World-Wide
Technical Reference Guide

Upright Regulation

STEINWAY & SONS

Boston PIANO
DESIGNED BY STEINWAY & SONS®

Essex PIANO
DESIGNED BY STEINWAY & SONS

the Family of Steinway Designed Pianos

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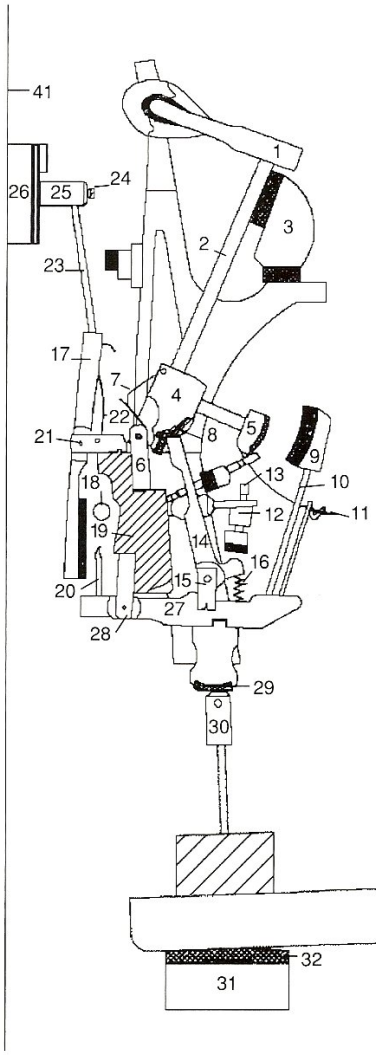

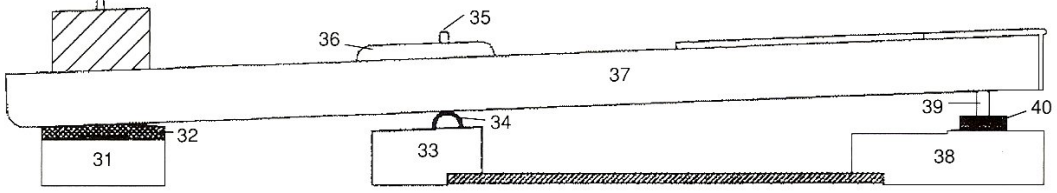

1. Hammer
2. Hammer shank
3. Hammer rail
4. Butt
5. Butt check
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7. Butt spring
8. Butt cushion
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11. Bridle strap and wire
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VERTICAL ACTION REGULATION

The following pages outline suggested steps to regulate the vertical piano. It should be noted that the specifications given are important. However, they may vary within reason, to accommodate individual needs of the piano player. It is important for the technician to understand the interrelationship between regulation procedures and how they affect the instrument's performance, and to use this understanding in determining individual needs of the instrument and the performer.

Before beginning to work on the piano, it is important to make general assessments and observations of the instrument making sure that:

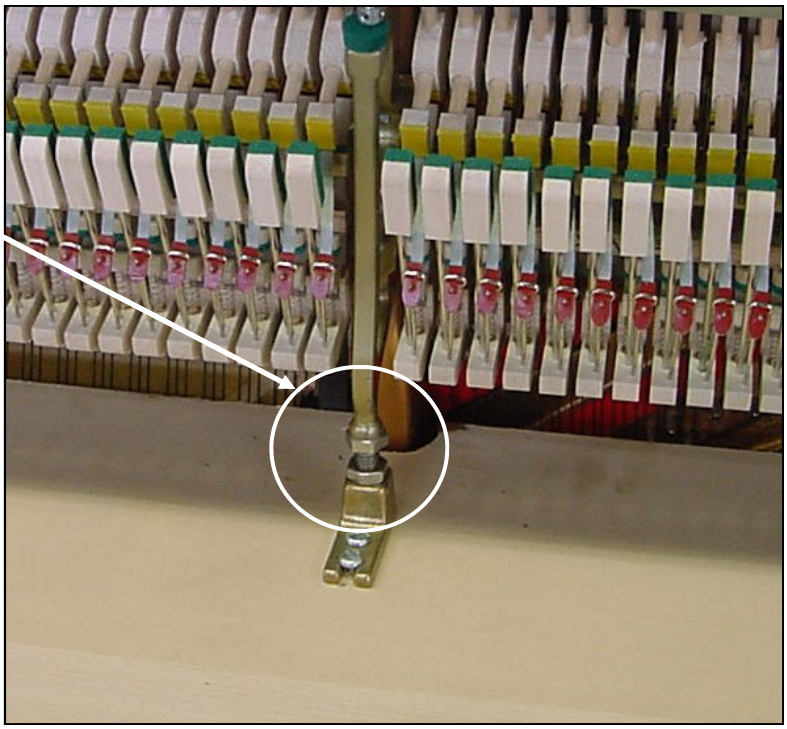
All screws are securely fastened, including those on:
hinges on toplid and keylid, trapwork, pedal assembly, action support brackets.

