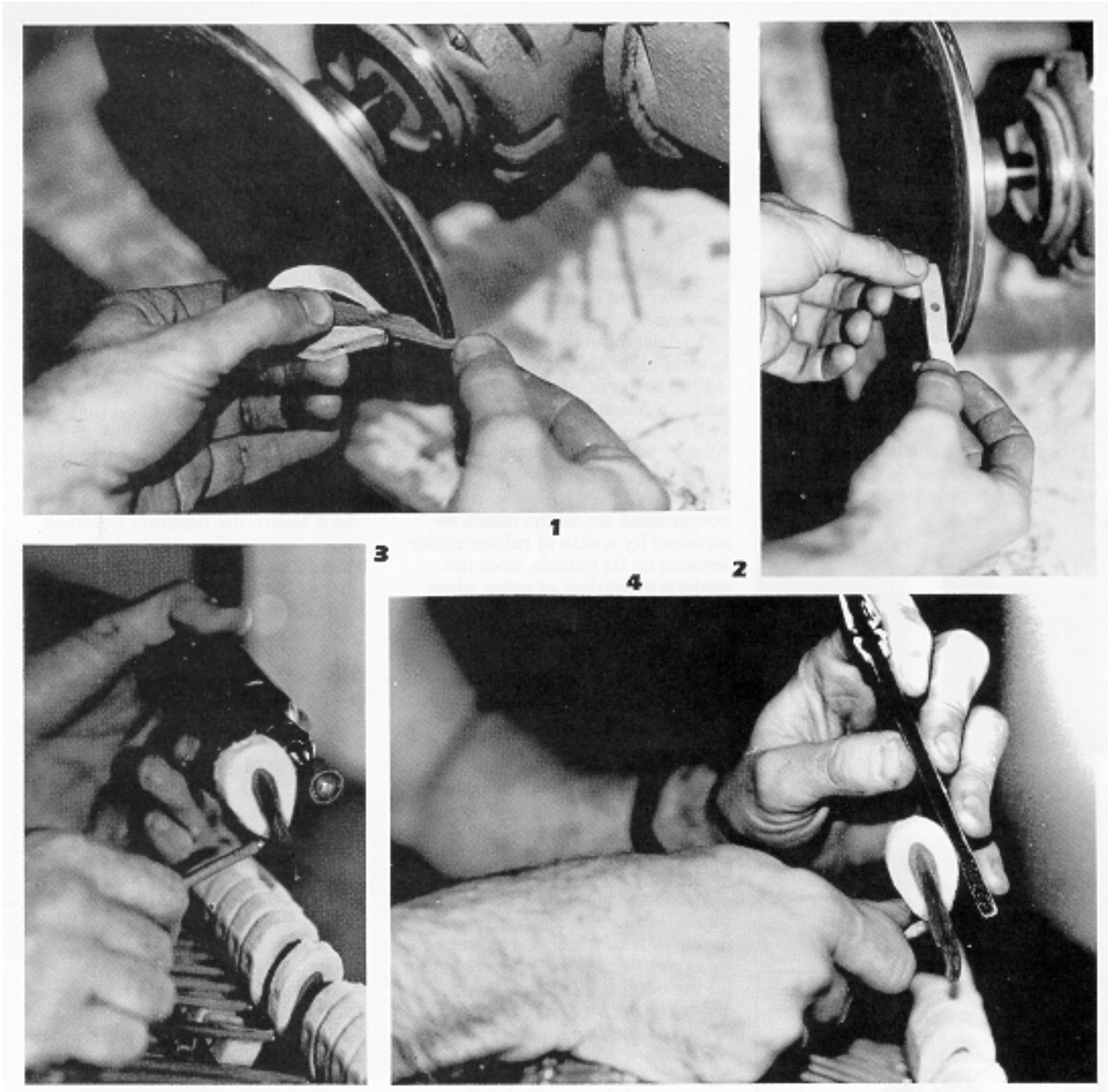
> "...the longer the decay time in a piano, the more appreciative the player will be of its "live" quality. I can't think of a time when I have ever received a complaint about a piano with too much decay, unless it was due to a sticking damper."

Why? For some very good reasons. One, because it saves on damaged tails; two, because it saves on broken hammershanks; and three, because the process protects the hammershank centers and pins.

It should be said here that the technician *must* know the hammers that are being worked with, and that this is the best opportunity to do very deep needling on new sets that one knows in advance of mounting will require that treatment! Look at *picture five.*

What we see here is a low tenor or bass hammer with a single-needle voicing tool held at about one o'clock. Note that the point of the needle goes all the way to the molding of the hammer! This type of very deep needling is effective in increasing the *decay* of the struck note, along with increases in net volume and *dwell.* It will not in any way affect the character of the *attack.*

The technique can be affected with the hammers mounted in the piano, or much better, before the hammers are mounted upon the hammershanks. The effects of this type of deep needling are *permanent,* excepting the usual deterioration of the hammer and piano superstructure with use and age. In *picture six,* which shows a high treble hammer, the reader will notice that the position has moved



upward toward 12:30 o'clock and that the needle now slightly bypasses the wooden molding. A word of advice here, which refers back to an admonition in the first of these articles: this is a technique that must be tried and learned by each individual piano technician. The effect will vary with each practitioner and every set of hammers. Do not take my word on this — you must verify it for yourselves. Caution is the better part of valor!

Let's go back to the very first of these articles and examine tone in terms of time and volume. When speaking of those essential ingredients, most of us want as much of them both as we can possibly possess. *Attack* is the character of the tone from the moment of its perceived initiation to the moment that it achieves its greatest degree of volume. *Decay* describes the tone from the height of its volume to the point in time when it can no longer be heard. *Dwell* is the nature of the emitted sound when it reaches that point in its decay period which is equivalent to the point at which the perceived attack was initiated.

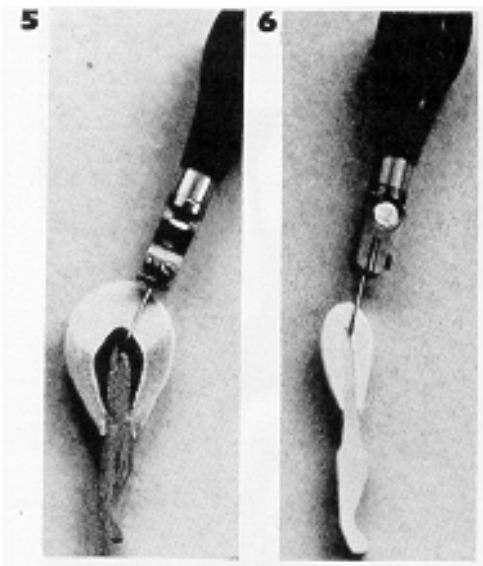
What do I want from a piano tone? I want a strong percussive attack which is at the same time not harsh or explosive. So-called "singing" tone actually is the ability of the instrument to sustain musical sound. Therefore, the longer the decay time in a piano, the more appreciative the player will be of its "live" quality. I can't think of a time I have ever received a complaint about a piano with too much decay, unless it was due to a sticking damper.

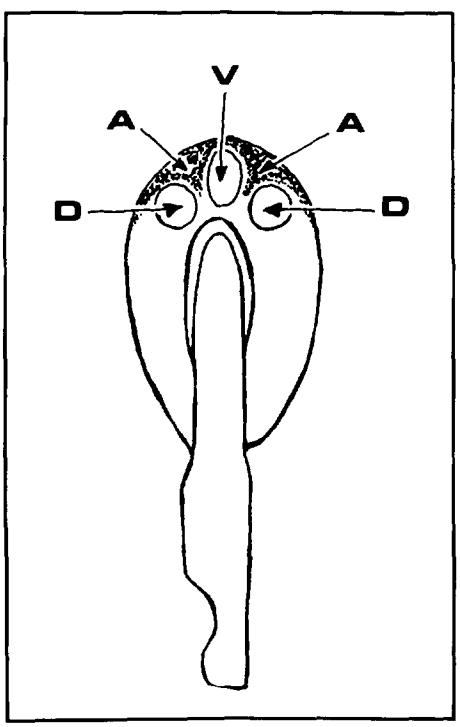
Dwell time is important too, because it determines the ability of the piano to articulate. A dwell time which is too narrow yields a piano which is not clear, and which can-

not "speak." A dwell time which is too broad results in a piano which is "muddy" and is most often associated with a very slow attack figure. Let's look at the drawing.

