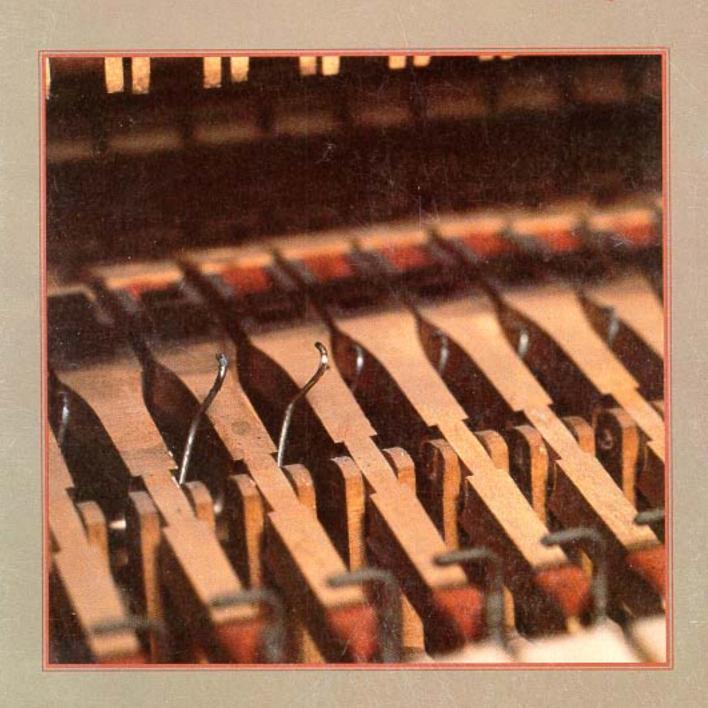
Piano Technicians

Journal

February 1988



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

The bridge is a critical component of the tone-producing system. It must precisely terminate the speaking length of the strings, and it must transmit vibration efficiently to the soundboard. In addition, it must be extremely strong to withstand the force of sidebearing and to resist splitting.

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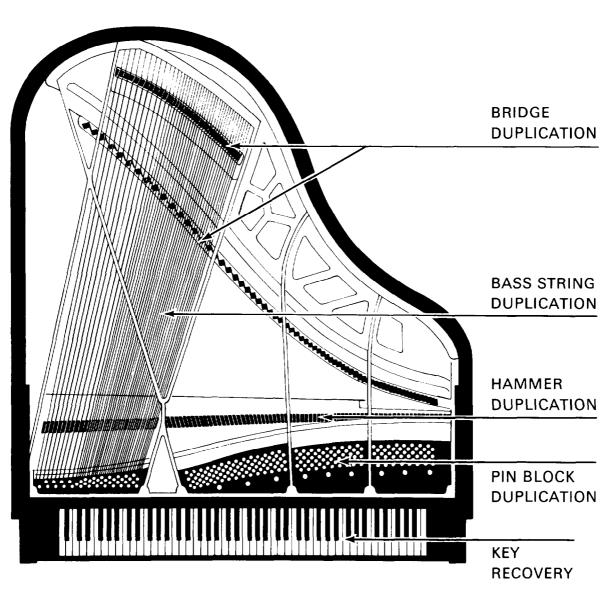
THE BALDWIN GRAND BRIDGE: Thin vertical laminations are bent for continuity of grain from one end of the bridge to the other without horizontal glue joints. Baldwin researchers have found this design contributes significantly to outstanding tone quality.

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

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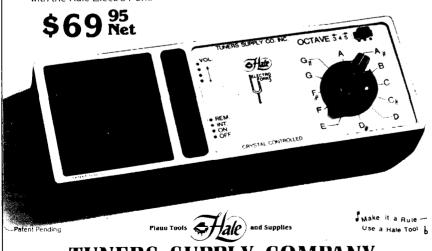
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President's Message



M.B. Hawkins President

Conversations: Never Miss An Opportunity

Tuning it up — "Oh, look. A piano tuner. Do you have to play to tune a piano?"

"I've never seen this done before. Mind if I watch?"

"I just love to hear a piano being tuned."

"Hi, I'll bet you play, too."

Anyone who has serviced a piano located in a place where a number of people are apt to pass within a reasonable earshot has probably heard some of the questions and statements above. Isn't it amazing how much interest we generate...or hadn't you noticed? If you haven't, you should, and if you have noticed, let me ask this question: how did you respond? Did you nod approval? Did you mumble a reply you hoped would indicate by expression and tone that you would rather be left alone? Or did you ignore the question completely?

You can't do that while you're tuning? Well, if you can't do that while you're tuning, can you stop and take a minute to not only be courteous, but sell your trade as well? You didn't have time? Oh. you had to get done so as to get to your next appointment. I hope you did not encounter traffic or a traffic light on the way to your next job. Either would have taken about as much time as it would have taken you to smile, be kind and answer a question or two. That could be done very gently, in a teaching manner. You could have passed along a brochure or two about yourself and the profession you have chosen to work in. You may have gotten a referral. At least you would have been representing the piano technician in a positive manner.

What a wonderful opportunity to give a mini-mini-technical. People appreciate little gems and, when you stop to think about it, we have many tidbits of information to share, provided we're not in too big a hurry to get to the next tuning. No matter how you look at it, it is marketing, a word we must never forget. As a matter

of fact, perhaps we need to find out a bit more about it.

It is easy to become so involved in the day-to-day hustle and bustle of things that we fail to see the forest for the trees. If we allow ourselves to lose sight of the big picture, it could be tragic. We could become so involved in getting from one tuning to the next without contributing to the whole while the forest becomes smaller and smaller.

Let's not miss our total role in the industry. It is not only tuning and servicing the piano, but helping people to understand what makes it tick as well.

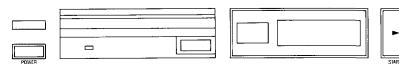
When we talk about pianos, we certainly contribute to player interest. It is possible that many opportunities to talk about pianos and the playing of pianos are missed because of a general insensitivity to little statements and questions as those noted earlier in this piece. Do you think perhaps we are not eager to share our excitement about what a terrific instrument the piano is with anyone other than technicians? Could it be that we think our talk will be too technical for the lay community? Well, if that is the case, I think we need to allow ourselves to become more emotional in a non-technical way. The enthusiasm alone will emit and you will communicate.

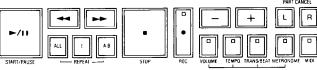
I believe if people were talked to more about pianos, their trust in what we have to say would increase. I also believe our confidence would increase and you would be giving a positive plus for your chosen field of endeavor. A natural byproduct would be alluding to the organization which has assisted you in your quest for additional knowledge. You may even cause the desire to rise inside to attend more functions designed to increase your awareness

Just think of it — all of this while simply talking about the instrument that makes it all possible. ■

Tech Gazette

Yamaha Piano Service February, 1988





MIDI Corner

DISKLAVIER™

Let's take a closer look at our new **Disklavier** piano. The Disklavier is a highly sophisticated music performance system that combines Yamaha's advanced electronics technology with a century of Yamaha acoustic piano craftsmanship.

The Disklavier uses a standard 3.5" floppy disc as a recording medium instead of a paper roll, as with the traditional player piano. This ensures that irregularities caused by the recording medium are eliminated. Each disk holds 640K of information, which translates to approximately 90 minutes of music.

The Disklavier functions as a true reproducing piano. Even the most delicate nuances of touch, from pianissimo to fortissimo, are faithfully captured and reproduced. Even music played from a connected MIDI capable electronic keyboard can be recorded and played back with full expression.

Some of the Disklavier's many features and capabilities are:

Easy instant changes of volume and tempo, and even transposing, during playback. Changing the tempo does not influence the pitch.

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Playing simultaneously with the playback of recorded music.

A built-in metronome function, making it possible to record or practice while listening to the metronome sound.

A repeat function that allows repeated playback of selected music.

MIDI functions are built in. This means that an external MIDI instrument may be played automatically during playback. It also allows for a large variety of MIDI control configurations using sequencers and rhythm machines.

Music that has been recorded using a sequencer can be reproduced, and MIDI voice modules can be connected for ensemble performances. So, until next issue...

Yamaha in the News

YAMAHA AT BERKLEE

Yamaha was recently named the official acoustic piano of the Berklee College of Music in Boston, MA. With an emphasis on contemporary music, Berklee is internationally acknowledged as one of the world's foremost music schools.

Berklee alumni and guest artists of the famous Performance Center read like a "who's who" of the popular music world. All of Berklee's nearly 300 pianos now bear the name **YAMAHA!**

Personnel Profiles

RHONDA KAHLE-GEUKENS



If you have had the occasion to call Piano Service any time in the last three months, you may have noticed a new voice at our end of the line. The person behind that voice is Rhonda

Kahle-Geukens, Customer Service Representative, and our newest member in the Piano Service Department.

Already an integral member of Piano Service, Rhonda works closely with our dealers in the ServicebondsM program and in warranty support.

A fourth generation Californian, Rhonda graduated from Savanna High School in Anaheim, California in 1977. After attending Cypress Community College, Rhonda refined her skills in customer service as an Account Executive with Riviera Finance until she joined the Piano Service staff in November of 1987.

Continuing to expand her knowledge and skills, Rhonda will soon attend California State-Fullerton to complete her degree in Business and Public Relations. Rhonda and her husband John live in Fullerton, California.

Calendar of Coming Events

PTG Conventions

Iulv 18-22:

February 12-14: California State Torrance, CA March 11-13: S. Central Regional Fayetteville, AR March 19-20: Central W. Regional Wichita, KS New Eng. Regional. April 8-10: Newport, RI April 15-17: Pennsylvania State Altoona, PA April 22-24: Pacific Northwest Eugene, OR April 29 & 30, Michigan State May 1: Livonia, MI Summer NAMM June 24-28: Atlanta, GA



31st Nat'l. Conv.

St. Louis, MO

From The Home Office

Larry Goldsmith Executive Director

Getting Organized

Most editors have cluttered desks. On the other hand, I have known some editors whose desks were so immaculate that not a speck of dust, much less an unfiled slip of paper, would dare transgress. They were usually neither more or less brilliant than their cluttered colleagues.

The mess is usually due to an unending flow of press releases, phone messages, stories being edited, letters from readers, memoranda and a bunch of other undefined paper. I would not slander an entire profession by saying that this indicates a tendency to disorganization. Rather, it comes from an attitude of "You never know when this is going to come in handy." True, much of the clutter could and probably should be tossed in the round file. But then again, it's obviously important to the sender, and it may well be important to a segment of readers. The success of an editor is measured in how well he or she can sort through the clutter and produce a thorough, readable and responsible publication.

That's the way it is in most professions. There's a basic objective – be it a satisfied reader or a satisfied pianist. The question is what you have to go through to reach that objective and, by extension, how successful you are at overcoming those obstacles. Many times what makes the difference is attention to detail, to organizing those little slips of paper into a usable bank of information and following up on it.

For more than 10 years, I've had a computer on my desk. These have ranged from small, clumsy prototype systems dedicated to newspaper publishing to medium-sized mainframes in corporate environments to the current rash of small, inexpensive, relatively flexible and sophisticated personal computers. As Henry Jones wrote in

last month's "Economic Affairs" column ("Are You Tired of Playing Games?") we've all been fascinated by their development over the years.

As an organizational tool, they are without equal. Writing letters is close to the least of their capabilities. Once information is in the computer, it can be organized in literally thousands of different ways. The problem is getting it into the computer. Converting a card filing system into a computer database that will sort information 29 different ways and dial the phone for you sounds great until you think about having to type all the information on thousands of clients into the computer in the first place – or the cost of having someone else do it. Even there, though, help may soon be forthcoming: scanners which can read information into a computer are becoming relatively less expensive and more accessible.

But again, I'm not recommending that anyone run right out and get a computer. The point is the results obtained. If you have a system for organizing your life and putting your ducks in a row, you may not need a computer right now. It's fair to say, though, that since computers have such an impact on all our lives today, it's only a matter of time until everyone will have at least some access to one. By then, you won't need to be a programmer. You don't really need to be one today witness the number of people who are marketing management systems designed specifically for piano technicians. The point is simply that those who are the most successful are the ones who are continually open to better ways of doing things.

Now where did I put that slip of paper with the typesetter's phone number?■

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The International Scene

Fred Odenheimer International Relations Committee

> Notes From Europe

As most of us are aware, today's trend in the U.S.A. is towards a larger and better piano. This seems to be true as far as upright as well as grand pianos are concerned. We find that consoles of 43-inch studios and uprights to 51 or 52 inches are more in demand. In grand sizes, 5'7" and around six foot are probably the best sellers. It is interesting to note that this is not just a phenomenon in our country but that also in Europe and perhaps worldwide a trend towards larger and perhaps better quality pianos is indicated. Anyway, there is an article in Das Musikinstrument that would confirm this view, especially as far as upright pianos are concerned. But I am sure it holds also true for grand pianos where sizes 5'7" to perhaps seven foot that are in greater demand. This brings us back to the truth that perhaps today's buyer is more discerning but also to the fact that the cheap piano is out-performed by electronics and cannot effectively compete in the lower price range.

Bosendorfer, the Vienese piano manufacturer should be known to most of us, especially after the Kimball Company acquired the factory and gave it more publicity in this country. A good number of technicians should have seen, heard or tuned the Imperial – the one with the extra keys in the bass, the strings of which may be heard but are never played. With its size of

some 9'6"(290cm) it has also the distinction of the largest grand piano in the world. Or does it?