Case parts are properly fit and functional, such as:
keylid, keyslip, keyblocks (cheekblocks), music desk and deskframe, pedal assembly.

Hinges are firm on their hinge pins to avoid buzzes:
continuous hinge on keylid, toplid hinge.

Check pedal trapwork:
Take out all lost motion between the pedal rods and trapwork levers. Make sure that the nuts are holding the rods tightly as they go through the trapwork levers. There should be no side play in the pedal assembly.

The action stack should be firmly mounted to the support brackets.

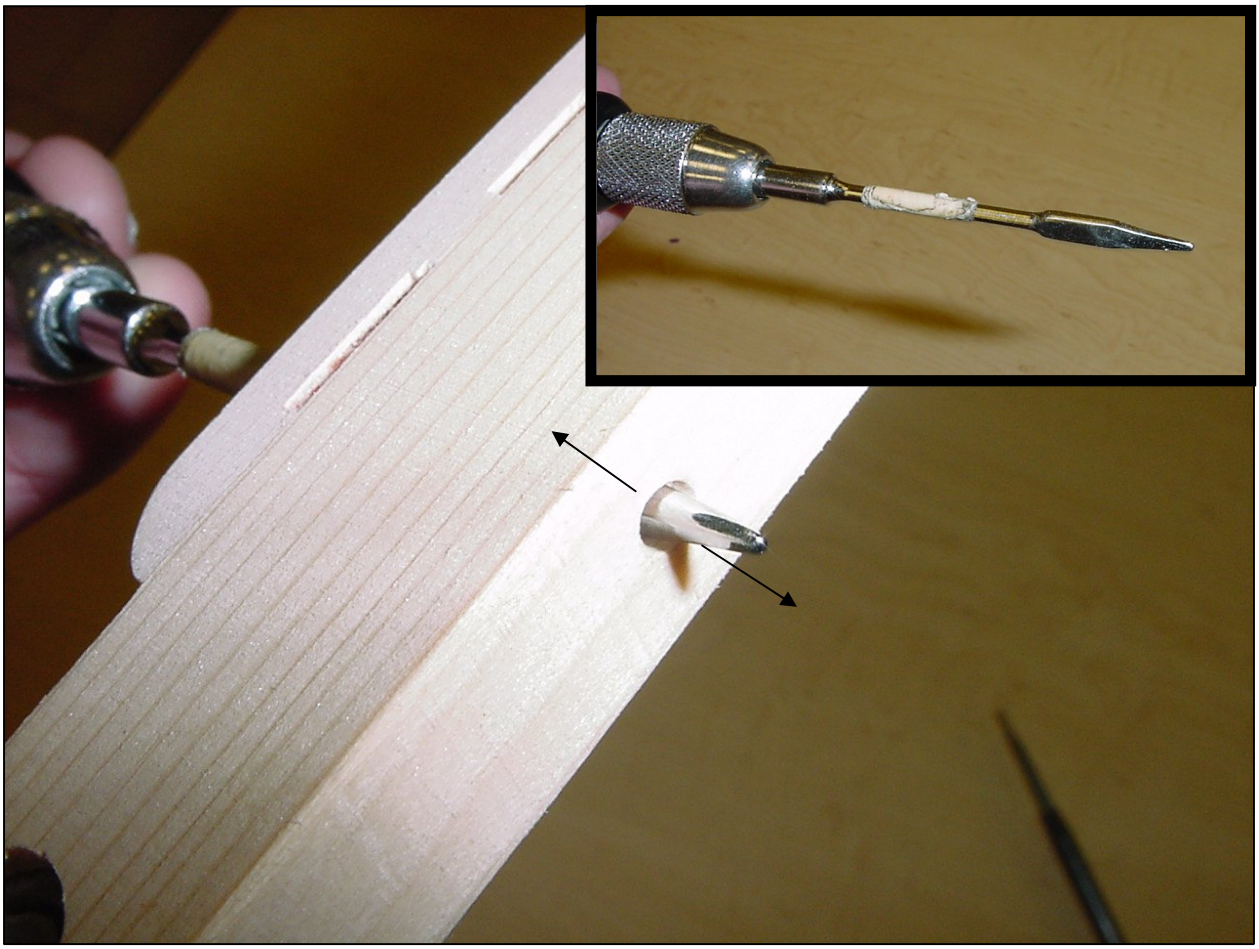


EASE KEYS

Background: Each key must be checked to see that it works freely, yet firmly before any other regulation steps are taken. A tight key will make other adjustments virtually useless.