The areas designated by the D's denote the portion of the hammer which predominately determines the amount of decay produced by the piano hammer. The shaded triangular areas most affect the character of the attack (the "A" parts). The ellipse shown by the letter V is the area of the hammer which determines the *quantity* of volume and the breadth of the dwell figure.

Now the game gets complicated. If there is a great deal of tension or hardness in area A, the hammer will have a highly percussive attack, but note that tension and hardness are not the same. If there is a great deal of compression or hardness in area V, the hammer will be quite loud, but note that compression or hardness are not the same. If there is a great deal of compression or hardness in area D, then the hammer will have a great deal of volume, *but a relatively quick decay.* Again, note that compression and hardness are not the same.





To determine the reasoning behind all of this, we must digress a little to examine a rubber ball and a wooden one. The wooden ball is hard, and will make a loud "clack" when it strikes the floor, but it will not bounce very well. The rubber ball, which contains compressed air on the inside restrained by a skin of rubber under tension on its outside, does not make a great deal of noise when it hits the floor, but it will bounce back to the thrower very well.

Since we have established that what we want in the modern piano is for the hammer to get away from the string using its own energy and not the borrowed activity of the music wires, it is essential for the hammer to behave more like the rubber ball than the wooden one. Therefore, what we are looking for is not hardness, but differential or resilience.

We do not want hardness in our piano hammer, but a compressed inside or core which is restrained by layers of material under tension on the outside of the hammer. *What the voicing needles can help us do is to distribute and exercise control over the parts of the hammer which are affected by the presence of these opposing forces.*

Let's say that we are dealing with a hard hammer that our customer has described to us as being too "harsh." If, after conference with the piano owner, we decide that the offending problem is one of attack, we can proceed to needle with three number six sharps in a weighted voicing tool. We will voice into the shaded areas A as indicated in the diagram to reduce attack without affecting the other components of the tone. If, because of lack of skill or knowledge, we needle into the areas of V or D, we can be assured that other component parts of the tone will change as well. Needling into the A portions of the hammer reduces the surface tension, and, correspondingly the attack characteristic.

Now let us suppose that the customer complains that the piano is "dead." Since we can hear that the attack is percussive, and the net volume is adequate, we determine that the problem is in fact in the sustaining quality of the tone, which is very short.

Now, using the same voicing tool we used for the previous operation, we drive the needles quite deeply into areas D depicted in the drawing. What happens is that we release hard and confined material in the deep shoulders of the hammer which actually *increases differential or compression while reducing hardness in those areas.* As a result, the hammer becomes more "bouncy" and robs less energy from the string(s) during the rebound process. In some circumstances, this operation may also actually increase volume as well, for exactly the same reason. This is why some inexperienced piano technicians have resorted to driving needles directly into the V area of the hammer from the striking point: They needled into area D just as "the book" told them they ought to for the purpose of reducing volume. Instead of reducing volume the piano began to increase in sustain and possibly loudness, and the tuner at that point panicked and resorted to a process that he "knew" would work.

Up to this point, we have not examined any other methods or tools of tone regulation other than the use of needles. Let's summarize needling techniques for tone control:

1. To reduce the percussiveness of attack, needle into area(s) A to relieve surface felt tension.
2. To increase the sustaining quality of the note, or decay, needle deeply into area(s) D in the shoulder of the hammer with the voicing tool.
3. To decrease both volume and attack, needle deeply into area(s) A in extremely close proximity to area V.
4. To increase both volume and decay, use a large needle placed exactly between area(s) V and D and driven all the way to the core felt, and in some cases, the molding.
5. Practice these operations with intelligence and caution!

It's The Little Things That Count!

Gerald F. Foye
San Diego Chapter

Have you discovered that attempting to regulate a grand action on the kitchen stove is a bit awkward? Or do you need a new dining room table because of all those unsightly holes accidentally drilled into it?

Many of us have limited work space, but a little thought and investment in time can offer many rewards in making the best of what we have. Actually, there is nothing wrong with a compact work area designed for our specific needs.

There are some excellent, lightweight folding tables available in discount stores. They also have the advantage of being portable and are useful in customers' homes for certain applications.

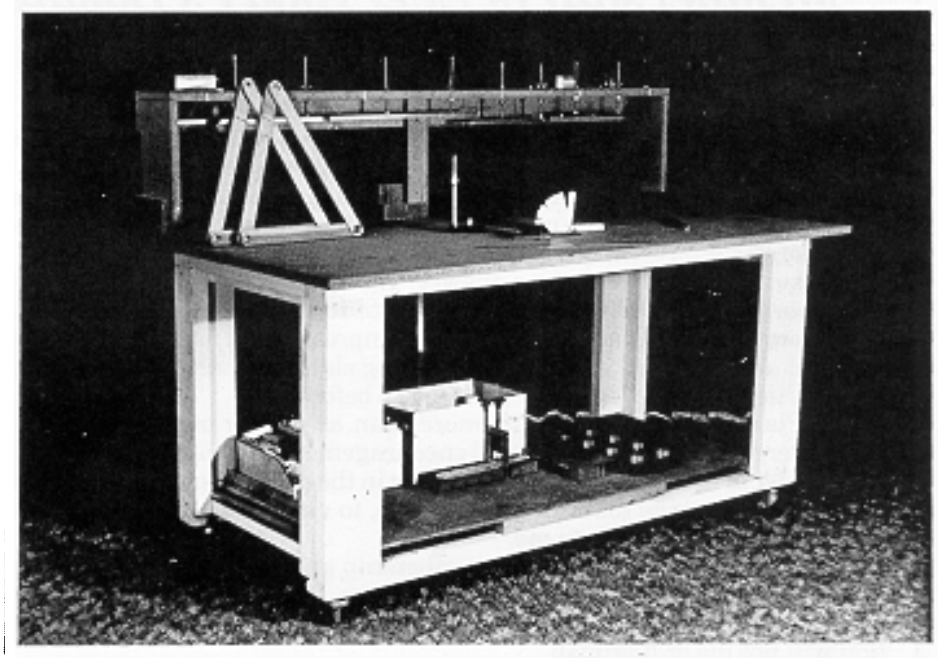
Using a converted bedroom, complete with a ceiling-mounted hoist arrangement for lifting grand plates, has served me well.

A more suitable worktable arrangement is the bench with let-off rack as shown in photo. The idea is an old one and it is up to the individual to design a unit to fit his or her accommodations.

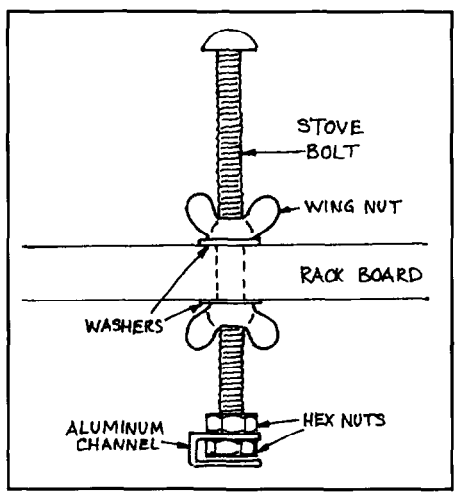
The work bench shown has a 30-inch by 60-inch particle-board top with a 28-inch work height. Two by fours were used for the frame, which makes the whole arrangement overly sturdy, but it was done that way to accommodate the weight of grand plates which can be moved about easily. The casters are industrial swivels with about 150-pound capacity each. A storage shelf at the bottom is convenient and a storage drawer will be added in the future.

The let-off rack arrangement is 12 inches high and is fully removable (with screws) to clear the entire bench top for such jobs as hauling plates, cabinet components, etc. Before using it for that purpose, the top is either removed or protected by a sheet of plywood.

In this application, the table top actually rests on a pair of one-inch square aluminum tubes for stability (to maintain flatness) and the entire top was shimmed with a straightedge (again for flatness) for grand action regulation.



Workbench with let-off rack



Let-off rails are 3/8-inch by 1/2-inch aluminum channel (see illustration) supported by 5-inch long, 1/4-inch diameter carriage bolts, with wing nuts, to allow for height adjustment. One problem is that different actions require different lengths of rails which necessitates making up sets and marking them for various brands. By spacing holes in the rails at 1-inch intervals, the rails also are adjustable for side-to-side location. The bolts are anchored with nuts slid into the aluminum channels.

