

Chapter 6

Voicing

“A good piano must have a sound that is strong, round, full, and sustained. Its tone must be a little metallic, . . . neither shrill nor dull, but mellow and lively. The tone must be equal in the three parts of the keyboard . . . [but] in the upper treble clearer and more piercing than the rest of the keyboard.”

—Claude Montal, blind piano manufacturer and inventor, 1836

The focus of this chapter is voicing or “tone-regulating”: the adjustment of a piano’s tonal characteristics by manipulating the shape, mass, density, and stiffness of the hammer felts. Two other aspects of piano servicing that directly affect voicing—string leveling and hammer mating—are discussed as well.

Most people see voicing only as a way to manipulate timbre—to make a piano sound brighter or mellow. However, the hammer head is a medium of variable stiffness: in soft playing it damps high partials, whereas on hard blows it releases their full spectrum. This creates a *tonal gradient* that makes the piano as expressive and versatile as it is. Figure 183 on page 71 shows how dramatic the timbral variations are at different dynamic levels, and illustrates why a skillful player can create orchestral effects on the piano.

Although the goal of a voicing can be a simple brightening or mellowing of a piano’s sound, a voicing must preserve, and, preferably, augment a piano’s tonal gradient. The alternative is a piano that is dull and lifeless, or piercingly bright, but monotonous. This chapter discusses the techniques that allow you to control timbre without compromising the tonal gradient. You will learn how to:

- **Sand** the hammers to reshape the felt or to remove the cupped outer layers of felt in new hammers
- **Seat and level** strings
- **Mate** hammers to strings to improve the clarity and uniformity of sound
- **Soften** certain areas of the hammer felt with needles, steam, or chemicals to increase sustain and reduce brightness and/or volume of sound

- **Harden** the hammer felt with chemicals to increase brightness and/or volume of sound
- **Sand** individual hammers to increase the clarity, brilliance, and brightness of sound
- **Iron** the felt to bring out the ultimate clarity and focus of sound

Voicing can’t change the basic tonal character of the piano or the hammers. It is a way to release a piano’s potential and even out its tone, but only within the limitations of its hammers, belly, and acoustic environment.

As discussed in “Piano Hammers” on page 70, hammers affect the tone with their resilience, hardness, and mass. Your ability to control those properties as part of the voicing is limited. For best results, *hammers must be close to ideal* to begin with. A set made of harshly treated, poorly fulled, low-quality wool will never match well-made hammers with highly resilient felt.

If you are in a position to replace the hammers, be sure to match the replacements to the size and character of the piano, taking into consideration action leverage and touch-weight. See “Selecting Hammers” on page 383 for more information.

New hammers often need extensive voicing to improve the sustain of sound, improve the tonal gradient, and even out the volume and timbre. Since this is demanding even for an experienced technician, I recommend first learning voicing techniques on an already-voiced piano. Attend a seminar at a piano-technology conference or school, or visit a piano-rebuilding shop, if possible, to observe a voicing and to learn what to listen for.

If you find any signs of rodent infestation, take the appropriate precautions before cleaning and vacuuming the action and keyboard (page 136).

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the hammers to strings and voicing the piano, followed by two or more full tunings.

Technicians typically don't level strings in vertical pianos except in the most expensive models. By seating the strings with consistent force at the upper termination (usually a raised V bar in the plate) after a restringing, you will get the strings close to level. If you decide to perform fine string leveling in a vertical piano, either use a weak magnet (Figure 365), or remove the action, tilt the piano on its back, and use a bubble gauge. If you remove the action, use rags to mute the strings other than the unison on which you are working. Note that in verticals you need to push *down* the strings that do *not* ring, whereas in grands you pull *up* the strings that *do* ring.

Seating the Strings

Seating the strings improves the clarity of tone and reduces buzzes and false beats. You should seat the strings around all bearings, but primarily around the front duplex bearings (Figure 362), on both sides of the V bar or agraffes, and around the bridge pins.

A device like Acousticraft or Robinson Strate-Mate²⁵⁷ speeds up the seating of strings at the speaking-length side of agraffes and on both sides of the capo bar (you may not be able to get close enough to all agraffes, especially in the low tenor). Such a device can also help to level the strings, but it must be used gently to avoid damaging the strings.