HOW:

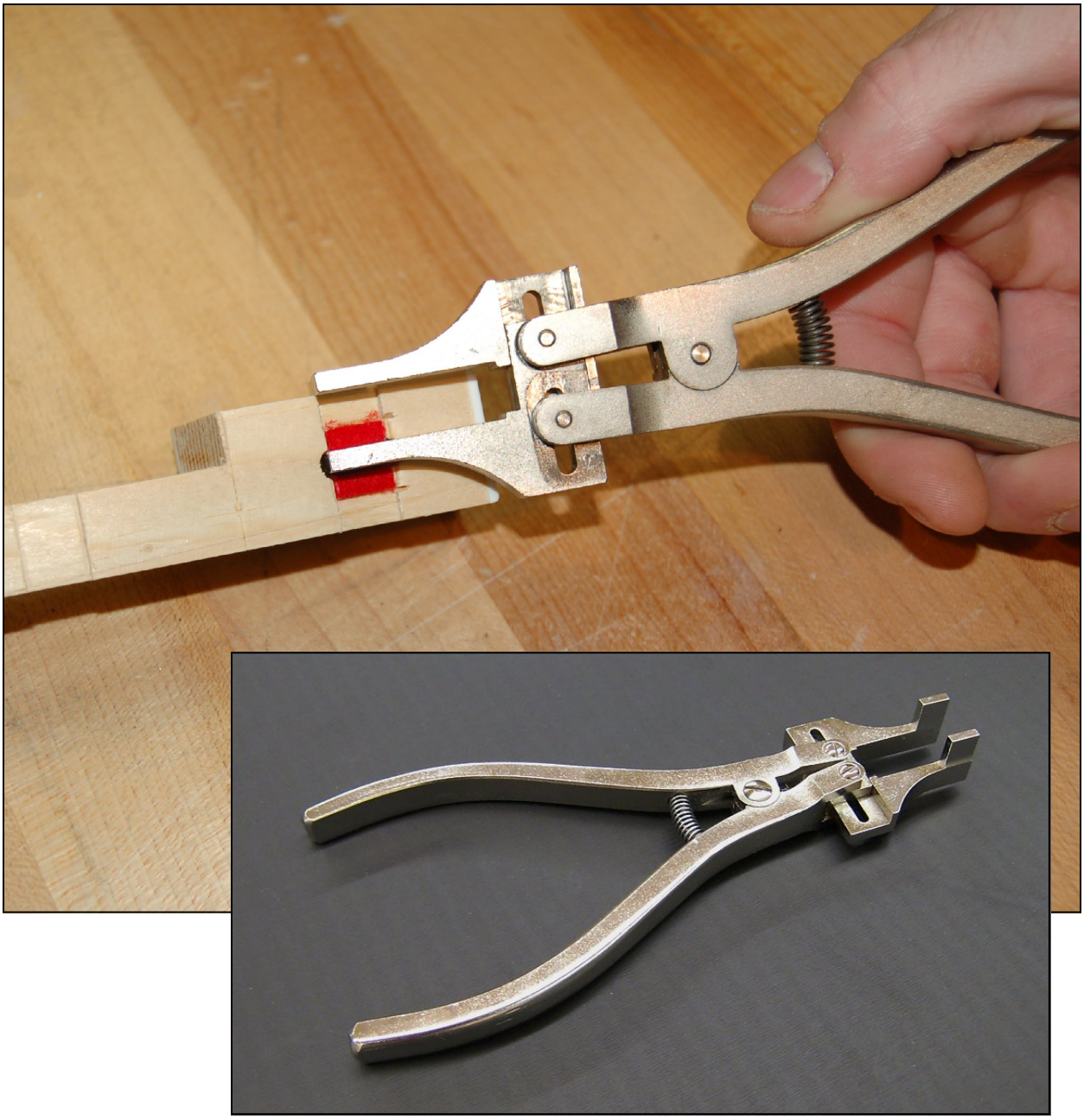
Step 1. Ease balance rail hole—The balance rail pin hole should be eased so that each key falls into place with slight downward pressure. There should be no back-to-front play in any key. Use a reaming tool to adjust size of balance rail hole, while inserting the tool from the bushing side of the key. Ream the "side to side" portion rather than the "front to back" portion of the hole to avoid the possibility of over-easing.