Each One Reach One

Membership Is Everybody's Business

Charles P. Huether
Vice President

Do you have a favorite story of some old-timer you met or got to know through the Piano Technicians Guild and how much this association has meant to you?

Do you think that this is a worthwhile reason for someone to become a member?

Did you ever consider the possibility that you are or will be one of those wonderful old-timers?

I am sure that each of you can answer "yes" to each of the above questions. I have my favorites and I can say without hesitation that I can tell you about many old-timers who have made a tremendous impression on me. They were people who inspired and educated. More than anything else, they helped me open my mind to possibilities which I had never considered before.

The Piano Technicians Guild, more than any other organization I have ever encountered, is built on respect and encouragement from older members. By older, I mean older in the business not necessarily in the chronological sense. For anything to cause this unique institution to decline, to cause this unique characteristic to diminish, is unthinkable to me.

So, see to it that your chapter membership grows and develops. Be the kind of person who inspires. It is rewarding to see something you nurture grow and blossom. We need interest and stimulation of members to ensure that the organization will not die or diminish.

NEW MEMBERS

Registered Technician

Calgary, Alberta Chapter
Hart, Lowell D.
Prairie Bible Institute
Three Hills, Alberta,
Canada T0M 2A0

Detroit-Windsor Chapter
Marsh, Thomas W.
34044 Winslow
Wayne, MI 48184

Indianapolis Chapter
Still, James L.
3921 Washington Blvd.
Indianapolis, IN 46205

Memphis Chapter
Wilson, Charles A.
1841 Kit Carson
Dyersburg, TN 38024

New York City Chapter
Shepherd, Martin D.
30 Park Terr. East, Apt. 1A
New York, NY 10034

Santa Clara Valley Chapter
Panton, Neil A.
1119-17th
Redwood City, CA 94063

Tucson Chapter
Evans, Arnold D.
2533 E. Florence Dr.
Tucson, AZ 85716

Allied Tradesman

Central Washington
Rhoades, Bill H.
3718 Cascade
Kennewick, WA 99337

Philadelphia Chapter
Trefz, John J.
1038 Lincoln Avenue
Prospect Park, PA 19076

Richmond Chapter
Milgram, Randy A.
Coham Park Farm
Cobaham, VA 22929

Southwest Florida
Freel, John S.
3540 Lori Lane S.
Lakeland, FL 33801

Washington, D.C. Chapter
Jordan, Richard C.
8623 Flower Ave. #1
Takoma Park, MD 20912

Apprentice

Buffalo Chapter
Church, Francie E.
26 Bellevue
St. Catharine's, Ont.,
Canada L2S 1P5

Calgary, Alberta Chapter
Walton, Daryl R.
P.O. Box 999
Brooks, Alta., Canada
T0J 0J0

East Texas Chapter
Swinney, Steven M.
705 Navajo Trails, Apt. 4
Marshall, TX 75670

Golden Gate Chapter
Radford, James E.
3710 Liscome Way
Concord, CA 94518

Memphis Chapter
Wilson, Tommy L.
1418 Ewell Ave.
Dyersburg, TN 38024

New York City Chapter
Cousins, Gerald P.
Somerset Lane, R.R. 3
Box 259
Putnam Valley, NY 10579

Associate

Golden Gate Chapter
Bellany, Kay M.
779 Solana Drive
Lafayette, CA 94549

Ternstrom, Ray G.
2125 Alice Ave.
Walnut Creek, CA 94596

Student

Capitol Area Chapter
Williams, Kevin P.
70 Fairlawn Drive
Selkirk, NY 12158

Cincinnati Chapter
Bany, Michael W.
6815 Betts Avenue
Cincinnati, OH 45239

Golden Gate Chapter
Franke, Nevada L.
P.O. Box 275
Byron, CA 94514

Nebraska Chapter
Chavis, Rick D.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

Emmanuel, Gerard V.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

Fippin, Kimberly S.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

Hyland, Eugene J.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

Laroque, Dean S.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

McDonnell, Joseph P.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

McGarry, John M.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

Mitchell, Timothy T.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

Pitts, Kevin M.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

Watkins, Ben J.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

Worth, Ronald R.
W.I.T. Piano Tech. Dept.
Sioux City, IA 51102

South Bay Chapter

Andrews, Ruth
3810 Shad Place
San Pedro, CA 90732

Washington, D.C. Chapter

Rowe, Henry H.
Rt. 1, Box 228-A,
Billingsly Rd.
White Plains, MD 20695

Western Michigan Chapter

Vote, Sylvia S.
3058 102nd Avenue
Allegan, MI 49010

RECLASSIFICATIONS
Registered Technician

Los Angeles Chapter

Anderson, Richard D.

Morris, Melvin

Nebraska Chapter

Stickney, Jeffrey P.

New York City Chapter

Lewy, Peter R.

Nezwazky, Francois A.

Ostrovsky, Alexander

Tasciotti, Lou C.

Woodruff, John M.

Member Recruitment Points
June 1, 1983—April 30, 1984

Booster Club	Pts.	Mbrs.	Booster Club	Pts.	Mbrs.
Adams, Ron	1	1	Laird, Jon M.	2	2
Anderson, Mark S.	3	1	Lang, Anthony L.	4	1
Anderson, Robert A.	5	1	Leary, Janet	4	1
Atherton, Olan M.	1	1	Lord, Joseph O.	1	1
Bailey, Benjamin	1	1	Lovgren, Christine	19	4
Baldassin, Rick	20	4	Lowe, Lawrence B.	1	1
Bennett, David L.	5	1	Lundell, Daniel D.	5	1
Berg, Harry E.	1	1	Marling, Harold S.	5	1
Bessette, Roland	1	1	Martin, Barbara M.	6	2
Betts, David C.	5	1	Mastagni, Angelo F.	4	2
Bianchi, John L.	1	1	Mayr, Vitus J.	4	1
Blees, Willem	21	7	McClure, Bob	3	1
Bordeleau, Edward	1	1	McKay, C. G.	1	1
Bowser, Gary A.	3	1	McVay, James I.	3	1
Brady, Stephen H.	5	1	Meehan, Joseph A.	1	1
Briggs, Arthur	4	1	Moberg, Jonathan M.	1	1
Briley, James E.	1	1	Morris, Jere F.	1	1
Bunker, Mark E.	1	1	Motsko, William R.	5	1
Capp, Richard M.	5	1	Neal, Douglas R.	11	11
Churchill, Kenneth R.	1	1	Neie, Gary A.	2	2
Class, Kenneth A.	1	1	Newhouse, Lawrence,	5	1
Coleman, James W. Sr.	5	1	Nye, Jonathan C.	5	1
Cox, Merrill W.	1	1	Odenheimer, Fred	4	4
Crabb, Larry Jr.	2	2	Oliver, Edward A.	1	1
Craw, Stephen D.	3	1	Oliver, Stanley	4	1
Darling, Lindasue	1	1	Onesti, Ralph J.	3	1
Davis, Steven W.	3	1	Ousley, Robert L.	5	1
Deptula, Walter A.	4	1	Pannell, Paul	5	1
Doss, Harry W.	4	1	Peake, David E.	1	1
Drost, Michael A.	1	1	Pennington, David L.	5	1
Dukes, Ernest F.	3	1	Perkins, Robert K.	6	2
Eaton, Wendell E.	3	3	Person, Donald A.	4	1
Eddy, Joe C.	1	1	Phillips, Webb J.	20	6
Edwards, Wm. E.	5	1	Powell, Teri L.	1	1
Evans, George J.	5	1	Prentice, Randy A.	2	2
Flegle, Richard Sr.	1	1	Preuitt, Ernest S.	1	1
Flippin, C.D. Jr.	5	1	Privette, Richard V.	1	1
Garrett, Joseph A.	5	1	Quint, Richard B.	1	1
Geers, C.A.	3	1	Randolph, Terry S.	6	2
Geoghegan, Stephen R.	15	3	Raskob, Richard	1	1
Gilberg, Donald C.	5	3	Reed, William H.	5	1
Gist, Ronald T.	1	1	Reeves, Robert A.	1	1
Goetsch, Lawrence T.	1	1	Reuter, Raymond A.	3	1
Greenbrook, Reginald G.	1	1	Rickey, Charles	1	1
Grossman, Matt	13	3	Ritchie, Mark O.	6	3
Gurnee, Daniel S.	1	1	Roe, Eugene	7	2
Gustafson, David E.	8	2	Sanders, Robert L.	1	1
Hale, Robert R.	4	1	Scoggins, James W.	1	1
Harmon, Clayton C.	6	3	Seabern, Paul W.	5	1
Harteau, Daniel P.	1	1	Shank, C. Dean	1	1
Hebert, Roy A.	1	1	Sierota, Walt	4	1
Heikkinen, Dale E.	6	2	Sims, James R.	4	1
Heismann, Barry	1	1	Sims, Willard L.	5	1
Hennessy, Frank P.	1	1	Sivel, Richard F.	1	1
Herwig, Lewis F.	5	1	Snyder, Stephen H.	1	1
Hess, Marty A.	1	1	Sorg, Herbert	1	1
Hitt, Henry L. Jr.	8	2	Speir, Leon J.	3	1
Hoffheins, Robert L.	4	1	Stoffer, Phil	1	1
Hofstetter, Robert A.	2	2	Stone, Patrick L.	4	1
Holder, Leopold	8	2	Stone, Sidney O.	15	6
Hong, Yat-Lam	1	1	Stopa, Frank J.	4	2
Hopland, Ray	1	1	Tremper, Fred W.	12	3
Houser, Clarke M.	1	1	Turner, Jeffrey R.	1	1
Howell, W. Dean	1	1	Vandervalk, Alexander	1	1
Huffman, Keith M.	1	1	Vanwinkle, Bill	3	1
Jeschke, Alfred E.	14	3	Welch, Cyrus L.	1	1
Johns, Barney J.	2	2	Welton, T.S.	5	1
Jorgensen, Owen	7	3	Werneth, Carey W.	5	1
Keast, Lawrence J.	1	1	West, Richard E.	2	2
Kimball, Richard C.	4	1	Whaley, Denzil L.	1	1
Kline, Albert	3	1	Whitaker, Craig M.	3	1
Kurk, Dennis E.	1	1	Woitasek, Walter J.	5	1
Laghezza, Roger	4	1			