To adjust each string individually, use a tool, such as the Concert String Tool from Davenport Tools (Figure 363), or use a notched brass bar to push down the strings at the front duplex, and a steel hook to pull up the strings at the other bearings. If the capo tasto is wide and you can't get close enough to the V bar with a hook, remove the action and push up the strings on each side of the V bar from underneath with a brass bar.

Don't tap or push the strings down vertically at bridge pins, because this buries them deeper in the bridge cap and extends their contact with bridge notches outward (Figure 105 on page 41). Instead of eliminating false beats, you may introduce them. Instead, gently pull or push each string, almost *horizontally*, toward the bridge pin (Figure 363). This will improve its contact with the pin and bridge without crushing the wood.

Bend the strings gently, with even force, and slide the tool from the bearing out. Seating the strings can throw them out of level. It's best to work with a bubble gauge on the strings, and level the strings as part of the procedure (see below).

Why is Leveling Needed?

If bichord or trichord strings are not on the same plane, the hammer will be in contact with the lower string(s) longer than with the high one(s). Whereas the low string(s) are partially damped by the extended contact,

²⁵⁷ <http://www.pianoteksupply.com/assets/pdf/instructions/Strate-Mate%20Instructions.pdf>.

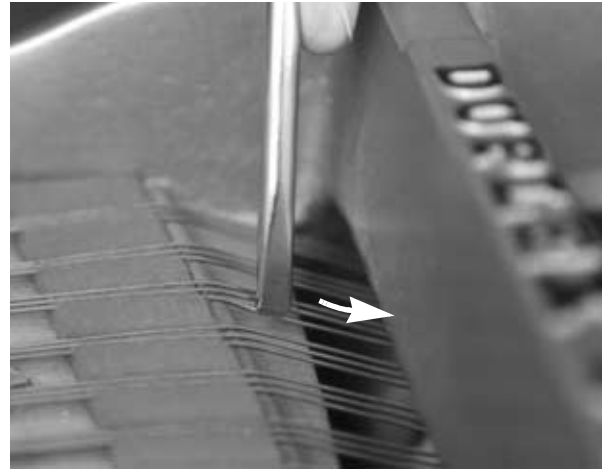


Figure 362 Seating the string at the front duplex bearing.

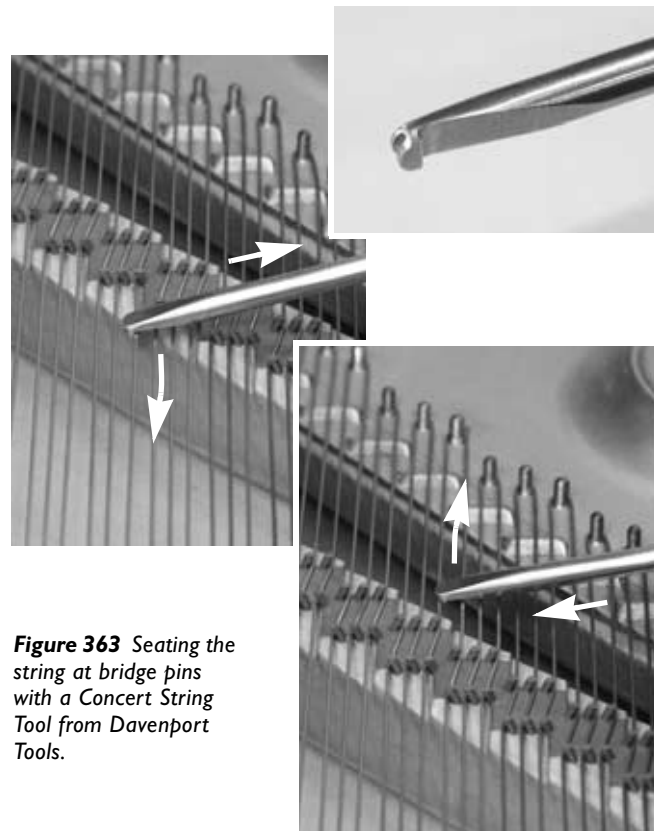


Figure 363 Seating the string at bridge pins with a Concert String Tool from Davenport Tools.

the high string(s) are struck with less force because the low string(s) slow the hammer. The uneven impact also makes the hammer head twist and move sideways, sliding slightly on the strings. The note will sound weak, unfocused, and nasal, with a characteristic sizzle during attack (see "Piano Tone and Sound Envelope" on page 43). You will be able to recognize this sound after you level a few unisons. It's somewhat like touching the strings lightly while striking the key.