There is a lesser-known Viennese manufacturer, "Ehrbar" with a concert grand of the same size. Those of you who worked on an Ehrbar grand piano will never forget it because of the Viennese action which was built into this instrument until well into this century. That is the action with the reversed hammershank and hammer. Evidently the company that specialized in rebuilding older instruments in more modern times but built a few more pianos every year intends to be heard of more again in the future by building a larger number of their own brand pianos. At least I deduce this from another article in Das Musikinstrument. I am also sure that these will no longer have the Viennese action.

Interestingly enough there is an article in the latest *Europiano* magazine on regulating the Viennese action, but naturally an article on that belongs into the Technical Forum or perhaps into a separate article.

Finally an article on determining the exact age of a Steinway piano in *Europiano* magazine caught my eye. I shall report on this in the future since at this time I am not at all sure that the American Steinway pianos are marked that way and so we want to check this out first.



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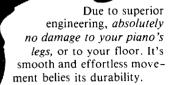


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Ernie Juhn **Institute Director '88**

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This time again private tutoring will be part of our Technical Institute. In fact, by popular demand the program will be expanded. Here is how it will work:

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subjects of tuning, grand regulating, vertical regulating and rebuilding, any subject will be available provided those who register will do so before June 10, 1988. (I urge everyone to sign up as soon as possible).

When the request forms for private tutoring are received a qualified instructor will be selected and sessions will be scheduled. Information about time and room will be included in the registration packet.

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Cleaning And Lubricating A Grand Action

Susan Graham Technical Editor

ast month we analyzed a grand action for possible causes of heavy and inconsistent touch. One of these was excess friction. Remedying friction problems is an important first step in correcting "touch." Proper cleanliness, lubrication and/or fit of parts are all imperative not only for good function but for accurate diagnoses of further sources of trouble.

The most efficient system for cleaning a grand action is not to waste time determining what needs to be cleaned but simply to get out the necessary materials and clean everything. Here's what I'll be using: air compressor, soft wire brush, buffing wheel and rouge, low-abrasive brass polish (Brasso), drycleaning fluid (Renews-it), a spring hook, a small dull screwdriver, a flange screwdriver, keypin polishing tools, plenty of rags, and the necessary safety equipment.

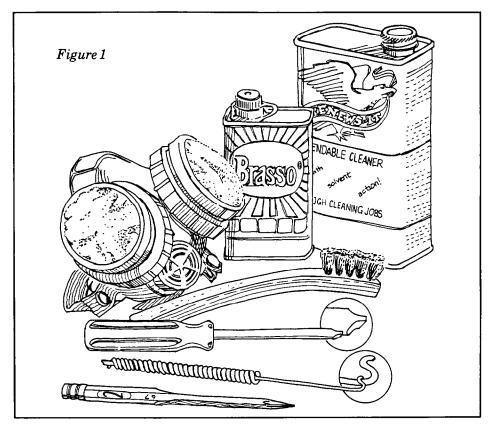
Many of the cleaned parts will need lubrication: DAG (colloidal graphite), teflon spray (such as TFL-50), unscented talc (or powered soapstone, or powered teflon) and a plain solid wood pencil.

Begin by removing the stack from the keyframe. Keep the keyframe screws in order – a business card with the necessary number of holes punched in it and one end labeled "bass" will do fine. Since cleaning is most efficient when compressed air is used, tighten all the flange screws. This will prevent blowing debris under a loose flange, and also maintains the spacing of parts. As always, use a

screwdriver which has the sides of the blade ground parallel so it will fit tightly in the slot and not mar the head (Fig. 1). Screwdrivers can be hollow-ground to this shape or they can be purchased ready-made from good tool suppliers and from sporting goods store which sell to gunsmiths. The tips available for power screwdrivers and good quality removable-tip hand screwdrivers will also be parallel-sided. Similarly, the correct-sized Phillips head screwdriver should be used if needed. Another tip on

P-head screws: if the screwhead has been damaged, it is usually at the bottom of the hole. A larger sized screwdriver with the tip ground off may engage the threads remaining around the outer edge and allow the screw to be removed. Do not overtighten flange screws, which may strip the holes in the rails. It may also spread the "ears" of the wippen flange, creating sluggishness.

The butterfly-spring wippen (Steinway, Yamaha) has a particular trouble spot which needs

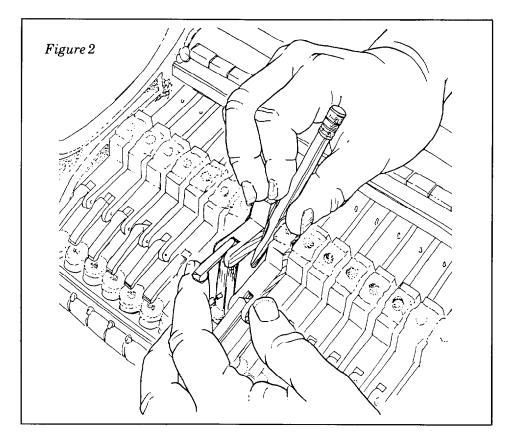


attention: since many of the actions we see for regulation and rebuilding are old Steinways, this is often where the cleaning process begins. Other styles of wippens, obviously, may not need this procedure.

Any butterfly-spring wippen with old grease graphite and debris in the repetition lever groove and corrosion on the spring head will be virtually impossible to regulate. The spring must be so strong to break free of all the gunk that it then overpowers the wippen and key return, causing noise, bouncing, poor backchecking and so forth.

It is not necessary to remove the wippens from the rail to clean the grooves. First, with the stack upright, use a spring hook (fig. 1) and release all the spring heads from the grooves and pull them gently to one side, free of the repetition lever. Use a nonabrasive brass polish such as Brasso to clean the heads. Do not use steel wool, which may damage the plating. You will need to support the spring with one hand and clean the corrosion off the head with a rag in the other. Do not kink the spring, and try not to change the tightness of the coil (at this time). Then, put clean rags or newspaper on the bench to protect the hammers and roll the stack completely over so the wippen cushions face up. Clean the repetition lever grooves by gently scraping them clean with a small implement which will reach between the wippens. A thin, dull screwdriver blade is excellent since it is narrow enough to reach the very bottom of the groove but not so sharp it removes wood. Push the gunk completely out of the groove (it will fall onto the knuckles but we'll take care of that later).

Lubricating the grooves requires an increasing scarce commdity: a solid wood pencil. The pencil must be whittled down on opposing sides to flatten it (Fig. 1) so it will fit between the wippen bodies and reach the groove to apply a line of graphite to the wood (Fig. 2). (If this whittling is attempted on a cheap modern pencil, which appears to be composed of wax and sawdust, it will break.) This line of dry graphite is all that is necessary to lubricate the spring groove, so long as it and the spring are properly



cleaned. Heavier lubricants, such as VJ lube or even DAG, tend to collect dirt, and allow the spring head to dig a little hole and then click as it pops free.

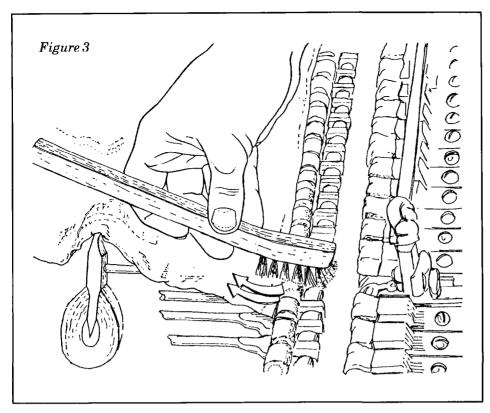
Right the action and replace the springs in the grooves. Wiggle each one slightly to be sure the spring head is really in the groove and not hanging up on the underside of the lever.

There are four components of a grand action which, if not replaced, should be cleaned. A product for home drycleaning, such as Renewsit, is suitable. Perchlorethylene, used by commercial drycleaners, is more effective but it is a highly toxic carcinogen. (It is absorbed not only through the lungs but through the skin and, once absorbed, cannot be metabolized.) The products such as Renews-it are less toxic but adequate safety equipment must be used: a wellfitted respirator (Fig. 1) with the correct filters (not a 39-cent painter's dust mask), gloves, goggles, and ear protectors if the compressor is running. The fact that the phone inevitably rings just as all this armor is donned can only be regarded dispassionately as a corollary to Murphy's law.

The objects of attention for drycleaning are knuckles, wippen

cushions, drop leathers, and letoff punchings. To clean the first two, roll the stack over halfway so it rests on the hammer or letoff rail and the front bracket feet. Cover the bench to protect the hammers, and let them fall forward to rest strike-point-down on the bench, exposing the knuckles. Put a rag across the shanks between the knuckles and the hammers. Soak the knuckles with drycleaning fluid and brush them with a soft wire brush (Fig. 3). Attempt to determine the direction of the nap; most likely, it runs toward the hammer. The knuckles should be brushed only with the nap, which will smooth the buckskin instead of roughening it. The reason for the nap orientation is to offer slight resistence to the jack as it slides forward under the knuckle, giving a little more power to the stroke. There is also less resistance to the jack return. Some manufacturers, however, reverse the nap direction. believing that it reduces knuckle wear since the jack is not catching on the buckskin. If the nap is indeterminate, assume that it is safe to brush toward the hammer.

If the knuckles are very dirty, blot them with a rag after brushing, resaturate, brush and blot again. Finally, use a blast from the



air compressor to blow out remaining crud from the knuckle and surrounding area. This speeds drying; it is important to let the knuckles dry completely before they are put back in contact with the top of the repetition lever to prevent them from setting in a flattened shape. If a compressor is not available, let the knuckles air-dry and then brush them a final time.

The procedure for wippen cushions is similar. The stack is still rolled forward, so the cushions are exposed as the wippens hang vertically. Support the repetition levers with one hand and soak, brush and blast the cushions with the other. Allow these to dry thoroughly.

Cleaning knuckles and wippen cushions does much to restore shape and consistency. There comes a time when it is no longer sufficient, however. These parts can be bolstered with thin strips of bushing cloth and a glover's needle, but I find that the result of bolstering is not entirely satisfactory, and it is just as timeconsuming as complete replacement. We'll discuss replacement procedures in the future.

Letoff punchings can also be drycleaned. Roll the stack forward on the hammer rail as above and put one-inch strips of wood on edge on the shanks where they will support the repetition levers as the stack is completely inverted. This holds the wippens up so the jack toes are away from the letoff punchings. The punchings can be soaked. brushed and blasted to clean them. This, too, will result at least in a partial restoration of shape, which makes regulation easier.

Access to the drop leathers is limited unless you happen to have the hammershanks off. If the shanks and flanges are being replaced, remember to clean the drop leathers before installing the new shanks. Otherwise, raise the shanks (the stack is once again upright) and dryclean and brush the leathers as well as possible (the long-handled wire brush pictured in figure 3 works well). Hardened, dirty drop leathers not only make regulation more difficult, they can cause noise: as the key is released, the repetition lever may rebound so the drop leather rattles against the drop screw.

Drycleaning is faster and more effective when compressed air can be used. Purchasing a full-sized, heavy-duty compressor may strain the budget as well as the storage space of a new technician, or those who do only occasional shopwork. I have found that a 3/4 hp. tankless compressor (mine happens to be a Sears) is perfectly adequate for these light-duty applications. Since

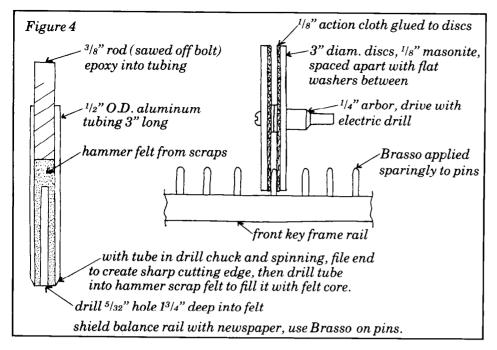
it has no storage, it runs constantly, and does not attain the PSI which a larger model would have. It is sufficient to spray plates and to cool the drill bit in drilling pinblocks, however, and to do various cleaning jobs. The immediate advantages of size, portability and affordability balance the possibility of having to replace it in the future (one of the very few times this has been true, however...).

While the cleaned stack parts finish drying, turn to the keyframe pins. Cleaning these pins by hand ranks as one of the most tedious tasks we encounter. Once again, Fern Henry and Bill Spurlock have come to the rescue and devised two drill-operated devices for quick and thorough key pin cleaning (Fig. 4). Like key clamps, once these are made, they become indispensable. (A 1/4" arbor is easily obtained by purchasing a rubber-backed "sanding disc" used with an electric drill.) If construction seems like too much trouble, clean a few sets of

keypins by hand...

While cleaning the keypins, watch for signs of nicks or corrosion which will damage the keybushings. One telltale sign is pink dust on the front rail punchings - an indication of nicks or bad plating on the front rail pins. This is often the result of improper use of the key spacing tool. The edges around the aperture of this tool should be slightly rounded and smooth - dress them with a small file if necessary. When the tool is used to make a slight bend in the front rail pins to space the kevs from side to side, lift the front rail punching and insert the tool below it: if the pin is damaged, the punching will cover it and protect the bushing. If the pins are nicked where they contact the bushing, they should be replaced or they will destroy the cloth. Some technicians grab the pin at the base with a diagonal cutter and lever it out against the keyframe. I lack the hand strength for this, so I use a trusty visegrips to grab the pin and yank it out with brute force (always being sure beforehand that I have replacement keypins.) The hole in the keyframe may be slightly larger or smaller than the round base of the new pin - either gluesize the hole or drill it out, as necessary. The pin should fit tightly to keep it from turning, but

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not so tightly there is danger of splitting the rail as the pin is pounded in. Use a punch such as a concave-end nail set when pounding the pins in to prevent damaging the top of the pin. Corroded balance rail pins should be replaced in a similar fashion — there are also several sizes of these so be sure of having the proper size before removing an old pin.