The Auxiliary Exchange

President's Message

HAVE YOU PULLED YOUR SUITCASES DOWN FROM THE ATTIC YET? Maybe you keep yours in the rafters of your garage! Perhaps they are in the storage bin! It's fun to get them out, dust them off, open them up and air them out!

The end of this month we pack up and head for our *annual convention* in Indianapolis. We hope you are going to be there, too! It's quite an accomplishment to work right up until it's time to go and still have a suitcase full of clean clothes to last for a week. It is even more of an accomplishment if you are taking the entire family.

Many of you know what I am talking about. As we got older, we wonder how we ever did it — yet it was routine, and we never gave it a second thought. The anticipation of a special vacation at the Piano Technicians Guild Convention always provided stamina to get everybody ready to go. *This year we will be no exception!!*

We are looking for you. We have a very exciting and complete program planned for all spouses. I am personally looking forward to meeting many of you. Your names have become very familiar, and I feel as though I know you; however, I have never had the privilege of meeting you personally and shaking your hand. Please, let's get acquainted this year in Indianapolis. Let me know who you are. Let's sit down and have a cup of coffee or a glass of iced tea together. Bring me any ideas you have for the Auxiliary. Let me know if you are interested in being part of an Auxiliary Board. We are always looking for people of various backgrounds and abilities to help us.

It is our desire to make you feel very welcome as you arrive at the hotel! We want you to enjoy every day of your stay with us. And by the way...if by chance you haven't quite made up your mind...you can still come. Be sure you call ahead for accommodations. And for those of you who will not be able to come this year — we will look for you next year in Kansas City. It will be an international convention you will not want to miss.

Back to the suitcases...get them out, get them dusted off, and let them know they are headed for one of the greatest conventions the Guild has ever had. We'll be waiting with open arms. (Not for the suitcases — but YOU!!!) Happy Traveling!

Belva Flegle, President,
PTG Auxiliary

Auxiliary Board

Officers

BELVA (Mrs. Richard) FLEGLE
President
400 Groveland Avenue #1011
Minneapolis, MN 55403

MARY LOUISE (Mrs. Donald) STRONG
1st Vice President
One Knollwood Drive
Rome, GA 30161

NORMA (Mrs. D. Elwyn) LAMB
2d Vice President
1833 Echo Park Avenue
Los Angeles, CA 90026

HELENA (Mrs. Dean) THOMAS
Recording Secretary
R.R. Box 210A
Edinburg, PA 16116

BERT (Mrs. Walter) SIEROTA
Corresponding Secretary
5201 Whitaker Avenue
Philadelphia, PA 19124

KATHRYN (Mrs. Willis) SNYDER
Treasurer
79 Furnace St.
Robesonia, PA 19551

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

Editor, Auxiliary Exchange

JULIE BERRY
6520 Parker Lane
Indianapolis, IN 46220

Nominating Committee Report

The Nominating Committee (Norma Lamb, chairman, Esther Stegeman and Shirlie Felton, members) submits the following slate of officers for the 1984-85 year:

President: Belva Flegle
First Vice President:
Louise Strong
Second Vice President:
(no one slated)
Recording Secretary:
Helena Thomas
Corresponding Secretary:
Bert Sierota
Treasurer: Kathryn Snyder

The election of officers will take place at the Auxiliary Council meeting to be held on Tuesday, July 3, 1984, at the Indianapolis Hyatt Regency. Nominations from the floor will be accepted prior to the election. Each Auxiliary chapter should designate one of its members who will be attending the convention to serve as delegate and another member to serve as alternate. Members who are not affiliated with a chapter should plan to attend the members-at-large meeting which takes place prior to the Council meeting. At that meeting, delegates are selected to represent the members-at-large in each of the six regions.

Greetings From Your First Vice-President!

What does a First Vice-President do? She is expected to interest you in joining the Auxiliary. She is your membership chairman. Here are 10 reasons why you should join with the approximately 250 men and women who are members of the Piano Technicians Guild Auxiliary:

1. One way to make your Guild member realize that you are proud of his/her profession
2. One way to learn more about his or her work
3. One way to show that his or her career is just as important as yours. (I am a career woman — a college music teacher. It is easy to be selfish!)
4. One way to spend a little time alone with your spouse. (I get a 140-mile round trip to Atlanta and dinner out every time my husband goes to a Guild meeting.)
5. One way to encourage your spouse to appreciate the Guild
6. One way to understand some of the Guild problems. Do you ever attend a chapter meeting? You say your Guild member does not want you to go? Ask! You might be surprised!
7. One way to make new friends with other wives/husbands of Guild members.
8. One way to have a good time at regional meetings and conventions.
9. One way to see different parts of the country *every summer* by going to the national institute and convention with your spouse. The Auxiliary plans interesting sightseeing trips and other treats for the non-members of the Guild at the conventions. Much of the expense can be taken off the Guild member's income tax return!

   Will I see you at the convention in Indianapolis?
10. One way to help the Guild financially — a small amount of money earned with difficulty and given back to the Guild gives a real emotional boost! *Buy suncatchers!*

See you in Indianapolis!

Louise Strong,
First Vice President,
PTG Auxiliary

In Memory of Dorcas Wagman

It is with sadness that we report the death early in May of Dorcas Wagman of the Detroit Windsor Chapter. Before her illness, Dorcas attended the local and annual seminars and conventions with her husband, Homer, and brightened the world for all of us. We will miss her. Those of us who had the privilege of knowing Dorcas will carry in our hearts many happy memories of her. Our thoughts are with Homer and the rest of Dorcas' family at this time.

A Word From Indianapolis

It is always nice to know a little about a place before you settle there for a week. In Indianapolis, you will be situated at the center of town with easy access to all the downtown attractions. Because Indianapolis was laid out in a logical fashion — it was located and designated to be the state capital when only three families had settled in the county — it is easy to get your bearings and find your way to and from downtown locations.

Ayres and Block's, our two large downtown department stores, are very close to the hotel; each of them is less than a block away. The Indiana State Capitol is diagonally across from the hotel, and Monument Circle is two blocks away. The streets in downtown Indianapolis are well lit; it is a nice walk — around city.