The effect of string leveling on voicing and sound volume is little appreciated. Either because it is misunder-

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Myth: A voicing won't hold for long unless the piano remains unplayed.

Truth: Though this is true for extremely heavy use, a properly voiced hammer with resilient, uncontaminated felt and highly interlocked wool fibers will get only slightly brighter from use, and will hold its overall characteristics of tone quality and sustain for years. It is imperative, however, that you address the hammer as a whole, opening up dense shoulders, and treating the area under the crown if it is too dense, not merely needling the crown. Resetting the felt after needling is extremely important to simulate the packing that will be caused over time by the strings. Rubbing the needled felt with a warm iron further stabilizes the tone.

the shoulders and, optionally, to the crown. Wait 30–60 minutes for full effect.

Resetting the Felt

After each needling run, reset the felt by striking it with the top of the voicing-tool handle (it should be flat or evenly rounded) or a small hammer. Making sure the hammer tails are well supported, give the felt a few decisive blows from about 11 to 1 o'clock.

Packing the felt after loosening it with needles may seem counterproductive, but it is the only way to stabilize and correctly evaluate the sound after needling. When not reset, the hammer will sound deceptively dull during voicing, but will open up within days. Resetting the felt also keeps the hammers mated to strings during voicing.

Pre-needling New Hammers

If you are replacing the hammers, pre-voice them as explained in “Preparing New Hammers for Installation” on page 385.

Needling Procedures

Voicing procedures are presented as a series of steps for clarity, but these steps are highly interrelated. They are *usually* performed on all hammers in this order, one step at a time, but often the steps are repeated, possibly many times. For example, deep-needling the shoulders of dense hammers (step 2) increases projection and sustain, but can also increase the brightness of sound. You may need to needle under the crown (step 3) after needling the shoulders, and vice versa.

Reset the felt after each needling pass, and keep the hammer crowns clean and mated to the strings. If you hear an unfocused *zing*, correct the mating before proceeding.

1 **Sand felt** on new, “raw” hammers to remove the cupped outer layers of felt (page 201). Is the sound after the initial sanding short-sustained and lifeless (even if harsh and loud)? If there is a lot of felt on the hammers and touchweight and over-centering are not an issue, sand the hammer further with 120- and 220-grit sandpaper. Removing some felt may actually *reduce* the harshness of

Pulling Out Broken Needles

Despite your best effort, sooner or later a needle will break and remain buried in the hammer felt. Pull out the needle immediately or you may not be able to find it later. Avoid the embarrassment of someone else discovering your broken needles!

You can extract a needle with any pliers, but flush-cutting pin nippers may be the most effective (Figure 433 on page 245). Open them up a little, press down the felt on each side of the needle with the corner of the jaws, grasp the needle lightly, and pull it out. As much as possible, avoid damaging the felt.

If the needle is too far below the surface, use a voicing tool or pin vise to insert another needle right next to it. The broken needle will be lifted up and out of the hammer enough to grasp it with pliers. Thanks to Allen Wright, RPT, for this tip.

otherwise dense hammers because reducing their mass reduces their string contact time. Are the hammers deeply grooved? If there is enough felt, reshape them (page 200). Level the strings, and mate the hammers to strings if the hammers are new (page 207).

2 **Needle dense shoulders** to increase sound projection and sustain, and, in some cases, to minimize impact noise. Pick a sample hammer in the middle section and check the density of its shoulders with a single needle. If you can easily insert the needle all the way into the felt, skip that section and perform the same test 10–15 hammers higher or lower. If inserting the needle feels as if it is penetrating a hard substance, see “Reflowing and Rinsing Hardener from Overhardened Hammers” on page 215. When you encounter a hammer with dense shoulders, radially stab each shoulder (area 4) with a three-needle tool about five times in the direction of the wooden molding (Figures 374 and 375a), starting low and stabbing higher each time. Counterintuitively, needling the shoulders *increases* the brightness of sound, and usually needs to be accompanied by progressively shallower needling toward the crown. To do this, start with full-depth stabs low on the shoulders, and gradually reduce the depth of the stabs toward the crown. Reset the felt on and around the crown (see above). Listen to the results. If the tone is rounder and sustain longer (even if the brightness has increased), needle the shoulders more and take mental note of the total number of stabs you made. When the tone stops improving, reproduce what you did on 10–15 hammers above and below your sample hammer. Repeat this process in other sections. The bass usually requires less needling, the treble more. Be careful not to bend or break the voicing needles in the treble. If the angle and density of felt on the topmost hammers prevents you from inserting three needles all the way, deep-needle those hammers with a single needle.