Burrs on grand capstans are common, and will cause friction in the action and premature wear of the wippen cushions. This burr is a tiny collar of metal around the top edge of the capstan. In most cases. it can be removed by polishing on a cotton wheel using white rouge and patience. Bill Spurlock cuts a 1/4" slot on a piece of 1/8" masonite and widens the top of the slot with a 1/2" router bit so it will fit around the base of four or five capstans at a time; this holds the keys in a group and prevents getting black marks from the wheel on the keys. If the burrs are severe, the keys may have to be handled individually to smooth completely around the circumference of the capstan, 3M makes a "Scotch-Brite Light Deburring Wheel" which, in the "8s" or finest grade, is excellent for deburring capstans, or it can be done by hand with emery paper. A final polishing on the cotton wheel is necessary, whether the capstans need deburring or not: polishing removes tiny scratches in the brass and helps seal the surface. At the very least, the capstans should be

cleaned with brass polish.

Now that everything is clean and dry, some lubrication is in order before the action is reassembled. The appropriate lubricant not only moderates friction between parts. but often helps seal a cleaned surface. It should be emphasized that lubrication is not a cure-all: parts need to be in good shape to work well, and no amount of lubrication can make up for flat knuckles or dished and hardened wippen cushions. Light lubrication, however, repeated as needed, does help a grand action to function smoothly and quietly.

Because it was convenient to do so, the spring grooves in the repetition levers were lubricated at the time of cleaning. Now it is time to treat the parts which were drycleaned, are now completely dry and have had one final brushing, if needed, to remove any residue. Drycleaned knuckles must be lubricated or they will squeak. It's even a characteristic of the nice vellow buckskin knuckles which we use as replacements and which appear on many new pianos: squeaks which often occur only the first time the note is played and then disappear, making them extremely difficult to diagnose.

For awhile I used spray teflon such as TFL-50 or the products available for commercial use packaged as "lubricant/release agent" to lubricate knuckles. This was done by simply saturating the knuckles and letting them dry,

when a white, powdery residue would form. Lately I have begun to suspect that the vehicle in these sprays has had a hardening effect on the knuckles, exacerbating the problem of return noise. The product which used to be available as Slipspray seemed to "powder up" more readily without saturating the buckskin with vehicle. Dupont no longer makes it: it is now manufactured as TFL-50 by Wet'n'Dry Lubes. I will have information on distributors later; it may become available through our supply houses. Local industrial suppliers, paint and hardware stores may carry a "house brand" such as the Aervoe product shown. Be sure not to confuse teflon sprays with silicone or petroleum-based products. A dry teflon spray can be sprayed on a piece of glass and, when dry, will wipe clean, leaving no residue.

At any rate, I am back to using unscented talc on knuckles. This is available in two forms. One is to buy soapstone sticks or chunks and powder them for easy application by scraping with a knife. Now I am informed that there are synthetic soapstone sticks around which are noticeably inferior to the real thing (probably made by the same people who make those wax pencils). Good, authentic soapstone can be had from welders' suppliers. Uns-



cented talc is available from some pharmacies, but it is much cheaper to buy from a chemical lab (look in the Yellow Pages). The reason for using unscented talc rather than baby powder is to avoid contamination from oils and perfumes. Apply the powder to the knuckes and burnish it in by hand. Powdered teflon, such as the product brand-named "one-puff," can also be used, and is handy to carry in a tool case.

Lubricating wippen cushions, drop leather and letoff punchings is not necessary. There is some debate about whether or not capstans should be lubricated: some maintain that the natural lubrication of brass is sufficient. Others, like me, see no harm in applying a coat of spray teflon to buffed capstans, and feel that it may retard future oxidation. I also apply teflon spray to the keyframe pins.

The repetition lever windows, the tops of the jacks, and the toes of the jacks are lubricated. This is one of the few applications for graphite. Powdered graphite can be mixed with alcohol to make it easier to apply, or it can be purchased as DAG 154 from our suppliers: DAG is a colloid of graphite in isopropyl alcohol. It is too thick as it comes from the bottle and needs to be thinned slightly. Brush it on the repetition lever tops, the jack tops and the jack toes and let it dry completely. If the pores of the wood are still visible, reapply. DAG can also be applied over Emralon (the lubrication, usually green, found on modern action parts) if needed, as it begins to wear through. Any form of graphite should be burnished: at the very least, polish it with a piece of backrail cloth to remove any excess. Better still, really burnish the wood and graphite with a burnisher used in sharpening, or any smooth, hard metal implement such as a dental tool or even a large blunt needle. The point is to create a very slick, polished wood/graphite surface, with no graphite residue to transfer to knuckles or other cloth parts. I do sometimes apply spray teflon over DAG or Emralon, especially during a quick touch-up regulation. Notice I do not recommend grease or stick graphite. Anything gummy on the repetition lever and jack will create more friction problems than it solves. It is also a

source of noise, since the knuckle will click as it breaks free, and the heavy residue is counterproductive to the workings of the buckskin nap. If there is a residue left from a previous technician's well-meaning efforts with the grease graphite, it may need to be gently scraped away with a razor blade, or removed with drycleaning before new DAG can be applied.

As stated, these cleaning operations are hardly worth thinking about – just do them. Time required for all these jobs is less than two hours, and it ensures that the action is ready for further friction analysis and control and, eventually, regulation.

Burning Shanks?

For 41 years, I have been warping hammer shanks to align hammers with adjoining hammers. But never again!

A few weeks ago, I put a lighted match to a hammer shank and – horror of horrors – I almost set the piano on fire. This could have been a real catastrophe!

It seems that someone had previously cemented a broken shank with acetate cement and much of this cement surrounded the shank. Everyone knows that acetate is celluloid and is highly combustible. In a split second, I had a flame at least three inches high. Luckily (may the saints be praised!) I was able to blow out the flame. Had I not been able to

do so, imagine the consequences.

My advice to anyone is to remove the unit (butt, shank and hammer) and warp the shank outside the piano.

Forewarned is forearmed. **Ernie Vagias**

Thanks to Ernie for this cautionary tale. I might add that a heat gun is a more controllable tool for warping shanks and other applications where concentrated heat is necessary. The heat gun delivers air heated to 750 degrees F. (at the nozzle) while the white portion of a flame produced by a match approaches 1,500 degrees C. - an enormous difference. Since the heat gun is sufficient, why risk the hazard Mr. Vagias outlines, as well as the attendant nuisances of burned fingers, embers in the action, etc.? A heat gun also has a more professional appearance, for your customer's sake, and will not leave smoke or char on action parts. It must be used with care, since the "heat" is not as visible as it is with a match and it is possible to scorch surrounding parts through absentmindedness, but it is still safer and more controllable than an open flame.

Please send technical questions and comments to: Susan Graham Technical Editor 2967 Madeline St. Oakland, CA 94602

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T U N I N G UP

Beats And Cents; Two Tuning Systems

Rick Baldassin Tuning Editor

ur first letter this month comes from W. Dean Howell, of El Paso, Texas. Dean writes:

Thank you for your fine in-depth discussions of piano tuning. I could not understand John Travis' class on piano tuning in Washington, 1958; thus I wrote "Professional Piano Tuning" in 1966. Sometime later Travis' book "Let's Tune Up" came on the market. We were both talking about aural beats. In many scales they increase smoothly ascending from F3; they decrease descending from F3, often smoothly.

On page 23 of the December 1987 Piano Technicians Journal, it is claimed that in measuring by cents with the Accu-Tuner, the Major Thirds decrease in width as they ascend from F3 to F4. Should this happen aurally too? I read every issue of the Piano Technicians Journal. Please tell us the difference between beat experience and the cents experience for rewarding piano tuning.

The problem here may be one of semantics. In a theoretical equal temperament with no inharmonicity present, the cent width for all of the Major Thirds is the same, 13.7 cents. At the same time, the beat rates of the same thirds increase as we ascend the scale, at

the rate of the twelfth root of two to one. When it was stated that the thirds decrease in cent width as they ascend from F3 to F4, this has reference to the fact that because of inharmonicity in the piano, the thirds do not remain the same in cent width, but get smaller as we ascend the scale. In spite of this, the beat rates still increase in speed, but at a rate slower than in equal temperament.

Looking back at the Sanderson Data presented previously, we see that the width of the F3-A3 M3 is 14.2 cents, while the width of the C#4-F4 M3 is 13.3 cents. In spite of this, the F3-A3 M3 beats at 7.0 BPS, and the C#4-F4 M3 beats at 10.5 BPS. So we see that the beats still increase in speed even though the cent widths decrease. The

accompanying chart gives the theoretical cent widths and beat rates, along with the cent widths and beat rates from the actual Sanderson data.

From the above we see that for this piano, the beat speed start out faster than in equal temperament for F3-A3, but end up slower than in equal temperament for C#4-F4. Even so, looking at the beat speeds from the Sanderson Data alone, the speeds do increase ascending, and quite smoothly at that. As to whether the aural tuner should try to emulate this, to my knowledge there is no way to do so. In aural tuning the object is to achieve a smooth increasing progression of beats as we ascend. This is also the object of tuning with an electronic aid. Even so, in the piano we would

Chart 1:	Theoretical		Sanderson Data	
Notes	Width	Beats	Width	Beats
F3-A3	13.7	6.9	14.2	7.0
F#-A#	13.7	7.3	14.1	7.4
G3-B3	13.7	7.8	14.0	7.8
G♯-C4	13.7	8.2	13.9	8.2
A3-C♯	13.7	8.7	13.8	8.6
A#-D4	13.7	9.3	13.7	9.1
B3-D♯	13.7	9.8	13.6	9.5
C4-E4	13.7	10.4	13.5	10.0
C#-F4	13.7	11.0	13.3	10.5

find that in either case, because of inharmonicity, the cent widths of the Major thirds would decrease as we ascend the scale.

We next have two letters which describe tuning systems with something in common: they each build the temperament from four chains or series of intervals, the first four series of Dominant 7th Chords, and the second four series of contiguous Major Thirds.

Our first system comes from Russ Upham of National City, California. Russ writes:

Enclosed is a method of tuning that Don Galt found fit to include in the March 1974 *Journal*. Don, in my opinion, was the most knowledgeable piano man I ever met.

After the appearance of this article, I received several letters from PTG members who were enthusiastic as to the results after trying it. About 80 percent of my tunings are on spinets or consoles. This method is flexible and produces a good musical sound out of these pesky little devils.

Sincerely, Russ Upham.

(Editors Note: This article was originally written for tuners who had harmony training in music theory. The spelling of each chord was musically correct according to music theory. Because of problems with enharmonics, and to make the work more easily understood by a larger group of piano technicians, the spellings of the chords have been altered to include the use of sharps only.

In addition, the octave numbers for each note have been included to help clarify. My apologies to you devotees of music theory. RB)

Harmonic Approach To Piano Tuning by Russ Upham

By harmonic, it is meant that the natural harmonics of a vibrating string are utilized for setting a temperament and for tests to produce the best possible musical sound from any piano, even the lowly spinet.

If we re-arrange all the harmonics of a vibrating "C" string in a series of thirds, they would appear as follows:

C3, E3, G3, A#3, D4, F#4, A4

This is known in harmony as a Dominant Thirteenth Chord. In this

method of tuning, we utilize the five lowest notes of this series for our tests when setting the temperament and for checking octaves as we tune up and down the keyboard. These lower five notes are known as the Dominant Ninth Chord. The lower four notes are known as the Dominant Seventh Chord. These are used in setting the temperament and for testing each octave above or below the temperament. We must alter each interval in this chord to produce a Tempered Scale. The tempering of the scale is necessary to be able to play in any key without re-tuning each time a keychange is made.

Major Thirds are expanded to a rather fast beat.

Minor Thirds are contracted to be quite fast.

Major Sixths are expanded to beat rather fast.

Fifths are contracted to beat very slightly.

Fourths are expanded to a slow roll.

Our task is to produce a series of Dominant Seventh Chords where each series increases by approximately one-half beat per second when ascending chromatically. The following is a diagram of the temperament: (The BPS are approximate and rounded off).

BPS	Chord
7.0	<i>C3 -D</i> ♯3- F3 -A3 -C4
7.5	C#3-E3 -F#3 -A#3- C#4
8.0	D3 -F3 - G3 -B3 -D3
8.5	D#3-F#3-G#3 -C4 -D#4
9.0	E3 -G3 - A3 -C#4-E4
9.5	F3 -G#3-A#3 -D4 -F4
10.0	F#3-A3 - B3 -D#4-F#4
10.5	G3 -A#3- C4 -E4 -G4
11.0	G#3-B3 -C#4 -F4 -G#4
11.5	A3 -C4 - D4 -F#4-A4
12.0	A#3-C#4-D#4 -G4 -A#4
12.5	B3 -D4 - E4 -G#4-B4
	5th-7th-Root-3rd-5th

Root and 3rd of the chord beat the same speed as the 5th and 7th. Here

is the procedure:

- 1. Tune A4 to A-440 tuning fork with F2 test note.
- 2. From A4, tune A3, using M3-M10 test.
- 3. From A3, tune F3, expanded to approx. 7 BPS.
- 4. From A3, tune D4, exp. to slight roll. F3-A3 slower than F3-D4.
- 5. From D4, tune G3, contracted slightly.
- 6. From G3, tune B3, G3-B3 beats same as F3-D4.(G7 Chord)
- 7. From A3, tune E4, cont. slightly. G3-B3 slower than G3-E4.
- 8. From A3, tune C#4, exp. approx. 9 BPS (A3-C#4 same as G3-E4). (A7 Chord)
- 9. From C#4, tune F#3, cont. slightly (F#3-A3 faster than A3-C#4).
- 10. From F3, tune A#3, exp. slight roll. (Play F-A, F#-A#, G-B).