On Wednesday during our convention some of the streets will be blocked off and lots of colorful food and entertainment booths will be set up for the annual Fourth of July celebration. We think Indianapolis is a great city, and we in the Indianapolis Guild and Auxiliary chapters will be on hand to help you find your way around. See you soon! — **Julie Berry**

P.S. Remember, if you are flying into town and would like to be met at the airport by someone from our chapter and taken to the hotel, please give us a call (soon) at 317-255-8214.

Time For Spring Housecleaning... For The Business!

It will still be roughly spring by the time you read this. I want to set forth my intentions for spring housecleaning the business.

When our son Charlie arrived in April, I promptly quit my job as a teacher to stay home with the baby. Eventually, the fact that I am around home more should give me more time to help with the phone calls, the bookkeeping, and the promotion of the piano service business. (Right now, I am doing well to find time to sleep and do laundry!)

I may not get time to spring houseclean our business until summer or fall, but I'll tell you what I plan to do. Perhaps some of my plans might apply to your business.

First, we will gather all the little scraps of paper from the top of the dresser, the back of the desk drawer, the bottom of the tool kit, and the crack in the seat of the car. On these various papers are written measurements for strings that need to be replaced, parts that need to be ordered, receipts for screws and paint purchased at the hardware store and tunings that need to be set up. We will compile all the technician's notes to himself into a list, grouping the orders together and the phone calls to be made together, etc.

Then we will look through the shop together and see if there are any parts from old pianos, empty bottles of glue, wads of packing paper from supply house orders, and little piles of red felt and sawdust which we might want to throw away at this time. (Sometimes technicians seem to have a hard time parting with little things that accumulate around the shop.)

After a brief repose, we can locate all the past issues of the *Journal* and stack them neatly. Beside that stack we can place all the supply house catalogs. Then we can inventory all the pianos in the shop to be sure there isn't one sitting around that we have forgotten about.

As we inventory them we can collect the tools and supplies that are sitting inside the cases; we might find we didn't need to order as many things from the supply houses as we had thought we did!

Every once in awhile it's a good idea to clear things out so they can start collecting again!

Classifieds

Classified Advertising

CLASSIFIED ADVERTISING rates are 25 cents per word with a $7.50 minimum. Full payment must accompany insertion request. Closing Date for ads is six weeks prior to the month of publication.

Box numbers and zip codes count as one word. Telephone numbers count as two words. Names of cities and states count as one word each.

Send check or money order (U.S. funds) made payable to Piano Technicians Journal, 9140 WARD PARKWAY, KANSAS CITY, MO 64114.

The Journal does NOT provide a blind box service. Please include a mailing address and/or telephone number with your ad.

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

FOR SALE

GRAHAM ANDERSON, Piano Rebuilding and Repair, 1225 Bennett Drive, Alabaster, Alabama 35007. 20 years' experience with Steinway- London. Specializing in replacement of action rails. Also available **GENUINE IVORY KEY TOPS replaced.** Call or write for free estimates. **(205)664-2527 or (205)663-6449.** (I)

NEW SOUNDBOARDS MADE FOR YOU. Ship old board. New board comes to you ready for installation. Send for instruction on: Victor Video Tape, $94.75. **Victor A. Benvenuto, 6825 Germantown Avenue, Philadelphia, PA 19119. (215)438-7038.**

COMPLETE HOME STUDY COURSE in Piano Tuning, Regulating and Repairing. Write or call for free brochure. **Aubrey Willis School of Piano Tuning, PO Drawer 15190, Orlando, FL 32858. Phone: (305)299-3690.** (I)

BUSINESS CARDS: A complete line of business cards designed exclusively for the trade. Send for free brochure to: **Creative Innovations, PO Box 120801, Arlington, Texas 76012.** (3/2)

PIANOS FOR SALE — Always on hand, 150 to 300 uprights! Plain case, art case and players. Also 50 to 150 grands at all times, as is or rebuilt. Excellent brand names — no junk! All set up for inspection. Lowest possible prices. Call for quotes. **Owen Piano Wholesalers, 2152 W. Washington Blvd., Los Angeles, CA 90018. Telephone (213)883-9643.** (I)

KEY RECOVERING MACHINES for sale. Prices on request. Send self-addressed envelope. Or build your own — send $15.00 for plans, photos, instructions (refund w/purchase of machine). **Solenberger Piano Service, 1551 Lynn Court, Santa Rosa, CA 95405.**

KORG AT-12 AUTOCHROMATIC TUNER. New, improved tuner replaces WT-12 model. Play any note on your instrument and the AT-12 instantly indicates the note and octave (by LED) and how many cents sharp or flat (by V-U meter) in 7 octaves: C1 to B7. Generates 4 octaves: C2 to B5 at 2 volumes. Calibrate tuner A-430 Hz to 450 Hz. Quartz crystal. Case, stand, AC adapter, batteries, earphone. One pound. One-year warranty. Introductory offer: $125 ppd. ($180 list). **Song of the Sea, 47 West Street, Bar Harbor, Maine 04609. (207)288-5653.** (I)

ZUCKERMAN HARPSICHORD KITS — A real challenge for the interested technician. Factory direct shipment at factory prices. Troubleshooting and advice for kit builders. **Authorized Agent Yves A. Feder RTT, Harpsichord Workshops, 2 North Chestnut Hill, Killingsworth, CT 06417. Telephone (203)663-1811.** (I)

COLEMAN-DEFEBAUGH VIDEO-CASSETTE. Two-hour tape of the popular aural and visual tuning class presented by Jim Coleman and George Defebaugh at Guild conventions and seminars. Text covers pitch raising, temperament setting, beat counting, octave stretching, use of the Sanderson Accu-Tuner, etc. Both VHS and Betamax — $79.50. **Superior Instruction Tapes, 2152 West Washington Blvd., Los Angeles, CA 90018. (213)735-4595.** (I)

ACCU-TUNER: Robert Conrad, Kansas City, MO., (816)444-4344. (I)

INTERVAL, SCALES & TEMPERAMENTS. An introduction to Musical Acoustics, 2nd edition, hardcover, obtainable for $8.00, including mailing from **Hugh Boyle, Dept. 101, 405 Green Lane, New Eltham, London SE9 3TE. England.** (2/1)

PIANO TUNING BUSINESS for sale. Beautiful Pacific Northwest, home with large shop/garage optional. **3951 Briarwood Drive Southeast, Port Orchard, WA 98366, (206)876-0632.** (1/1)

ACCURATE ELECTRONIC TUNING. Substantial improvement over any published method. Clearly written instructions. Easy-to-learn routine. Designed for use with Hale Sight-O-Tuner — can be adapted for others. $10.00. **Don Hardin, 2620 Cypress Ave., Stockton, CA 95207.**

WANTED

WANTED: MASON & HAMLIN OR STEINWAY. Want one that was a player. Have mechanism to install. **Brady, 4609 Cranbrook, Indianapolis, IN 46250. (317)259-4305, after 5 p.m. (317)849-1469.** (I)

PIANO TUNER-TECHNICIAN. Experienced. Relocate to Central Florida. Major dealer. Excellent opportunity. **(305)331-6666 Mr. Davis. Or Write: Warehouse Pianos Inc., 755 Hwy 17-92, Fern Park, FL 32730.** (I)

HELP WANTED — artist piano-rental company seeks head technician. Work with the greatest pianos and artists in the world. A head technician is sought for long-term employment in New York City. Electronic and aural tuning expected. Must be willing to embrace with equal zeal the following: tuning, rebuilding, regulating, voicing, road touring and sometimes long and unusual hours. Benefits: work with the world leader in concert piano preparation and provision, all types of artists, all types of music. As a reward for long-term loyalty, profit-sharing or other bonuses could apply. **(212)582-6798.** (I)

WANTED TO BUY — Yamaha PT-3 or PT-4 tuning scopes. Call anytime day or night. **(212)582-6798.** (I)

WANT SMALL ELECTRIC HAMMER NEEDLER for softening/ voicing hammers. Anyone have one? We would like to have one made if we cannot locate one. Anyone interested? **Grant Leonard, 401 W. Lake St., Minneapolis, MN 55408. (612)824-6722.** (2/1)