3 **Needle under crown to remove tonal harshness:** Compare the decay of a note when you play it normally, and when you pluck its string(s). If the decay is much longer and has more bloom when plucked, you may need to voice the shoulders more. However, area 2 may be too

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to strings (page 207). To test the voicing, play the piano with the soft pedal fully depressed. On each note that stands out, mute all but one string at a time with felt mutes and compare the sound of each string by playing *pp*, *mp*, and *f*. If the regular voicing is even, you are likely to notice discrepancies mainly at *pp* and *mp*. To voice down a particular string, stab the felt lightly and shallowly with a single needle at and around the crown *only* between the grooves, under the affected string. You can do this with a chopstick tool in the piano, but the results won't last as long as when you do it outside the piano and reset the felt. If the volume is uneven at *f*, remove the mutes and compare the note with its neighbors. If it is slightly louder than the other notes, insert a single needle from both sides into area 2 precisely under the string that sounds louder (between the grooves). Reset the felt and mate it if necessary. Never compromise regular voicing for the soft pedal.

10 Iron felt (see below).

Ironing the Felt

Ironing gives the voicing a finishing touch, both visually and tonally. It makes the hammers sound cleaner, more focused, and somewhat brighter. Ironing can also be used as a light voice-up technique.

You can use an electric clothes iron²⁶² or a curved hammer-ironing tool, available as an attachment for soldering irons (piano-supply houses offer temperature-controlled units). If electricity is unavailable or running an extension cord is not practical, you can use a hand tool (Figure 379) heated with a lighter or on a stove. You can also warm the tool in a glue pot or on a hot plate, covered with a piece of cloth. The surface of the iron should not exceed 150°F [65°C].

Place the hammers on a support block. If you use a travel iron, lift all hammers except the group that will fit under the heating element. Place a piece of soft, thick felt or cloth on the block to allow the iron to reach hammers that may be slightly shorter. Iron the hammers from the front to back shoulders with small circular motions, 10–15 seconds per group. The motions encourage felt fibers to interlock, effectively refelting the surface layer. Move the iron continuously and lighten the pressure over the crown. Lift each angled hammer a little to reach its shoulders.

If you use a hand iron, iron the shoulders of a group of hammers all on one side, then the other. Make quick, light passes over the crown.

Alternatives to Needling

Hammering

This nondestructive and noninvasive technique, promoted by David Stanwood, RPT, is particularly effective on hammers that were over-ironed, pressed with too much

²⁶² Look for an electric, temperature-controlled mini travel iron without steam vents, such as the TravelSmart® by Conair.



Photo by L. Bösendorfer Klavierfabrik, GmbH

Figure 379 Ironing the hammers with a hand iron made by Meyne Klaviertechnik.

heat, or overlacquered on the shoulders and crown. It also works on old hammers with dried-out felt. Hammering the surface of densely packed felt “limbers” the fibers and unlocks their resilience by allowing them to untangle slightly. In overlacquered hammers the impact breaks down the lacquer, again restoring some of the felt’s original resilience. Stanwood calls this technique “sugaring,” alluding to the effect being similar to “sugar coating,” or shallowly needling, hammer crowns. He points out that this technique will have minimal, if any, effect on uncontaminated, moderately dense, cold- or warm-pressed hammers made of highly resilient felt.

How: Support the hammer tails (Figure 373), not just the shanks. Using the round head of a ball-peen hammer, strike each piano hammer several times with moderate force on the upper shoulders and crown. You can use any hammer, but the rounded shape of the ball peen concentrates the force of the blow to a point, for a deeper effect.

Steam-Treating Hard Hammers

This controversial technique is a quick way to voice down very dense hammers in pianos that otherwise wouldn't be voiced at all, or that don't justify the effort of needling. The problem is that steam affects the felt momentarily—you have to work quickly, or you risk ruining the hammers. If you apply too much steam or let the water soak the felt, the damage may be irreversible. In old hammers there is also some risk of the felt coming unglued from the moldings. Practice on old hammers if you can; for example, on a set you intend to replace or in a piano that will be scrapped.

How: The following technique is proposed by Ed Foote, RPT, as a solution for hammers that don't justify fine voicing, and that would not otherwise be voiced.

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