At this point, this series should increase in speed by approximately 1/2 beat per second. If not, an adjustment must be made. If F#3-A#3 beats faster than F3-A3, and more than G3-B3, a smooth progression can be achieved by lowering F3 slightly, and lowering A#3 slightly, producing a smooth progression of thirds. Adjust these two notes to the extent that F-A, F#-A#, and G-B increase in speed smoothly. Some pianos sound better if F-A beats at 6.5 and some at 7.5. The piano is telling you how it wants to be tuned.

- 11.From C#4, tune G#3, exp. slow roll. (F3-G#3 same as A#3-D4). (A#7 Chord)
- 12.From G#3, tune D#4, cont. slightly. (G#3-C4 same as F#3-D#4). (G#7 Chord)

We are now ready to tune upward. For the next octave, we will use the Dominant 7th as the test. The inside Major Third beats the same as the outside Major Sixth. When this test is used, the octaves are automatically being expanded smoothly and progressively. Tune each note first as the upper note of the octave, then as the upper note of a fifth, with no beats. Next lower the note very slightly to contract the fifth. The inside 3rd, outside 6th is the final critical judgement.

- 13. Tune F4 as octave from F3, and as fifth from A#3 pure, then lower so that A#3-D3 beats same as G#3-F4. (A#7 Chord).
- 14. Tune F#4 as octave fom F#3, and as fifth from B3 pure, then lower so that B3-D4 beats same as A3-F#4. (B7 Chord).
- 15. Tune G4 as octave from G3, and as fifth from C4 pure, then lower so that C3-E3 beats same as A#3-G4. (C7 Chord).
- 16. Tune G#4 as octave from G#3, and as fifth from C#4 pure, then lower so that C#4-F4 beats same as B3-G#4. (C#7 Chord).
- 17. Tune A4 as octave from A3, and as fifth from D4 pure, then lower so that D4-F#4 beats same as C4-A4. (D7 Chord).
- 18. Tune A#4 as octave from A#3, and as fifth from D#4 pure, then lower so that D#4-G4 beats same as C#4-A#4. (D#7 Chord).
- 19. Tune B4 as octave from B3, and as fifth from E4 pure, then lower so that E4-G#4 beats same as D4-B4. (E7 Chord).
- 20. Tune C5 as octave from C4, and as fifth from F4 pure, then lower so that F4-A4 beats same as D#4-C5. (F7 Chord).
- 21. Tune C#5 as octave from C#4, and as fifth from F#4 pure, then lower so that F#4-A#4 beats same as E4-C#4. (F#7 Chord).
- 22. Tune D5 as octave from D4, and as fifth from G4 pure, then lower so that G4-B4 beats same as F4-D5. (G7 Chord).
- 23. Tune D#5 as octave from D#4, and as fifth from G#4 pure, then lower so that G#4-C5 beats same as F#4-D#5. (G#7 Chord).
- 24. Tune E5 as octave from E4, and as fifth from A4 pure, the lower so that A4-C#5 beats same as G4-E5. (A7 Chord).
- 25. Tune F5 as octave from F4, and as fifth from A#4 pure, then lower so that A#4-D5 beats same as G#4-F5. (A#7 Chord).

As we go up in the treble, the following method of testing will be very satisfactory in producing a good musical sound in the highest end of the piano.

1. Tune each octave a slight bit on

- the sharp side, but not too much.
- 2. Using the note you are tuning as the root of the chord, play a major chord. If you are tuning C6, play C5-E5-G5-C6.
- 3. Next lower the third and play a minor chord C5-D#5-G5-C6.
- 4. Next raise the third and fifth each a half-step and play a minor chord C5-F5-G#5-C6.
- 5. Play the original major chord again. Listen to the octave being tuned each time. If the octave is not right, a definite bad beat will be noticeable. Make it sound musical.

For the lower end of the piano, we will again use the Dominant 7th Chord for an octave down from the temperament. Procedure:

- 1. Tune E3 octave. Test E3-G3 beats same as A3-C#4. (A7 Chord).
- 2. Tune D#3 octave. Test D#3-F#3 beats same as G#3-C4. (G#7 Chord)
- 3. Tune D3 octave. Test D3-F3 beats same as G3-B3. (G7 Chord).
- 4. Tune C#3 octave. Test C#3-E3 beats same as F#3-A#3. (F#7 Chord)
- 5. Tune C3 octave. Test C3-D#3 beats same as F3-A3. (F7 Chord).
- 6. Tune B2 octave. Test B2-D3 beats same as E3-G#3. (E7 Chord).
- 7. Tune A#2 octave. Test A#2-C#3 beats same as D#3-G3. (D#7 Chord)
- 8. Tune A2 octave. Test A2-C3 beats same as D3-F#3. (D7 Chord).
- 9. Tune G#2 octave. Test G#2-B2 beats same as C#3-F3. (C#7 Chord).
- 10.Tune G2 octave. Test G3-A#2 beats same as C3-E3. (C7 Chord).
- 11. Tune F#2 octave. Test F#2-A2 beats same as B2-D#3. (B7 Chord).
- 12.Tune F2 octave. Test F2-G#2 beats same as A#2-D3. (A#7 Chord).

At this point, the beat becomes too slow to determine. We will now use a very useful and accurate test. It is the Dominant 9th test. The root and octave-7th beats the same as the octave-7th and octave-9th.

- 1. Tune E2 octave. Test E2-D4 beats same as D4-F#4.
- 2. Tune D#2 octave. Test D#2-C#4 beats same as C#4-F4.
- 3. Tune D2 octave. Test D2-C4 beats same as C4-E4.

- 4. Tune C#2 octave. Test C#2-B3 beats same as B3-D#4.
- 5. Tune C2 octave. Test C2-A#3 beats same as A#3-D4.
- 6. Tune B1 octave. Test B1-A3 beats same as A3-C#4.
- 7. Tune A#1 octave. Test A#1-G#3 beats same as G#3-C4.
- 8. Tune A1 octave. Test A1-G3 beats same as G3-B3.
- 9. Tune G#1 octave. Test G#1-F#3 beats same as F#3-A#3.
- 10. Tune G1 octave. Test G1-F3 beats same as F3-A3.
- 11. Tune F#1 octave. Test F#1-E3 beats same as E3-G#3.
- 12. Tune F1 octave. Test F1-D#3 beats same as D#3-G3.

At this point, continue down to A0, using the double-octave-seventh and double-octave-ninth.

- 1. Tune E1 octave. Test E1-D4 beats same as D4-F#4.
- 2. Tune D#1 octave. Test D#1-C#4 beats same as C#4-F4.
- 3. Tune D1 octave. Test D1-C4 beats same as C4-E4.
- 4. Tune C#1 octave. Test C#1-B3 beats same as B3-D#4.
- 5. Tune C1 octave. Test C1-A#3 beats same as A#3-D4.
- 6. Tune B0 octave. Test B0-A3 beats same as A3-C#4.
- 7. Tune A#0 octave. Test A#0-G#3 beats same as G#3-C4.
- 8. Tune A0 octave. Test A0-G3 beats same as G3-B3.

Dominant 9th tests can be heard clearly if the upper 7th and 9th notes are played in the temperament section. The piano is now in tune.

Our thanks to Russ for this interesting approach to tuning. I never met Don Galt personally, but based on a procedure which I learned this summer, employing the use of a zirk fitting and grease gun to re-glue separated beams, which procedure had been taught by Don Galt, I would have to agree that he was a smart cookie.

Our next system comes from Jesse Manley, of Griffin, Georgia. Jesse writes:

I have enjoyed your columns in the *Journal*. I have very little sight

left, and my hearing is deteriorating. At my last testing I had about fifty percent hearing in the middle ranges and less than that in the high frequencies. So far there are no serious frequency gaps in my hearing. I have not been conscious of any tuning problems, but small action noises no longer catch my attention. Recently a lady described a "thud" caused by playing a certain treble key. After a minute or so looking for a "thud" that irritated the piano owner, she excitedly told me the "thud" was gone. I had bent the bridle wire to make sure that it did not click against the backcheck. I told her I would have corrected it sooner if she hadn't referred to it as a "thud." I probably thought she would have called it a "metallic click."

In a recent column it was mentioned that George Defebaugh uses an electronic tuner for a few high notes where he is developing a hearing loss. Can you forsee how a blind tuner might make use of an electronic device for tuning pianos? I receive George Defebaugh's tape recording of the Piano Technicians Journal, and I'm sure that all the blind technicians appreciate his reading as much as I do. If we could use the electronic tuners efficiently, so much of the information presented in the journal would be more meaningful to us.

Your articles have caused me to begin thinking of how I evolved my favorite ways of doing a tuning job effectively. I have enjoyed setting some of this down today. If it contains anything you think may be of interest, please use it. Keep up the good work.

Sincerely, Jesse Manley.

An Approach To Aural Tuning by Jesse Manley

It is probable that the electronic tuning devices will change the tuning profession as profoundly as the chain saw has changed lumbering throughout the world. After reading a little about the electronic analysis of actual string partials, I have changed my tuning of the treble by not sharpening the high treble as much as I once did. It is interesting to learn more about partials and their relative strengths as shown by electronic analysis. It

seems an appropriate time to examine some of the methods which use these partial beats to accomplish aural tuning.

I was taught to use a C-523.3 tuning fork to begin a series of fourths and fifths to tune a temperament octave between F3 and F4. I used mainly Major Thirds and Major Sixths to check my work and get an acceptable temperament.

It was many years before I was given a copy of the little book on tuning that was published by the Faust School of Tuning in Boston. As I devised my favorite temperament, I chose to use the A-440 fork, which, after all, is the designated standard pitch for most of the world. I began with a chain or stack of expanded Major Thirds. I tuned the F3-A3 M3, then the A3-C#4 M3, and the C#4-F4 M3. I then tuned the C#3-F3 M3. I worked at this until I had until I had octaves from C#3-C#4 and F3-F4, which were as smooth as possible. The beat of the C#3-F3 M3 would be about half the speed of the C#4-F4 M3, as well. There was a uniform increase between each pair of Major Thirds in the upward progression. The beats were fast enough to make the uniform increase in beat rates obvious. When I perfected this chain of Major Thirds, I had a sort of skeleton for my temperament.

I could the tune a chain of Major Thirds built upwards from E3 to E4. I could only suspect that the beats in this series of thirds were slower than the series that had been tuned on F. In addition, I knew that the M6 from E3-C#4 should equal in speed the M3 from F#3-A#3 (yet untuned) which would be slightly faster than the F3-A3 M3 in the first series. G#3 is next tuned to E3, slightly slower than F3-A3. Also, the M6 from G#3-F4 should equal in speed the A#3-D4 M3 (yet untuned), just slightly faster than the A3-C#4 M3 already tuned. C4 and E4 are tuned as thirds such that they fit in with their neighbors, form a good progression, and a smooth sounding octave from E3-E4. The second chain of Major Thirds is complete.

The third chain is tuned from the top down. D4 is tuned such that the F3-D4 M6 is half way between the speed of the F3-A3 M3 and the A3-C#4 M3, or in other words that the speed of the F3-D4 M6 should equal the speed of the G3-B3 M3 (yet untuned). I then tune A#3 to D4, F#3

to A#3, and D3 to F#3, such that these thirds fit in with their neighbors, form a good progression, and a smooth sounding octave from D3-D4. The third chain is now complete.

At this point, there is one final chain of Major Thirds to be tuned. D#4 can be tuned to F#3 such that the F#3-D#4 M6 equals the speed of the G#3-C4 M3, then the remaining notes B3, G3, and D#3 can be tuned as thirds such that they fit in with their neighbors, form a good progression, and a smooth sounding octave from D#3-D#4.

When a temperament is tuned as one long chain of fourths and fifths, it is hard to isolate an error without depending heavily on other test intervals. It is much easier to provide a foundation based on a chain of four Major Thirds encompassing two good sounding octaves, where a comparable difference exists between each contiguous pair of thirds in the series.

For most tuners, the unaided ear cannot count beats very accurately. A tuner can learn, however, to discern small differences in beat speeds guite accurately. I like to think of my estimate of difference in beat rates like the difference in value of coins when making a purchase or sale. My fundamental interval for this seems to be the Major Third. The smallest difference I usually consider is the difference in speed of beats between two Major Thirds a half-step apart. I may only suspect this difference. If I am too sure it really exists, the difference may be too great. If I play a chromatic sequence of three or four Major Thirds and hear no increase in speed, I know I am headed for trouble. An example of this half-step difference would be from F3-A3 to F#3-A#3. Since the speed of the E3-C#4 M6 equals the speed of the F#3-A#3 M3, the difference from F3-A3 to E3-C#4 could also be considered a half-step difference. Likewise since the C#3-E3 m3 equals in speed the E3-C#4 M6, the difference from F3-A3 to C#3-E3 could also be considered a half-step difference.