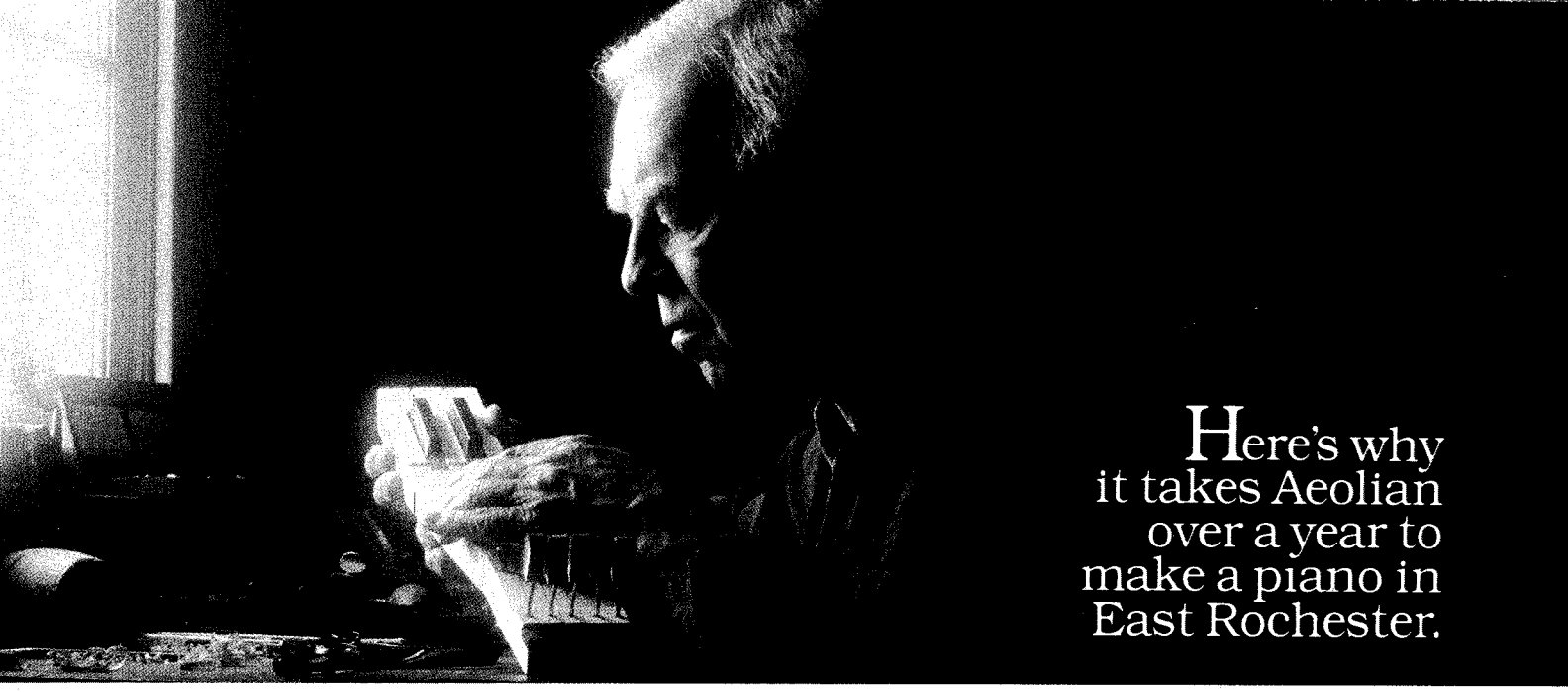
PIANO TECHNICIAN II — Half time, 10 months' appointment August through May each year. Two years' experience required. Starting salary $905.50 a month. Closing date July 1. For more information, write or call: **Personnel Office; California State University, Chico; Chico, CA 95929. Phone (916)895-6435.** (1/1)

CONCERT PIANO SERVICE has immediate opening for part-time & full-time tuner, $200-$700 week, plus insurance benefits and optional car leasing. Must have reliable transportation to start. Must tune on at least a Piano Technician Guild Apprentice level. Send resume to: **Concert Piano Service, Att: Laurence Strawbridge, PO Box 175, New Milford, CT 06776. Or Call 203-354-4957 or 203-797-8695.** (2/1)

TECHNICIEN EN PIANOS, Suisse 28 ans, bonnes references, cherche place de travail pour 1 an au Canada. Echange possible dans bonne entreprise de Lausanne (Suisse) place a disposition. Ecrire directement a **Didier Roy, Corniche 20, Ch-1097 Riex.** (1/1)

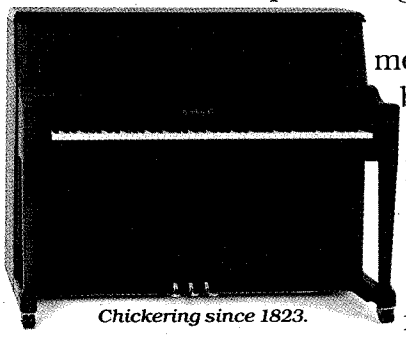
MISCELLANEOUS

SIGHT-O-TUNER MODIFICATION. For the first time — INTERNAL ERROR COMPENSATION. The "error" discussed by Steve Fairchild has been compensated internally, freeing both dials for measuring. No confusing Error Compensation Chart or third dial. Bourns 10-turn Knobpots give increments of .01 cents! Now tune with even higher accuracy in less time. Cleaning, calibration, guarantee and temperament systems of leading concert technicians included. Best prices —why pay more? Repairs accepted. Methods proven by full-time concert RTT with electronic experience. Careful — don't get off pitch! **Rick Baldassin, (801)374-2887.** Endorsed by Dr. Albert Sanderson, inventor of the Sight-O-Tuner. (I)



Here's why it takes Aeolian over a year to make a piano in East Rochester.

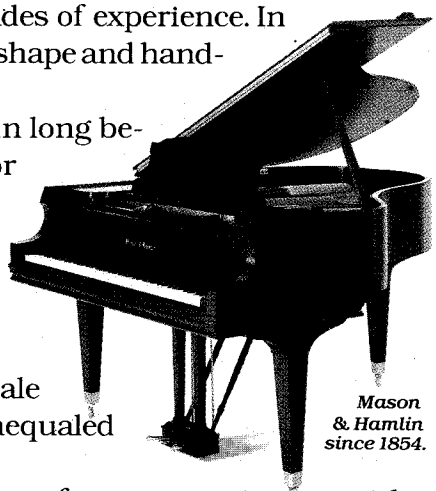
We work slowly and carefully in our East Rochester plant to create Chickering, Knabe and Mason & Hamlin pianos. Each of these great names boasts its own unique character, while sharing a tradition of uncompromising quality.



Chickering since 1823.

The demand for quality pianos is as strong today as ever. We're meeting that demand with instruments made with solid spruce soundboards and lumber core cases. And our pianos are painstakingly assembled by our skilled craftsmen. These masters of piano making have perfected their art through decades of experience. In creating each piano, they individually shape and hand-fit over 7,000 parts.

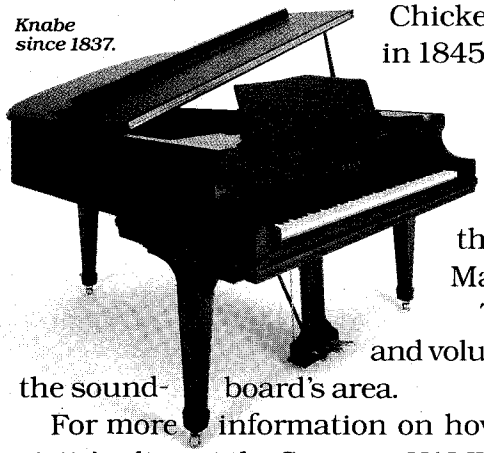
Our demands for perfection begin long before the first step of manufacture. For example, we select only prime, aged spruce for back posts and keybeds. And our pin blocks and bridges are quarter-sawn, hard rock maple. The extra attention to detail results in flawless pianos that are traditionally in demand by discriminating customers.



Mason & Hamlin since 1854.

America's oldest piano, Chickering enjoys a proud heritage. Chickering pioneered the overstrung scale in 1845, and has refined it to a degree unequaled in any other piano today.

Knabe since 1837.



Acclaimed as the premier performance instrument by the most exacting and critical musicians, Mason & Hamlin maintains a lasting tonal quality. A remarkable innovation, called the tension resonator, preserves the crown of the soundboard in Mason & Hamlin pianos for the life of the instrument.