A difference between Major Thirds a whole step apart is large enough for me to be sure it exists, but it is still a small difference. An example of this whole step difference would be from F3-A3 to G3-B3. Since the speed of the F3-D4 M6 equals the speed of the G3-B3 M3,

the difference from F3-A3 to F3-D4 could also be considered a whole step difference. Likewise since the D3-F3 m3 equals in speed the F3-D4 M6, the difference from F3-A3 to D3-F3



could be considered a whole step difference.

The next largest comparison equals the difference found between a pair of Major Thirds that are three half-steps apart. This is a difference that can be easily detected, but not large enough to make the difference hard to identify. An example of this 1-1/2 step difference would be from F3-A3 to G#3-C4. Since the speed of the F#3-D#4 M6 equals the speed of the G#3-C4 M3, the difference from F3-A3 to F#3-D#4 could also be considered a 1-1/2 step difference. Likewise since the D#3-F#3 m3 equals in speed the F#3-D#4 M6, the difference from F3-A3 to D#3-F#3 could also be considered a 1-1/2 step difference.

The next largest comparison equals the difference found between a pair of Major Thirds that are four half-steps apart. This is the difference which our first chain of Major Thirds was built on. We thus have means to fill in the gaps between the notes of our original chain.

A real advantage of a chain of thirds is that it makes possible an early understanding of why Major Thirds must be expanded in equal temperament, and why minor thirds must be contracted. A chain of three pure Major Thirds leaves the octave unquestionably small, thus proving the need to expand the thirds. A chain of four pure minor thirds produces an octave which is far too large, thus proving the need to contract the minor thirds in Equal Temperament. It takes a chain of 12 fourths and fifths to make an octave, and the fact that these intervals must be expanded or contracted is much harder to demonstrate. Overdependance on fourths and fifths in one's temperament tuning thus often leads tuners to hope to discover a better way to eliminate irregularities in temperament tuning.

Our thanks to Jesse Manley for sharing his approach with us. As to whether I forsee how a blind tuner could make use of an electronic aid. advances in the area of "talking" electronic devices may make electronic tuning devices adaptable to blind tuners. The problem in the past has been twofold: first, how to tell what note, octave, and cents the tuning device is set on, and second, how to tell which way the display is moving when a note is played. The technology for overcoming these problems is at hand. I forsee that the final barrier may be financial, since there would be such a limited market for such a product. I suppose there may be grants available for such research. Anyone knowing of any possible financial assistance for research which would aid blind persons is kindly invited to advise me of such. As advances are made, I will keep you posted.

In each of the above systems, four series or chains of intervals were established. Though they were different from each other, each system helped to demonstrate that the notes in the temperament are not isolated, but linked to each other in very complex relationships. Breaking these very complex relationships into four series of intervals helps us make better sense of the situation, and aids in the improvement or optimization of the temperament through the logic behind the series.

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G O O D

VIBRATIONS

Downbearing: An Introduction

Nick Gravagne New Mexico Chapter

his issue marks the introduction of a new topic for this series. Although we will still be in the belly of the piano, our interest will shift from the subject of soundboards to that of downbearing. However, it is obvious that downbearing and soundboards cannot be adequately discussed as separate topics, given the almost direct connection of the piano string to the board. For this reason, further discussions on soundboards will crop in here and there when it becomes necessary to make the point of downbearing more complete and practical.

Downbearing (also referred to as string bearing or just bearing) would be a much simpler topic to discuss if it were mainly arithmetic with a mechanical application. To be sure it is at least this but there is also a nagging subjective underscoring which goes beyond the slide rule. It is here that the difficulty sets in. For example, it is one thing to talk of string angles, tensions, compressive forces on the soundboard, and quite another to state a priori that these numerical inspections will ensure good piano tone. For this to come about there must be a common meeting place for the mathematician and the artist. Stretching this idea just a bit it could be said that such a meeting place exists in the belly of the piano where the string contacts the bridge. Since there is an objective and subjective point of view in this topic, I will try to be clear as to which one is being considered at various places in these discussions.

Of course, the most obvious thing to know about what a piano string does when it crosses the bridge is simple: it must press on the bridge. The reason for this is also very basic: if the string does not press on the bridge, it cannot deliver its vibrational energy to the soundboard - the string will vibrate uselessly in space, or very nearly so, if the pressure on the bridge is too light. (Ignore the gripping effect of the bridge pins for the moment.) It follows that if a string is to press on the bridge/soundboard it must be deflected from the straight line it naturally makes between the agraffe and the rear string rest. In order for there to be bearing, this deflection must be caused by a pushing force and not a pulling force. Such a general understanding of downbearing is probably enough to satisfy most piano owners, but of course a piano

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Downbearing would be a much simpler topic to discuss if it were mainly arithmetic with a mechanical application. To be sure it is at least this, but there is also a nagging subjective underscoring which goes beyond the slide rule.

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rebuilder needs more specific information.

So then, from the standpoint of the rebuilder, what actually is downbearing? A string deflection? Is it one string angle or two angles? How about front and rear bearings? Measurements and gauges? Should bearing be the same in a nine-foot grand as in a five-foot grand? And on and on. It is my aim in these next few articles to present a systematic analysis of this topic both in theory and practical application. However, it is only fair to point out that although the different manufacturers concur on the nature of downbearing, they don't necessarily agree as to a specific and universal application. This being the case, it becomes necessary for a rebuilder of pianos to adopt a reasonable and defensible position on the subject.

Continuing, by way of introduction, a word on math and science seems necessary here as there appear to be different responses to these subjects. What I have decided to do is include a section at the end of appropriate articles entitled "computations" for those who appreciate and require a specific rundown or proof of the theory. However, I wish to emphasize that the actual point being made in any articles, whether theoretical or practical, will not be dependent on reading or understanding the "computations" section.

Above all else, bearing is primarily a force. The word "bearing" itself suggests this to us, since it indicates both pressure and direction. In physics, bearing would be said to have both magnitude (the amount of force in pounds) and

direction. Such a condition is referred to as a vector quantity and is graphically depicted as a line with an arrowhead at one or both ends. (Such schematic representations will appear in future articles.) A piano string pressing on a bridge is a vector quantity since it has both magnitude and direction. The magnitude is expressed in pounds and the direction of this weight is, of course, toward the soundboard and, ideally, perpendicular to the bridge (more on this later). The obvious question at this point is: if downbearing is a compressive force on the bridge/soundboard, how much force do we want and how is it obtained in practical rebuilding? And further, should the force be the same from one string to the next?

To begin answering these questions, let's first review some ideas presented in this series in the March 1987 *Journal* regarding the Steinway soundboard experiments of the '30s. In particular, our focus is on that builder's observations concerning the magnitude (in a relative sense) and uniformity of downbearing. It was pointed out that "too much downbearing in a non-uniform manner...tended to stiffen certain portions of the board rendering them incapable of free movement." The conclusion and recommendation stated that "a systematic method of adjusting the downward pressure of the strings

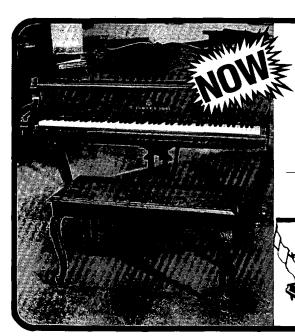
permits an optimum equalization of the pressure for different sections of the bridge."

The gist of this point of view is simply that even pressure throughout on the soundboard not only encouraged a superior mechanical motion in the soundboard but that the beneficial acoustical byproduct was better piano tone. Even pressure, of course, means that each string is pushing on the bridge with the same (or nearly so) force as any other string in the piano. This idea of evenness is nothing new to piano technology - consider even-tensioned scales, even spacing of parts, even touch, even voicing, equal temperament, etc. So it comes as no surprise that uniformity of soundboard compression is something incorporated into piano construction. Still, not all piano builders or rebuiders subscribe to this point of view. To me, uniform downbearing has everything to recommend it and, with a few minor departures from absolute strictness. I aim for it in rebuilding.

Let's take a different look at the concept of a soundboard moving as a vibrating diaphragm. Consider the drum. The drumhead is a stretched membrane over a rather large hollow cylinder called a shell. This head, a vibrating diaphragm in its simplest form, is tightened or loosened by turning several lugs at the perimeter. The experienced drummer knows that tuning the

drum requires adjusting the lugs while tapping with the drumstick on the drumhead close to the lug and listening to the pitch. Proceeding around the rim of the drum in this manner is the surest way of applying equal pressure to the drumhead. Equalizing the force on the head makes for a more uniform stick response in playing, a bettersounding drum, and minimizes the danger of the drumhead splitting due to unequal pressure. Although the drummer may not be aware of it, the tuned drumhead as a diaphragm is moving uniformly and as a whole. (Recognizing that drumheads are stretched flat in tension across their surface while soundboards are bellied up in compression, the analogy is still useful.) For the soundboard to vibrate as a whole and uniformly. it, too, must be "tuned" and the proper handling of downbearing is the way to do it. At the very least, it is an aspect of piano rebuilding in which the technician can exercise some real control.

At this point in the discussion, three factors which govern the treatment of downbearing have been identified: that bearing is a force, that this force is directed toward the soundboard, and that the combined force of all the strings should be evenly distributed among the bridge. Next time, we'll discuss how a string angle causes a compressive force on the bridge/soundboard.

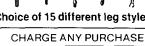


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S O U N D BACKGROUND

Concerts Promote Piano In Great Britain; Early Improvement In Square Piano Construction

Jack Greenfield Chicago Chapter

London's First Concert Pianist

Johann Cristian Bach helped introduce the piano to audiences in England by his performance in 1767, but he was better known as a composer and conductor. The first keyboard performer after him who was primarily a pianist was Johann Samuel Schroeter (1752-1788) who made his debut in London in 1772. He was followed by Muzio Clementi (1752-1832). Clementi made his first appearance in London in 1774 as a harpsichordist. Taking to the piano during the following years, he developed into one of the most brilliant virtuosos, not only of Great Britain, but of all Europe.

Schroeter was already an experienced pianist before coming to London, having played concerts beginning in 1767 in Leipzig, where he and his family had lived. Schroeter, his brother, two sisters and their father were well-known gifted musicians. (Christoph Gottleib Schroeter, the organist and music theorist who had designed some piano actions earlier was not related.) In 1771, the Schroeter family departed from Leipzig on an extended concert tour that ended in London. Johann Samuel remained in London when the rest of the family returned to Germany in 1774.

Schroeter's initial public appearance in London was at a Bach-Abel concert. Playing upon a Zumpe-type square piano, his graceful, bravura

style and ease in playing rapid passages made a strong impact on his audiences. His personal appearance and the publication of his compositions helped promote the demand for pianos. He published several piano concertos and at least 32 sonatas, most as piano solo accompanied by violin or flute. Some critics find a slight resemblance to some of Mozart's writings in Schroeter's work. Mozart himself thought well of Schroeter and composed special cadenzas for several of the Schroeter

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Playing upon a Zumpe-type square piano, [Clementi's] graceful, bravura style and ease in playing rapid passages made a strong impact on his audiences. His personal appearance and the publication of his compositions helped promote the demand for pianos.

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concertos. Schroeter's compositions draw little attention today and few have been republished in modern editions.

After marriage into a wealthy family in 1782, Schroeter gave up his successful public career. However, he received an appointment to serve the Prince of Wales and he continued to play at semi-private parties. He also succeeded Bach as music advisor to Queen Charlotte. Troubled with poor health, Schroeter died in 1788 at the age of 36 years.

Clementi's Background

Clementi lived a long life. He was born four years before Mozart and he died five years after Beethoven.

Although Clementi did not come from a musical family, he achieved success as a composer, pianist, director, teacher, music publisher and piano manufacturer. He also was a man of wide cultural interests with a command of languages. Like Beethoven, he received his basic musical education from little-known instructors and he acquired his keyboard proficiency through self-instruction.

Clementi was born in 1752, the oldest of seven children in the family of a silversmith in Rome. He began to study music at an early age and showed remarkable talent. Given financial assistance by the wealthy English Beckford family, in 1776 he was brought to England to study.

During the next seven years, he remained at the Beckford country estate, spending most of his time in study and practice, apparently under self-guidance. In return for his support, he provided occasional musical entertainment for the Beckford household. When he reached the age of 21, he moved to London to begin his career and support himself as a musician.

Clementi's Start In London

During Clementi's first four or five years in London, he served as conductor, from the keyboard, at King's theatre where Italian opera was performed. Audiences were largely from the upper social class. He also appeared at occasional concerts as a solo harpsichordist. His concerts became more frequent and he became better known after the publication of his Six Sonatas for the Harpsichord or Piano Forte..., Op. 2 in 1779. These were followed by a set of nine more sonatas, Op. 3, and three keyboard duets, Op. 4. According to the biographical article "Clementi, Muzio," (1980 Grove) by Leon Plantinga, contemporary newspaper announcements show that prior to 1780, Clementi played only the harpsichord in his concerts. After performing publicly on both instruments during 1780-1784, he then played the piano exclusively in concerts afterward. Even though the Op. 2 sonatas may have originally been composed for harpsichard, they were even more effective on the piano. Clementi's use of double thirds, fourths, fifths, sixths and octaves in rapid passages was spectacular and critics called his performances "sensational."

Clementi's First Concert Tour

By mid-1780, Clementi was well enough known to undertake an extended European tour. He spent most of the next five years away 11

The damper blocks are held on the top of vertical damper wires supported on the damper underlevers hinged to the back of the case and lifted by the back ends of the keys. The damper underlever was known as the damper crank. This system was more efficient and resulted in a smoother touch.

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from London. His travels took him to Paris where he played for Marie Antoinette, to Vienna where he had his famous contest with Mozart before Emperor Leopold II and through Switzerland to Lyons. France, where he spent a good deal of time. His trip was broken by a return to London for about six months in 1783-1784 and he may have visited his family in Rome before he came back to London to stay in May 1785. Clementi continued to compose throughout his trip. His 26 sonatas and various other compositions written during this period are considered some of his best keyboard compositions. Mozart, evidently resentful of the challenge of Clementi's fame, except for acknowledging his technical skill, wrote disparagingly of Clementi's playing and composition. Haydn was more favorable and described some of Clementi's piano sonatas as "very

beautiful."

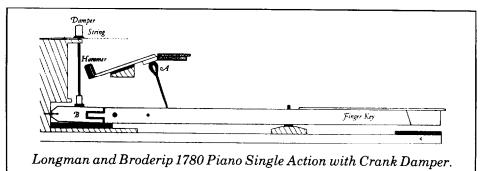
Improvement In Square Piano Design

In 1780, while grand pianos were still rare in England, Bach, Schroeter, Clementi and others played on Zumpe-type square pianos at their concerts. The limitations of the instrument were now quite obvious. One of the first improvements. adopted by several builders, was in the damper mechanism. In the original "overdamper" mechanism, damper pads above the strings were mounted on the underside of damper arms hinged to the back of the case. Thin wooden damper rods resting at the back ends of the key levers lifted the damper arms. The later *crank* damper system seen in a 1780 Longman and Broderip square piano owned by an English collector, operates on the same principles as the dampers in modern grand pianos. Damper pads mounted on small wooden blocks rest on top of the strings. The damper blocks are held on the top of vertical damper wires supported on the damper underlevers hinged to the back of the case and lifted by the back ends of the keys. The damper underlever was known as the damper crank. This system was more efficient and resulted in a smoother touch.

Broadwood Studies Piano Redesign

Observing the success and increasing acceptance of the piano and realizing that his harpsichord business might soon come to an end, John Broadwood also turned his attention to improving the square piano. He may not have acted any sooner because the death of his wife Barbara, Shudi's daughter, in 1776, had left him with three small children to bring up. He married his second wife in December 1781, and soon added more children to his family.

Broadwood was now receiving valuable guidance from Clementi, who had become a friend of his. At the start of his tour, Clementi obtained a square piano and harpsichord from Broadwood. With a better understanding of instrument construction than most performers, Clementi was able to gather information for Broadwood and advise him of the new developments in piano design in the foreign European music centers he visited.

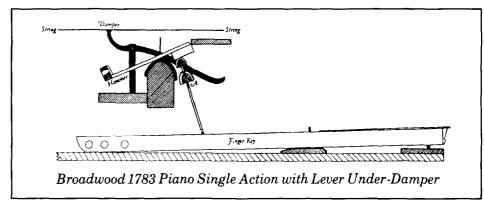


Broadwood Patents A New Square Piano Design

In 1783, after about three years of development work, Broadwood received a patent for a new square piano design with changes in the arrangement of the tuning pins, action, soundboard and pedals. Broadwood's new square piano was the first instrument to be constructed on principles specifically best for a piano rather than as a clavichord or harpsichord with hammers. The result was a marked improvement in tone.

Previously square pianos were built like large German clavichords with the tuning pins to the right of the bridge on the right side of the piaqno. The strings were aligned diagonally away from the front toward hitchpins placed two-thirds of the way across the back from the left side. Broadwood switched the locations of the tuning pins and the hitch pins. The specifications in his 1783 patent stated that the new arrangement gave more room between tuning pins and "also gives a more regular pressure on the bridges, and produces a more regular tone." Good (Giraffes, Black Dragons and Other Pianos) points out that in the original design. deflection angles and downbearing of string segments between the bridge and the tuning pins on the right may vary because of differences in the height of the top coil of the wire wound on the tuning pins. In Broadwood's design the strings from the bridge do not go directly to the tuning pins. Instead, they stretch over the straight horizontal ridge of the "nut" (the traditional term for the pinblock bridge in historic keyboard instruments) which helps maintain uniformity in the vertical angle of deflection while providing speaking length termination. Broadwood also made changes in the construction and stringing to provide more soundboard area free to resonate, allow straighter key levers, and reduce the length of unused wire in the end segments.

Other changes were less beneficial. The action remained basically the primitive Zumpe action except for underdampers held on pivoted, curved brass levers below the strings, and lifted by small blocks projecting from the stiff wire jacks. The counterweighted levers were too



costly and difficult to regulate.

A Broadwood square piano dated 1797 in the collection at the Metropolitan Museum, New York, is an example containing features of the 1783 Broadwood patent. It has no sustaining damper lift system but has a single pedal mechanism to raise a front flap of the lid over the soundboard for a crescendo effect. English square pianos with only a single pedal were not unusual but others did have a sustaining damper lift.

The 1783 patent also included the addition of a second soundboard below and linked to the usual soundboard by a soundpost. Only a few pianos were made with double soundboards before this idea was abandoned.

When introduced, Broadwood's redesigned square pianos sold for around 20 pounds with cost varying according to case ornamentation. Broadwood records list the first sale of a "P.F. with brass dampers" in September 1783. The instruments

were so well-received and the demand for them built up so rapidly that the firm soon fell several months behind in filling orders. One dealer in Edinburgh ordered a total of 21 Broadwood pianos in 1784. These had to be shipped by boat. In April 1784, Clementi, who promoted British pianos in his travels abroad, ordered two more from Broadwood. As a result of Clementi's influence. later in October Pascal Joseph Taskin, the French instrument builder appointed "Keeper of the King's Instruments to Louis XV, ordered four Broadwood square pianos.

Broadwood's total 1784 instrument sales included 133 pianos and 38 harpsichords. This compares with less than 40 keyboard instruments per year for most other builders in London and Vienna. The firm also had had over 700 additional transactions such as tuning, repairs, sales of parts and rental of instruments. Thus far, however, Broadwood had still built only a few grand pianos.

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Sensitizing The Tuner-Technician; Or Psychoanalyzing The Customer

Suggestions For Keeping Customers In person And Via The Phone

Norman Heischober Northeast Regional Vice President Long Island – Nassau Chapter

any articles have been written and speeches given about techniques for getting customers. I will review some of the aspects of keeping those customers.

Assuming we have the technical ability and skills, what more must we have to help increase or maintain our income?

One of the major ingredients, I feel, is summed up in one word, sensitivity. Let me elaborate. One of the definitions of sensitivity may be an awareness of the needs and feelings of our customers. We, as consumers, often select one store, restaurant or service person over another based upon some intangible feeling.

The following are some of the areas of intangibles or unknowns that lead a customer to call *us* back or call someone else. We will discuss each one in greater depth.

- A. Making the appointment: a) on the phone, b) in person
- B. Entering the home
- C. Clothes and Personal Appearance
- D. Manners Voice Professionalism Smile
- E. Responding to customer's attitudes and questions
- F. Selling of extras: Dampp-Chasers, lamps, etc.
- G. Punctuality

H. Making the next appointment

Let's break each one down into smaller units. Some of you may think all or some of the points are picayune or obvious. However, one never really knows which factors impress or turn off the customer. A discussion may bring some of the aforementioned to the forefront of your list of business skills. Again, assuming your technical skills are what they should be, what else is involved in your being called back?

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We often picture ourselves quite differently from the way we really are. Perhaps seeing ourselves as others see us will make us more sensitive to our actions and words.

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It behooves us to be aware of as many of the factors as possible and we will discuss them from the point of view of the customer as well as the technician.

We often picture ourselves quite differently from the way we really are. Perhaps seeing ourselves as others see us will make us more sensitive to our actions and words.

Making The Appointment They call you

Who answers your phone? How do they answer it? Is it done with a sullen sounding "hello" or some child saying "yeah" or some other inappropriate salutation? What about background noise? Is there a family argument going on, or are some other non-professional sounds being projected?

If you had never tuned for them before, and were not being called because of a recommendation, how would you respond to the following questions or statements?

- 1. "How much do you charge?"
- 2. "I have a note or key that doesn't work; it sticks only when the teacher is here."
- 3. "How often do I tune? The teacher says every other year is fine, and it is due now."
- 4. "I didn't like my last tuner and he was a member of the Guild."

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- 5. "The teacher said the last tuning was bad and that I paid too much."
- 6. "Do you tune by machine?" I heard it was ______" (you fill in the blanks).
- 7. "Can you come after 5:30 P.M.?"
- 8. "I will not be here but my (maid, husband, wife, child, neighbor) will be here."
 - 9. "Can I mail you a check?"
 10. "If I pay cash, will there be
- 11. "OK. Thank you, I'll discuss it with my husband/wife."

Recommended customers are generally the easiest with whom to make an appointment and for whom to work. They are generally pre-sold on you. However, here are some situations that may be encountered; I'm sure you have others.

- 1. "Mrs. Smith said you charged her X dollars. Why are you quoting more?"
 - 2. "Does that price include tax?"
- 3. "It takes how long to tune?" (can be applied to all customers)

You call them.

- 1. "My teacher said your last tuning did not hold."
- 2. "How much do you charge now? That much? I don't remember paying that much last time."
- 3. "I don't have the money right now."
- 4. "Nobody plays the piano any more, so, why bother to tune it?"
 - 5. "It sounds fine to me."
- 6. "Call me in a few weeks I'm not ready now."
- 7. "Do I need a humidity system for my piano like Mrs. Smith has?"

Should we send reminder cards and/or make phone calls? Here is where you must know your customer. Some can get a call or a card the day before and forget to call to cancel. They also can get the notification a week before and wait until the last minute to postpone or cancel. How do you deal with these situations?

We will discuss our reactions to the above in general in give and take. However, some generalizations can be made as to how to deal with the statements and questions.

- 1. Do not try to respond to all of them in any great detail in an effort to prove how great or knowledgeable you are.
 - 2. Listen to the customer and try

to determine what they are really asking and want or need.

- 3. Calm, positive, self-assured answers with analogies to things they might understand is quite important. For example, the grease and oil job on the car can be used to describe maintenance. Diagnostic exams can be used to describe evaluations. Wear and tear on the furniture, rugs, etc., can be used to describe bushing compression and hammer wear. Humidity related odors and problems can be related to sticky doors, drawers, etc. However, avoid giving the customer the impression that you are talking down to him/ her through over-simplification.
- 4. Suggest a time and date for an appointment to discuss their concerns further and to service their piano.

Entering the House

One must consider which entrance to use. Obviously, if there is only one, the window won't do and the following won't apply.

Some of us may feel that we don't like to come in the side door (perhaps rightfully so). However, some people, particularly those whose front door enters directly into the living room, may not appreciate their rugs tracked up with dirt. You all know the type of person who keeps the living room as a show place and keeps the husband/wife and kids out, except for "company." Are you "company?" You have to ascertain what makes her/him least "uptight." Sensitivity and/or awareness allows you to make that determination.

Where do you put your galoshes, umbrella, hat and coat? You may feel that these are not important points. Bear in mind, some people react internally, in the gut, to lack of sensitivity or concern for their property. They may say nothing or very little to you, but you may not hear from them again.

Clothes, Personal Appearance And Posture

How important are the clothes you wear when you go to the customer's home? To some, it may seem unimportant, to others it may mean a great deal. Are we to dress like grease monkeys, plumbers, repairmen or professional people? I think

that our clothes help create an attitude, an aura. For example, when we ask for a price increase or some other money that the customer must expend, perhaps our manner of professional dress and attitude would reduce hostility or resistance on the part of the customer. Of course, it may not, but our clothes won't be the reason.

Posture: We all have our infirmaties, aches and pains. This still does not mean we have to walk like the poor street person who hasn't eaten or slept for weeks and is rapidly dying (unless it happens to be so in your case). The old stereotype of the poor old bent-over piano tuner is on its way out. We are a new breed of professionals. Some of you remember the late Robert Fairchild. He was, in my mind, the paragon of style. He tuned in New York City. at the height of the Depression and for some of the most demanding, some of the wealthiest and poorest people. He always wore a suit, boutonnaire, spats, carried a cane and a doctor's bag with his tools, and never went in the back door. As he left, he would give the lady of the house a kiss on the hand and hand her his flower. You may feel this isn't your style, but it certainly made an impression on his customers.

Manners, Voice, Professionalism, Smile

I'm sure most of us are aware of what good manners are. However, included under the topic of manners is the subject of personal hygiene. Body odor, bad breath, liquor on the breath, smoking in the customer's home without permission and smelly clothes from whatever source, are what I have in mind. I feel that quite often we may not be aware of these problems, but the customer is. A small tube of mouth spray, a small bottle of after shave lotion for the men and perfume for the women, would help increase our unconscious appeal to the customer. (Sometimes it can be too good, and then you may turn them on. Oh well, those are the risks we take in this work).

In what manner do we deal with noisy children, pets, radio, TV, and conversations going on around us? It's their home. You are the visitor. What should we do? The key word is sensitivity. Be aware of the customer's feelings about all of the

above and react with gentleness and firmness. You are doing whatever you do for their best interest and always with a pleasant smile on your face and in your voice.