The sound of a Knabe is unmistakable. In our Knabe grand, tone and volume are enhanced by the unique shape of the rim, which increases the soundboard's area.

For more information on how you can get in tune with our quality-built family of pianos, visit Aeolian at the Summer NAMM show, booth 8306 or contact Dave Campbell, Aeolian American Corp., East Rochester, New York.

Aeolian

performs for you.

Not Just Another Pretty Piano

Wurlitzer Pianos are pretty, of course ... beautiful, in fact. But they're more than that. They're fine instruments designed, engineered and built to perform over a lifetime with ease of upkeep and maintenance. That's because they're designed and built with the technician in mind.

For example, on most Wurlitzer Pianos you'll service, the music desk assembly and fall board are removable without tools ... just lift off the music desk assembly and unsnap the fall board equalizer.

By removing just two screws and one nut, you can lift off the drop rail, leaving the keys totally serviceable.

How many times have you wished you could keep the key slip from touching the keys? With a Wurlitzer, it's easy ... thanks to the key slip adjusting screws. And adjusting the pedal bolts is just as easy.

All of this, of course, makes for a more dependable piano that can make your job a little less frustrating.

Our continuing commitment to you, the technician, goes beyond product design. It's apparent in our ongoing willingness to teach and train. Our key technical people attend PTG meetings and conventions and conduct training sessions. Our service department continues its seminars. Our technical staff is at your service to provide any assistance you might need, just call 800/435-2930 toll-free between 8:00 a.m. and 4:30 p.m. For parts call Code-A-Phone 800/435-6954. In Illinois call 815/756-2771.

We recognize that a quality instrument must be well maintained. That's why Wurlitzer Pianos are designed, engineered and built with you in mind.

WURLITZER®

The Music People

Dekalb, Illinois 60115

June 1984
UPDATE

Balance Sheet

The following statement of the Guild's assets and liabilities reflects our status as of December 31, 1983.

Current Assets		**Liabilities and Equity**	
Cash — checking account	$77,967.52		
Cash — savings/IAPBT	454.15	Current Liabilities	
Emergency Fund reserves	10,361.13	Accounts payable	12,308.73
		Business taxes payable	14.82–
Accounts receivable	7,820.92	Chapter funds payable	7,345.00
		Film deposits	300.00
Inventory — merchandise	2,500.00	Unearned income	73,594.50
		Deferred comp — annual	6,000.00
Total current assets	99,103.72	Total current liabilities	$ 99,533.41
Other assets		Deferred comp — long term	14,500.00
Furniture, fixtures, equipment	29,725.25		
Depreciation of furniture, fixtures and equipment	21,686.00–	Members' equity	4,488.30–
Organizational costs	1,450.00	Net income/loss	952.14–
Total other assets	9,489.25		
Total assets	**$108,592.97**	**Total liability and equity**	**$108,592.97**

Board To Honor Chapter Presidents

Presidents of the Piano Technicians Guild chapters will be recognized for their hard work on behalf of the Guild and their members in a reception from 5:30 to 7 p.m., Monday, July 2, at the Hyatt Regency Indianapolis. The reception will be in the hotel's Regency Suite on the Regency Club Level.

"This service is all too seldom recognized," Guild President Ernest S. Preuitt said in announcing the reception. "The national officers would like to say 'thank you' for a job well done."

Invitations have been mailed to chapter presidents, and response cards are to be returned to Headquarters by June 13.

Teacher Committee To Meet In Indy

Teacher Relations Committee Chairperson Ruth Brown announced that a meeting of the committee will be held during the Indianapolis convention. The purpose is to present a new program designed for national use in conveying professional advice to piano teachers and students with technician participation. The time and place will be posted during the convention.

On Belonging

Editor's Note: Here's an excerpt from Duncan Ritchie's excellent column, "From Your Editor's Cluttered Desk," which appears in the Southwest Florida Chapter's newsletter.

Do you "belong" to the Southwest Florida Chapter or do you "hold a membership" in the Southwest Florida Chapter? No they aren't the same thing. If you "belong" to an organization, a group or a society, you are committed to it. You are dedicated to it. You give it a high priority in your schedule. If you "hold a membership" you pay your dues, you carry a membership card, you receive the magazine, you display the logo in proper places to help in whatever way it will do some good for you. But beyond this, you don't get so involved that if something more interesting or more fun comes along, you don't forego that simply to attend a metting.

I wouldn't suggest that any member who doesn't attend a fixed number of chapter meetings a year be dropped from the rolls. We can always use the money that the chapter collects from your dues. I realize there are only 24 hours in a day. I realize that there are really only four nights a week when meetings can be scheduled. I realize that it takes time and effort to be an active member in any organization. I'm not denying any of this. I'm just asking, do you "belong" to our Chapter or do you "hold a membership" in our chapter? It's your choice.

Errata

From most accounts, the 1984 Guild Directory, which was published as the March issue of the *Journal*, was a rousing success.

Unfortunately, because of the move from Seattle and other factors, some errors were made.

The name of Timothy C. Nowark, Syracuse, N.Y., was left off the list of Certified Tuning Examiners. The telephone number of Richard Giroux, Burlington, Vt., (802) 658-3069, was omitted from the member and chapter listings, and that of Ray Chandler, (213) 637-1411, was listed incorrectly. Student member Rita Black, 3469 Cedar Valley Ct., Smyrna, GA 30080, (404) 434-3392, was omitted.

In Respectful Memory

H. Daniel Mensing

Editor's note: The following message was prepared by the Rev. H. David Mensing, a Guild member, for funeral services for his son, H. Daniel Mensing, April 26, in Faith Lutheran Church, Tinley Park, Ill.

Henry Daniel Mensing, better known as H. Daniel Mensing, was born on June 22, 1942, at Cortland, N.Y., the son of the Rev. H. David Mensing, also a Guild Technician, and his wife Cordelia, nee Bloedel. He was received into God's Kingdom of Grace by Holy Baptism on July 19, 1942.

He graduated from high school in 1960 and attended the University of Illinois in Urbana, Chicago University, and Sherwood Music School, from which he received the Bachelor of Music Education Degree in 1967. He served a local high school as assistant band director for several years. He was taught piano technology by his own father, and became a Craftsman Member of the Piano Technicians Guild in 1964. Thereafter, he practiced this profession, until the present time.

He was united in marriage with Dawn Merrilee, nee Styx, on June 16, 1973. This marriage was blessed with two sons: Mark and Karl.

For many years, he was a faithful member of his church, and served as officer, Sunday School teacher, and choir director. Over the years, he enjoyed apparently good health and strength, and a very happy and successful life.

On Easter Sunday, he taught Sunday School, attended the Easter Service, and directed the choir. Several times that day, he expressed great joy in the Easter message. He also experienced a happy time with the family on Easter Evening.

Early Easter Monday morning, April 23, 1984, while sleeping, he passed away, and as he firmly believed, was taken by the Risen Savior to his heavenly home. The funeral was held at Peace Lutheran Church on Thursday, April 26, 1984, and his body was laid to rest the same day.

The survivors, of his immediate family, are his wife and two sons, his dear father and mother, and two brothers: Rev. David T. Mensing, and John P. Mensing, and a sister, Ruth Luedtke. He will be missed by all of us as a well-liked and prominent piano technician.

'Piano Parts' At Sale Price

No shop or reference library should be without one.

"Piano Parts and Their Functions," a complete guide to the names and purposes of structural and moving parts found in contemporary pianos, is now available at a special discount price to members of the Piano Technicians Guild.

The book, first published by the Guild in 1977 and reissued by Kendall/Hunt Publishing Co., in 1981, is now available to Guild members for $10 in the hardcover version and $8 in softcover. Nonmember prices are $15 for the hardcover book and $13 in softcover.

It includes diagrams of the many separate parts of different types of pianos, accompanied by their common names; an alphabetical list of the names together with assigned numbers by which the corresponding parts in the drawings may be located; and a glossary of technical and musical terms.

"Piano Parts and Their Functions" as compiled by Guild member Merle H. Mason with the cooperation of the Guild's executive director, staff and members, its committee on nomenclature and service manuals, piano manufacturers and suppliers.