Do we hear and see ourselves as others see and hear us? Do we too easily show annoyance and arrogance, both facially and verbally, at what we consider to be a dumb question or remark? Are we too loud or too quiet? Are we too impatient? Also in the category of voice, perhaps we should include the matter of the amount of talk in which we engage with our customers. If time is what we charge for, can we justify or afford to spend it sipping coffee and enjoying idle chatter? Or is sociability more effective in building a personal relationship? Are we to be the "barber shop" type of tuner, all talk and no work; the glum sourpuss type, unfriendly, removed; or the psychologist? The latter can be quite interesting, but dangerous. People have a tendency to talk to strangers and passing acquaintances. Learn to listen. Do not be judgemental, pontifical, or an advice giver. It can backfire badly. People often regret having talked too much and may be too embarrassed to call us back. Should vou use the customer's bathroom or play with their pets? We have to be aware of how they really feel about these points. If it is the first visit, I would urge prudence and reserve. Let the customer take the lead and you listen and watch carefully for voice, body language, and facial expressions

before acting. Your sensitivity and awareness and knowledge of your customer must determine your actions, tone of voice and degree of involvement.

One of the greatest tests of our professionalism is the manner in which we respond to the customer's questions and attitudes. How do we deal with the doubting customer? the one that has a little knowledge? - the fearful and the hostile customer? Sensitivity is where we begin. Listen to what they are really saying. We must try to understand why the questions are being asked. Most often, the questions and attitudes are due to anxiety. In today's world, people are suspicious, almost adversarial. The events around them the past years have reduced their level of trust. How about yours?

The selling of extras must be done with great care and honesty. Time must be taken to explain the need for them. Even after the sale there may be doubts in their minds.

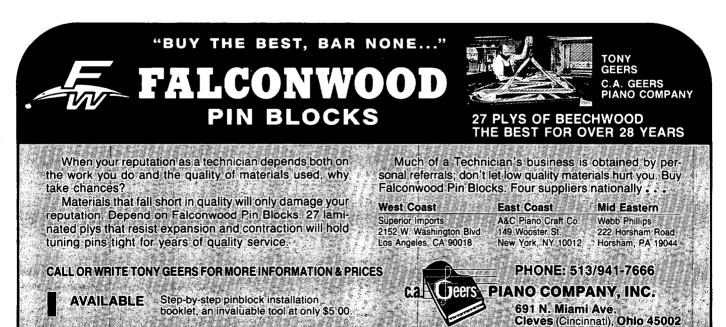
Our activities and deeds must lead the customer to respect and trust our professionalism. Keeping appointments, and arriving at the time we said we would, goes a long way toward establishing a feeling of confidence. You know how it feels to wait around for the delivery or service man who will be there "some time" during the day.

Care for the furniture in the customer's home is another way in which to show our sensitivity and awareness of their concerns and feelings. Obvious, you say? To some of us yes, but, are we careful about where we put our case? Who handles the items on top of the piano and where do they get placed? Where do we put the front board? Do we lean the top against the wall or picture? Just our awareness and involving the customer to have confidence in our professionalism.

We have discussed some of the intangibles that may cause a customer to call us back or to use us in the first place. We must be sensitive to their feelings about their home, piano, our appearance, personal hygiene, and our professionalism. We should speak and answer questions without pomposity or arrogance but with quiet professionalism and sensitivity. We must sincerely try to understand the actions, questions and needs of the customer. A challenging question may be from anxiety or the result of prior bad experiences. Lack of knowledge or input from TV, radio, newspapers and friends about service cheats all contribute to the "can I trust him or is he selling me a bill of goods?" syndrome. It is not necessarily directed against us. We don't have to be paranoid.

Literally, we must all be amateur psychologists. Have you heard the one about the two psychologists who passed each other on the street and said hello to each other? Each one thought "Gee, I wonder what he meant by that?"

What did your customer mean? Was your response a sensitive one?■



$\mathbf{A} \mathbf{T}$ LARGE

Appraising Pianos Using Real Estate Techniques

Fred Blumenthal St. Louis Chapter

he technician with whom I studied piano tuning recently called me to help appraise a piano in a nearby residence. Arriving a few minutes early I inspected the piano and informed the owners that the instrument was worth "about \$400". A few minutes later, Mr. Cobb arrived, inspected the same piano and announced that it was worth "\$300 or \$400."

At first I was pleased by the similarity of our estimates, but on further reflection, it occurred to me that, had the stakes been higher, the responses would have been unacceptable. Consider, for instance, a real estate company seeking two appraisals of a commercial building in order to compare and average the results. Being told that the building was worth "about \$3 million or "\$3 or 4 million" would be comparable but unaverageable.

In such markets as the automobile business there are "blue books," giving information on value based on age and features. No such guides exist for either real estate or pianos, however, due to the vast number and dissimilarity of parcels of real estate and the general disinterest of the insurance business in pianos. In real estate, trained and licensed specialists are called on for appraisal work by lending institutions, insurance companies, buyers, sellers and the courts. And like piano technicians, knowledge, training, integrity and skill are assumed, and are supported by professional associations.

accurate "scientific appraisal" of pianos would be a valuable service for technicians to offer customers, and would deserve payment - the circum-

stances described above notwithstanding. Over the many centuries that real estate has been traded, standardized methods have evolved for appraising properties which, after all, differ much more than do pianos. These methods might not transfer directly to pianos, but may serve as steps towards more accurate appraisal.

Galaty, Allaway and Kyle describe appraisal as "an estimate or opinion of value," and value as "the relationship between an object desired and a potential purchaser."1 In my memory's ear, I hear technicians avoiding appraisal by asking "Well, what did the customer pay for it?" Up

The accurate 'scientific' appraisal of pianos would be a valuable service for technicians to offer customers, and would deserve payment...Over the many centuries that real estate has been traded, standardized methods have evolved for appraising properties which, after all, differ much more than do pianos.

to this point, particularly as applies to used pianos, this has been the most important measure

in appraising pianos.

Value has four characteristics utility, scarcity, effective demand and transferability. Market value is the highest possible price in an open market, without pressure, both buyer and seller being wellinformed, taking into consideration present and potential use, considering book, salvage and depreciated value, and not considering insured value or balance due.

The standard procedure for real estate appraisal involves three approaches to value. The three results are then "reconciled" rather than averaged because each of the three approaches is not equally applicable to every piece of real estate. The three approaches are the market comparison approach, the cost approach and the income approach.

Market comparison approach: This approach compares the subject property with recent sales of similar properties, taking into consideration the date of sale, location, physical condition and terms and conditions of sale. This method is used most frequently by real estate agents in helping sellers figure out what price they can realistically ask for property in a given market. In a "comparative market analysis" the sale prices are put into the context of differences between the subject property and the recently sold prop-

In applying the market comparison approach to pianos, we might note that Mrs. Jones bought a used piano for \$1,000. To appraise

¹ Modern Real Estate Practice (Chicago Real Estate Education Company, 10th edition, 1985-p. 291)

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another piano that Mrs. Smith is considering buying, we would add to the \$1,000 for inflation if Mrs. Jones purchase was not recent, take into account differences in age, repair, size, style and the reputation of the manufacturer. By adding to and subtracting from the \$1,000 figure we would reach an appraised value for the Smith piano.

Cost approach: This approach is based on the principle of substitution, which holds that value is the cost of buying an equally desirable or valuable property. As applied to real estate, five steps are used first, estimating the value of the land as if it were vacant; second, estimating the current cost of constructing any existing buildings (called "improvements") third, esti-



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mating the amount of accrued depreciation due to physical deterioration, functional obsolescence and locational obsolescence fourth, deducting the accrued depreciation and, fifth, adding the estimated land value to the depreciated cost of impovements to reach an appraised value. "Functional obsolescence" means what it says: both a buggy whip and a buggy whip factory are functionally obsolete. "Locational obsolescence" means the property became less valuable because of where it is: the housing surrounding the now-idle buggy whip factory.

As applied to pianos, the cost approach to appraisal might call for noting the original price of an instrument, adding for inflation and any antique value, and subtracting the amount of money it would require to return the piano to new condition. If such fundamental innovations as the invention of the cast iron plate occurred more frequently, incurable obsolescence would be a major factor.

Income approach: This approach deals with the present worth of future rights to income derived from the property. The four steps involved

in appraisal by this approach are first, estimate the annual potential gross income second, deduct for potential vacancy third, deduct for operating expenses and fourth, estimate the price an investor would pay for this income, called the "capitalization rate. The annual income divided by the "cap rate equals the appraised value.2 A duplex that earns \$6,000 per year, less a 10 percent vacancy factor and a 10 percent operating budget, earns \$4,800 per year. If an investor seeks a 10 percent return on investment, the appraised value is \$48,000 (\$4,800 divided by .10)

Applying the income approach to pianos suggests a body of information on rental instruments but the technician with current information on sales and rentals will have an advantage in any approach to appraisal.

Income will be potentially less consistent for pianos than real estate, making the vacancy factor more important and probably greater. And for operating expenses of real estate we must substitute moving, tuning, repair and maintenance costs of pianos. By this approach, an upright piano that's consistently rented could turn out to be more valuable than a concert grand that's rarely used. In this example the grand would have a lower capitalization rate, but would probably have a higher rental based on current market, and would probably appreciate more over time. As stated above, the results of the various approaches to appraisal are reconciled, rather than averaged, because not all approaches to appraisal are equally appropriate to all situations.

The preceeding comments are not offered as a complete method of appraisal, but rather as steps in that direction. Perhaps future refinements could place further emphasis on whether a piano is new or not, its potential for aging well in its current location, and the subjective opinions that veteran technicians are justifiably proud of concerning the qualities of various brands and models of pianos.

² For this and all information used on real estate appraisal, see *ibid*, pp. 290-304. About the author: Fred Blumenthal is a Ph.D. in musicology, a former music critic for the now-defunct St. Louis *Globe-Democrat*, an associate member of the Piano Technicians Guild and a licensed real estate agent.



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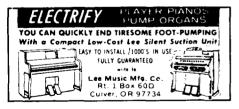
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President's Message

As I write, deadlines being what they are, Christmas is nearly upon me with packages not wrapped, cookies still to make, cards to write and mail, a bit of shopping yet to do, candy to make and the days dwindling down to those precious few. With Thanksgiving as late as the 27th and Christmas falling on a Friday it comes as an incredible shock when someone points out: "It's only ten days 'til Christmas!"

We had Christmas in July in 1986. This will be Christmas in February and like the month, will be brief. With nine grandchildren, one of whom is returning from Germany with his new bride for the occasion, I can only afford the time to hope that you all enjoyed a very Merry Christmas and, belatedly, wish you the happiest and most prosperous 1988.

Ginger Bryant

Our president will not plead and excuse for her brief and belated message, but it is felt our readers should know the reason. Ginger was a bit late with her February copy because of a chipped left wrist bone. Also, as if that were not enough, she managed to sustain a third degree burn on her right forearm and hand, from her thumb almost to her elbow. This was not an easy maneuver for Ginger to achieve but she managed to transfer a tray from stove to sink, and to maintain a balance, she "rested" her right arm on the red-hot burner. Do you suppose the new Kadwell-Russell cook book should also contain household and first aid hints?

Agnes Huether, Editor

Februa – A Festival Of Purification

That time has arrived again, another leap year! February takes on an extra day and all those born on February 29th grow old only every four years. This month with its awkward spelling, always a challenge to this writer, and its varied pronounciations,

is generally bitter cold. Heating fuel bills will attest to this. Social activities are at a minimum except perhaps for Valentine's Day and most every one is longing for the arrival of spring with its hopes and promises. We recalled that old rhyme: "If you gently touch a nettle, it will sting you for your pains; grasp it like a lad of mettle, and it's soft as silk remains." With these words in mind we "investigated" February with vigor.

The word comes from the Latin, februare, to purify, and a festival of purification is held on February 15th, probably of Sabine origin. Further checking in Webster's revealed that the Sabines were an ancient tribe of central Italy who were conquered and assimilated by the Romans in 290 BC. We know that the Gregorian calender assigned an extra day to February – the 29th – to occur every four years but how and why we have leap year and Sadie Hawkins day, we will leave to our scholarly colleagues to define and explore.

Every one knows the two famous birthdays that occur in February: our

presidents Abraham Lincoln and George Washington, but did you know that several musicians, composers and writers were born in this month. Victor Herbert was born on February 1st 1859, and on February 2nd, Fritz Kreisler the violinist in 1875 and that other famous violinist, Jasha Heifetz, in 1901. James Joyce the Irish novelist was also born on this date in 1882. Felix Mendelssohn-Bartholdy, pianist, composer and musical conductor, was born in Hamburg on February 3, 1809. On February 21, 1893 Andres Segovia the renowned Spanish guitarist was born. To him is due the world's thanks for adapting classical music to the guitar. Another famed musician, George Frederick Handel, was born on February 23, 1685, and in leap year 1792, Gioacchino Antonio Rossini, Italian operatic composer, representative of the bel canto school of opera, was born on February 29th.

Two famous singers lay claim to February birthdays. They are Marian Anderson on the 17th in 1902 and Enrico Caruso on the 25th in 1873. In the field of literature, Charles Dickens was born on the 7th of the month in 1812 and on the same date in 1478 Sir Thomas More the English statesman, author of *Utopia* and lord chancellor to Henry VIII was born. Charles Lamb, born Feb. 10, 1775, John Henry Newman born Feb. 21, 1801, and the poet Henry Wadsworth Longfellow are a few of the great writers.

It was surprising to realize that February was not without a significant roster of scientists. Here are a few of them: Thomas Alva Edison, born Feb. 11, 1847, Charles Darwin Feb. 12, 1809, Nicolaus Copernicus, Polish astronomer, born Feb. 14, 1473, Thomas Malthus, English economist, born Feb. 14, 1766, and Galileo Galilei, an Italian astronomer, born Feb. 15, 1564.

Do we have many or some of our Auxiliary members who may boast a February birthdate? It might be fun to explore. Your editor was vastly amused to check up on her own birthdate and to discover that some of the celebrated people on her birthdate, April 29, were William Randolph Hearst, Emperor Hirohito and the conductor Zubin Mehta.

Agnes Huether

Do You Believe In Miracles?

"For God is not ungracious to forget your work and labor of love" Heb 6:10. Indeed, he did not forget the love of Dorothy Silva who has been blind for many years. Surgery was performed on Dorothy's right eye several weeks ago and as of this writing, full sight to the right eye has been restored. Surgery on the left eye is scheduled within four to six weeks. Prognosis is excellent for complete recovery. Please send your thoughts and prayers to this lovely lady.

Ginger Bryant

From The North Country.......
Nita Kadwell reports: "As I write this, our cookbook project is simply an

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idea. You members of the Piano Technicians Guild and Auxiliary are going to make it a reality.

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What's Up In St. Louis?

It's really not too soon to start saving for our annual convention in St. Louis, Missouri and in the next several months there will be accounts of what to see and do in that city famous as the Gateway to the West, originator of the ice cream cone and home of the Budweiser Clydesdale horses. Our convention will be held at the two-yearold Adam's Mark Hotel in the riverfront area with its 910 room complex, two restaurants, four lounges, enclosed parking and a health club.

There is a tour planned for the 79acre Missouri Botanical Garden, the oldest garden in the United States. Among its attractions: the Climatron, the world's first geodesic dome green house, containing waterfalls, pools and 2,000 types of plants from the tropics and subtropics; a 14 acre Japanese garden featuring raked sand gardens, rock formations and a

small lake with islands. Luncheon on one of the moored riverboats, stroll to the Gateway Arch with a visit to the Museum of Westward Expansion, a chamber beneath the Arch, which contains exhibits of the Lewis and Clark expedition and of 19thcentury life, all this can be enjoyed in downtown St. Louis.

Editor

There was an interesting item in The Record of New Jersey on Sunday December 13th, 1987: a special from the Chicago Tribune. It follows: The Steinway Piano company is approaching completion of its 5,000,000th piano, and to celebrate the occasion it is putting together a most unusual instrument.

It will take craftsman Wendell Castle and two full time assistants four months to complete the casing alone, to be made of ebony, holly and other rare woods and to include signatures of all the world's Steinway artists.

Roughly 925 signatures will be laserburned onto the underside of the piano lid, with the instrument to make its debut early next year in Carnegie Hall, New York City.

Mardi Gras

In South Louisiana

February 16, 1988

When the term "Mardi Gras" is heard, one thinks New Orleans, but the fact is that Mardi Gras is now celebrated in much of South Louisiana and has also grown in other areas eager to get in on

the merriment.

Mardi Gras translated from the French means "Fat Tuesday." It was a religious holiday brought to this country from France. French house wives used up all their animal fat and lard prior to the strict fasting days of Lent and held great feasts where volumes of croissants, crullers and other goodies were consumed. It was a grand day of celebration when the fatted calf was killed and all feasted until midnight when Ash Wednesday arrived, 40 days before Easter, not counting Sundays.

Since New Orleans was founded in 1718 there has always been some type of feasting on Shrove Tuesday/Mardi Gras, before the penitential Lenten season of Fast. Often this season of celebration, also called Carnival, begins on January 6 and continues daily to the stroke of midnight on Shrove Tuesday or Mardi

The first recorded Carnival in New Orleans was in 1827, when a group of the sons of rich plantation owners returned from their studies in Paris and participated in masking and parading as they had seen in festive French events.

The parade developed in 1837 with a huge papiermache float on a platform on a headhauled carriage. The Mystic Krewe of Comus appeared in 1857 and continues to this day as the oldest Krewe of Mardi Gras. This was the first of a parade and tableau, built around a single unifying theme. The culmination of Carnival and Mardi Gras is the meeting of the Courts of Comus and Rex at midnight on Mardi Gras. Mardi Gras was made a legal holiday in New Orleans in 1875 with celebrations in all of South Louisiana below Alexandria. It might as well be a legal holiday because no one would be able to conduct business anyway. Even the U.S. Post Office is closed.

There is a unique celebration on Mardi Gras day in the Aadianna area of Louisiana to the west of New Orleans about 100 miles. Maskers on horseback "run the Mardi Gras" riding over the prairies to the various farms collecting chickens, vegetables or whatever they can obtain from the farmers. The riding is at a fast pace to simulate robbers or thieves. When all of the collecting is completed, all meet at a prearranged location, and the preparation is begun for a large pot of gumbo and rice. Everyone, including the farmers who were "robbed," then join in for a huge celebration and feast. Of course they don't drink too much either!

In the religious aspect of all this celebration, one of the most popular customs is still the baking of a special cake in honor of the Three Kings, a King's cake. It is like a huge doughnut or large ringed coffee cake topped with sugar in the Mardi Gras colors of purple, green and gold. Into the cake is placed a small plastic baby doll to represent the Christ Child. At a party, if you are the one to find the doll in your slice of cake, or in the bite you took, you are dubbed the king or queen and you are the one who

must host the next party naturally at which there will be another King Cake.

All of the events and joys of the Carnival season and Mardi Gras just could not be put into an article or even a whole book.

One must just be a part of it for one time to see what it is all about. Imagine being present in downtown New Orleans among a million people clustered around Canal and St. Charles Streets. If that's too much to bear, maybe one of the many other little towns and cities which have the Mardi Gras celebration would delight you. You just have to come down and be a part of it one of these years. It will be like nothing else you have seen, when you see it for the first time. It's a Law! Everybody must have a good time.

Deanna B. Zeringue

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Al Fisher-piano technician and teacher.

At Interlochen Center for the Arts, Al Fisher makes sure the pianos are in top condition for students and performing artists. That might look like a formidable job, especially when

you consider that most of the pianos used during the famous National Music Camp are in lakeside buildings where temperature and humidity change constantly. But Al Fisher will tell you that it's "easier than you might think" with Wurlitzer pianos... because Wurlitzer actions are manufactured with uncommon precision.

Naturally, he appreciates that. But he also appreciates the extra service that Wurlitzer provides piano technicians. For example, the videocassette that shows how Wurlizter pianos are built. Al Fisher uses it regularly in the piano tuning classes he teaches at Interlochen. "I use it with all my students. It's well done."

People like Al Fisher appreciate Wurlitzer, because we keep the technician in mind when designing pianos and establishing service programs. And that makes the technician's job a little easier.



DeKalb, Illinois 60115

February

UPDATE

1988

Published Monthly For Members Of The Piano Technicians Guild, Inc.

As We Go To Press...

The Guild's Board of Directors, meeting in St. Louis, MO, Jan. 22-23, accepted a proposal by the Security Financial Group of Lewisville, TX, to provide a health insurance program for Guild members. The arrangement will allow members to select from a variety of programs and carriers, depending on their individual needs. For more information on the program, Guild members can call the Security Financial Group at 1-800-332-3870. A full description of the program, as well as other actions taken by the Board, will be published in next month's Journal.

Membership Fees Due

All members should have received an invoice for 1988 dues in late November or early December. These invoices, which in many cases included chapter dues, were officially due at the first of the year and will be delinquent March 31.

Those members whose dues become delinquent will not receive any further *Journals*, and they will not be listed in any upcoming membership directories or listings.

In addition, all dues and fees must be paid by March 31, 1988, in order to register at member rates for the 1988 convention in St. Louis. The same deadline is in effect for members of the Piano Technicians Guild Auxiliary.

Survey Results Presented To Board

A recent survey of Guild members has been completed for presentation to the Board of Directors during its January meeting. The survey drew 212 responses, just slightly under six percent of the membership. Here's a summary of the survey responses:

1. How long have you been a Guild member? Less than one year: 4 percent; 1-3 years: 10 percent; 3-10 years; 45 percent; more than 11 years: 17 percent.

2. Are you an RTT? Yes: 81 percent, No: 19 percent.

3. How long have you been an RTT? Less than one year: 2 percent; 1-3 years: 10 percent; 3-10 years; 49 percent; more than 11 years: 39 percent.

4. In what Guild Region do you live? Northeast: 16 percent; Southeast: 13 percent; South Central: 10 percent; Central East: 20 percent; Central West: 12 percent; Western: 29 percent.

5. Do you attend chapter meetings? Regularly: 72 percent; occasionally: 15 percent; rarely or never: 7 percent; chapter rarely or never meets: 6 percent.

6. Have you attended one of the past three annual conventions? Yes: 57 percent; no: 43 percent.

7. If not, why not? Too far to travel: 12 percent; too expensive: 48 percent; Too time-consuming: 2 percent; did not see classes I wanted to attend: 1 percent; scheduling conflicts: 29 percent; other: 8 percent.

8. Overall ranking of convention city preference: St. Louis, Chicago, Minneapolis, Portland, Kansas City, Atlanta, Nashville, Philadelphia, Louisville, Dallas, Hawaii, Houston,

Miami, San Antonio.

9. Do you plan to attend the St. Louis convention? Yes: 66 percent; no, 34 percent.

10. Do you plan to attend the Portland convention? Yes: 65 percent; no, 35 percent.

11. Would you consider attending a convention in Hawaii? Yes: 16 percent; not sure: 48 percent; no: 37 percent.

12. Ranking of considerations in deciding to attend a convention in Hawaii: cost, opportunity for vacation, desire to visit Hawaii, Institute schedule, time away from work, non-Institute activities.

13. How many regional conferences have you attended in the past three years? None: 19 percent; 1-2: 36 percent; 3-5: 35 percent; more than five: 10 percent.

14. Do you work full-time in piano service: Yes: 81 percent; no: 19 percent.

15. Are you self-employed? Yes: 93 percent; no: 7 percent.

16. If yes, do you employ others? No: 72 percent; 1-5 employees: 28 percent; more than six: 1 percent.

17. How many pianos do you service in the course of a year? Less than 100: 11 percent; 101-250: 17 percent; 251-500: 25 percent; 501-750: 22 percent; 751-1,000: 16 percent; 1,001-1,250: 6 percent; more than 1,251: 2 percent.

18. Do you use a computer in your business? Yes: 24 percent; no: 76 percent.

19: If yes, what kind? IBM: 44 percent; 40 percent; CP/ M-based: 6 percent; Commodore:

Continued on page 3

Chapter Management Committee Reviews Activities

Webb Phillips Chair, Chapter Management **And Achievement Committee**

The industrial age from which we come has this motto: "If it ain't broke, don't fix it." The motto of our informational age comes from space engineering and says, "if it's working, it's probably obsolete." The thinking of today is far more important and essential to our success. We have to be thinking, looking for better ways to do it and avoid habits and ruts.

We are aware that many times there is not enough time to present everything at a chapter business meeting or, for any number of reasons the general membership may not be getting all the information regarding chapter achievement as fast as we like. From time to time, for that reason, there will appear in the Journal notes and letters between the chairman and the regional directors. This is done only to make sure the general membership is informed without delay, and that you know the channels are wide open for your personal input and new ideas.

This month, we are showing the mid-year committee report to the executive board. and a short note to the regional

directors.

Goals (in addition to the goals stated in Article I, Section B, numbers four and five):

- 1. Our first priority is to educe a response from all chapters, even if only a postcard stating whether or not they met.
- 2. Report all chapter activity of social and technical interest to others through the Journal.
- 3. Construct a simple new yes-no form for monthly reports.
- 4. Update the Chapter Management Handbook and make it available to all chapters.

5. Make a training film for incoming chapter officers.

- 6. I want to stimulate more chapter efforts for recognition, rather than individual efforts within the chapter. By making public (in the *Journal*) everything that is going on and everything necessary for a chapter to get award recognition, all are informed. I feel that more interest will be stimulated among general membership to direct the responsible persons to get involved with monthly reports and chapter projects. To this end:
- a. Make each regional director accountable not only to the Chair, but to their own region.
- b. Publish in the Journal not only national award winners but the winners of regional awards within each region. This makes each regional director a person with responsibility and a feeling of importance. An enthused, truly significant figure is

a valuable asset.

7. Interested regional directors must play a bigger role than having their names appear on a list. I feel we have an outstanding committee of people with mutual interest, dedicated to the growth and improvement of the Guild. Having them institute their own ideas and philosophy to obtain chapter participation may bring new wavs.

Progress and achievements

1. To date I have made and distributed to regional directors a new scoring and activity sheet.

2. Made public (by Journal) a general idea of how points are given for awards.

3. Sent to the Home Office a copy of the Chapter Management handbook we are working on.

4. Sent to all directors samples and guidelines for contacting chapters.

5. A letter has been sent by each regional director to all chapter presidents asking for cooperation. For those who do not respond, a postcard will be sent, then followed up with a personal phone call.

For action by board

Approve funding for a video of a formal meeting to be used in training new officers.

Chapter Notes

Los Angeles

In our November meeting we welcomed one new member. Then George Defebaugh brought us up to date on the piano industry in Japan and Norm Neblett spoke of the changes in taking the new tests to become a Craftsman. Following these splendid reports, our program chairman, Teri Powell, was prepared with an excellent hands-on program for the non-

Craftsman members. With action models at several tables, members and/or visitors could go to whatever table they wished and improve their ability on regulating or repairing. There were grand action models, vertical models, places for rebushing flanges, pinning, flanges, etc. A qualified teacher headed each project. This type of learning is very important to the noncraftsman members and should

be done occasionally.

In our December meeting, this writer was fogged in from making the 120 mile trip. Teri Powell gave the technical appetizer on how to store materials in the shop. This must have been interesting. Our main speaker was Richard Davenport. who spoke on troubleshooting grand damper problems. Here I

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