The 98-page book, illustrated by James E. Campbell, has become a standard reference work for English-speaking piano technicians.

To order single copies, send a check or money order for $10 (hardcover) or $8 (softcover), plus $1.50 for postage and handling, to: Piano Technicians Guild, 9140 Ward Parkway, Kansas City, Mo., 64114.

Reflecting Back, But Looking Forward

Dale Heikkinen
Chapter Management and Achievement Committee

June is an appropriate time to look back at chapter activity of the past year. Elections of officers usually has taken place. The year-end picnic or banquet is over. Since there is a natural business lull in the number of tunings during the summer, July and August give us a chance to vacation or mull over our business affairs. So it seems more appropriate at this time to reflect back and ask questions rather than editorialize; to reflect back but to look forward at the same time.

If you are a member in good standing, did your chapter have a good year? Was it an interesting year with a wide variety of programs and interesting speakers? Were you able to "pick the brains" of any of these speakers? Conversely, were they willing to talk to you? Did you gain any positive ideas for improving or making your business more efficient or profitable? Did you contribute or want to contribute a short program segment or a full-length presentation of your own? Was it a good year for the chapter treasurer, one in which he did not have to beg and cajole members to pay their dues?

Or was it a difficult year just getting a quorum of members together? Was it a difficult year for the program chairman, getting those speakers lined up at the last minute? Did your chapter spend the least amount of money on speakers and audiovisuals, inadvertently accumulating a budget surplus of, say, $1,500 or more? Did you spend any money on yourselves, just as a treat, for a nice year-end picnic or something fancier like a banquet for husbands and wives? Or as a group, were you tight-fisted, holding onto all your money instead? If you had a budget surplus, did you ever consider making capital improvements on your equipment, namely, your examination equipment? Has your Sight-O-Tuner ever been recalibrated, or has it ever been modified with knobpots to make it easier to score applicants? Or was it a difficult year because of a festering feud between two or more members that no one had the stomach to mediate?

Did your meetings start on time, or were they always 15 minutes late to defer to the late arrivers? Eventually, the late arrivers realized your kindness and arrived one-half hour later, making it more conducive to their introverted behavior (sorry, to their own exhaustive business schedule).

"If you are a pessimist, there will have to be some preparation by someone to attract people to attend. But if you're an optimist, can you possibly keep your membership away with good programs, good food and good companionship?"

Has your chapter president ever considered putting the business meeting at the end of your chapter meeting, say, the last 15 minutes? If you try this, you may be surprised to find that your chapter will rarely be bogged down with excessive amendments on motions. The motions will either glide through the business meeting with a simple yea or nay, or be tabled because the membership will be so eager to dash off to Denny's, Elias Brothers' or Howard Johnson's for pie and coffee!

If you had an excellent speaker for one of your meetings, was the business meeting deferred until next time? Or was the discussion of nonpayment of dues, next month's program, motions to be submitted for the national council agenda, or the location of next month's meeting of such overwhelming importance that the business portion simply could not be dispensed with?

Did your chapter ever have executive board meetings in which any of the above-mentioned items were discussed to make the actual business meeting shorter and possibly smoother? Did your chapter ever have executive board meetings to discuss the general direction your money should be spent — who, for example, would take responsibility for each area of the examinations, and what should be the main thrust or focus of your programming in view of the age and makeup of your membership? The small, intimate, and open meeting of the executive board is periodically (regularly or otherwise) valuable because of the experience, interest and input of other craftsmen who want to give the chapter direction and purpose. Most craftsmen are also interested in maintaining and increasing their profits by expanding their skills and technical knowledge. As a result, these technicians become less dependent upon the gyrations of the national economy or their own limited tuning and repair skills. And did your executive board come back to the membership with recommendations?

Were your chapter meetings too long and without any formal ending so that people eventually left in ones and twos after three or four hours? Were the meetings too long in view of those who had to travel long distances? Was the speaker long-winded and tedious, not quite knowing when to stop or how to stop because he was being paid a hefty lecture-circuit fee ($25.00)?

Because of the diverse makeup of chapters throughout the country, did yours specifically target programs to the age of the members? For instance, in chapters with lots of student members, did your chapter programs highlight basic repairs and elementary business and service procedures? For those nearing retirement, did your chapter programs include any segments on Social Security, paying your spouses a salary even though they are housewives or househusbands, hospitalization, or the extent of your earnings in retirement without being penalized? Did your chapter target any programs for the business person just getting started with two to five years of experience?

continued on next page

Reflecting Back...

For those desiring independence, were there any programs for the person stuck in a full-time university situation or dealership? Or, were your chapter programs strictly speaker-oriented without any round-table discussions or New England-style town meetings on various topics?

All of the above questions and more will still be there in September. By then, some questions will have to be turned into action by your chapter when the fall programs begin. If you are a pessimist, there will have to be some preparation by someone to attract people to attend. But if you're an optimist, can you possibly keep your membership away with good programs, good food and good companionship? Sixty programs will have been published in the *Journal* by the end of August. These programs provide a most fascinating and interesting view of why we are drawn together by our mutual work. Surveying these programs, it makes us curious, at the least, and at the worst, it makes us want to hear all of them. Even if the chapter Management and Achievement Committee received only one program from your chapter for the whole year, that would still be a minimum accumulation of 150 programs around the U.S. and Canada, more than enough to provide your chapter with programs for ...How many years did you say??

Chapter Management and Achievement redistributes and publishes these programs and program outlines through the regular monthly mailings to your chapter presidents, through the résumé of programs which appear in the *Journal* Update from around the U.S. and Canada, and finally by distributing all available outlines to chapter officers or program chairmen who request them. Eventually, there will be a broad spectrum of programs from which to choose. Eventually, we will tap the valuable resources of teachers and public speakers in our midst. The local chapters will continue to be the very best forum for honing public speaking skills and developing interesting programs related to piano tuning, service and remanufacture.

Chapter Programs around the U.S. and Canada

Syracuse, NY	"Damper construction," Ken Walkup
Alpha, Wash., D.C.	"Steinway Day at Jordan Kitt's," Joe Bisceglie and Vince Orlando
Western Maryland	"Soundboards"
Richmond, VA	"Grand regulation," Bill Leach and Cliff Hiatt
Southwest Florida	"Player pianos," Nancy Hazzard
Toronto, Canada	Field trip to Tadashi
Detroit, MI	"Vacuum casting of cast iron plates for higher accuracy," Henry Wickham
Lansing, MI	"Expanding your bag of tricks," improving your tuning skills, Steve Hornbeck
Waukegan & Chicago	"Basic vertical regulation, minor repairs and troubleshooting," Richard Eckburg
Twin Cities, MN	"Practical business planning," Dr. David Juncker
Hutchinson, KS	"Back to basics," Jim Freeman
Houston	"Affixing decals," John Bathe
Golden Gate	Mini-technical: "Sixteen different problems often found in grands and uprights"; members try to determine the cause of each problem and the remedy
California State Convention	"Upright repairs," Ray McCall "Metal repairs," Francis Mehaffey "Concert preparation," Kermit Williams "Operating a one-man shop," Richard Davenport

National Convention Table for Chapter Management and Achievement

1. ***Stop By To See Letterheads***

   Do you have a sharp letterhead for your business? Our Committee receives letterheads from all over the country during the course of a year. Indianapolis is your opportunity to inspect these envelopes for ideas you can use.

2. ***Drop Off Black and White Photographs***

   Where does your chapter meet? Chapter Management would like to have you submit B & W photographs of your one-man shops, your meeting locations, or pictures of members in your chapter.

   Stop by to be photographed, if:
   you have confessions to make like Woody Allen
   love puns like Frank and Ernest
   enjoy the satire of Doonesbury
   make $40,000 like C.O.M.E. Purty Zoon
   and, if you came to Indianapolis to ride a Moped on the Indianapolis 500
   then you are interesting!

3. ***Fill Out the Names of Your Chapter Officers***

   Please stop by the convention table to give us a list of your chapter officers. At the present time, the Home Office is limited in sending us labels for only chapter presidents. There are situations where it is more appropriate to communicate with another chapter officer.

Chapters Want To Know

Many chapters struggle with programming and attendance. The requests for program outlines are greater than the supply. It would be very helpful if one of your chapter officers would drop off an outline of your chapter programs for the past year.

Dale Heikkinen
Chapter Management and Achievement