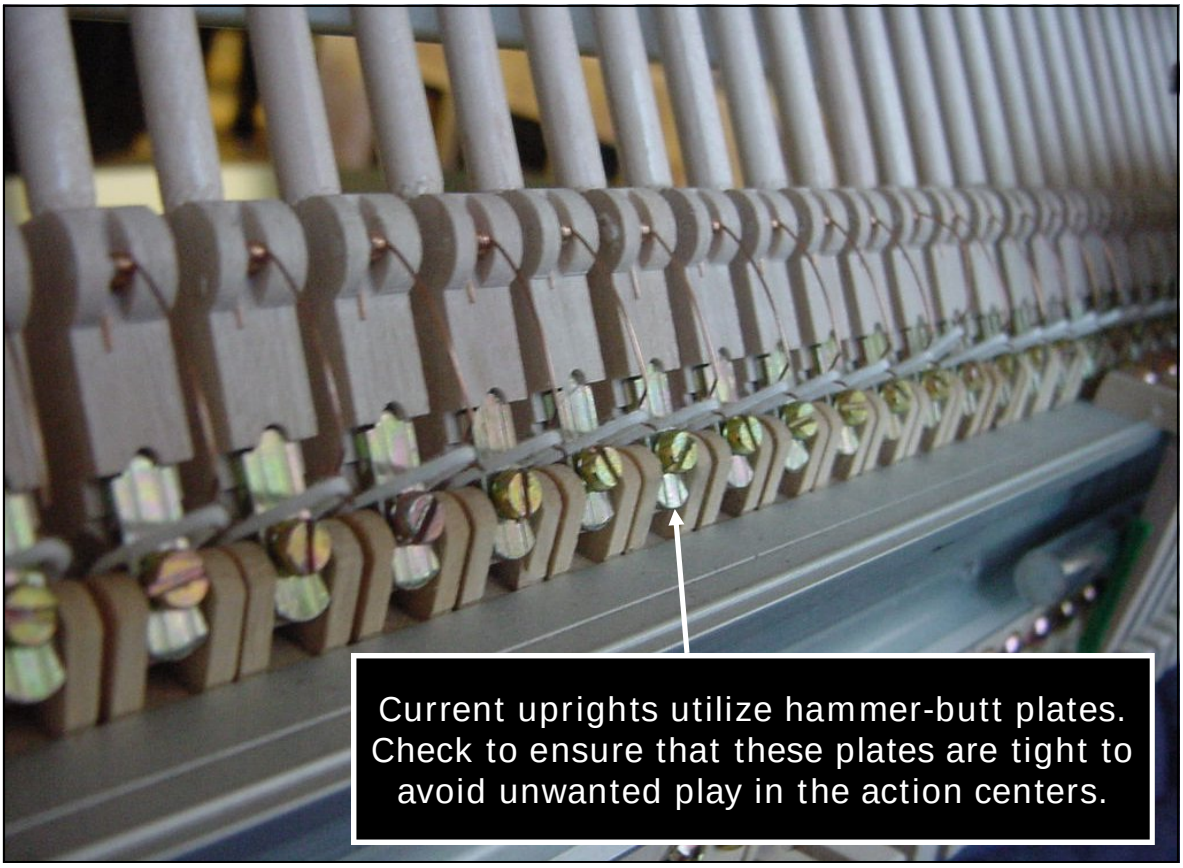
If play exists, glue-sizing the hole with a mixture of hot water and glue (3 parts to 1 part) usually works well. If the play is excessive, shimming both sides approximately 1/16" from the edge will secure the key to the balance rail pin. Ream, if necessary, by using a reaming tool inserted from the bushing side of the key.

Step 2. Ease balance rail bushing—The balance rail bushing should have a small amount of play on both sides of the balance rail pin when the key is gently rotated back and forth at its front. The amount of play should be consistent throughout the keyboard. Adjust, using key-easing pliers.

Step 3. Ease front rail bushing—The front rail bushing should have a slight amount of play from side to side when the key is at the rest position and when it is depressed. Again, this should be consistent throughout the keyboard and should be adjusted using key-easing pliers.



CHECK ACTION PINNING (Refer to Grand Preparation, chapter 1, pages 18-19.)

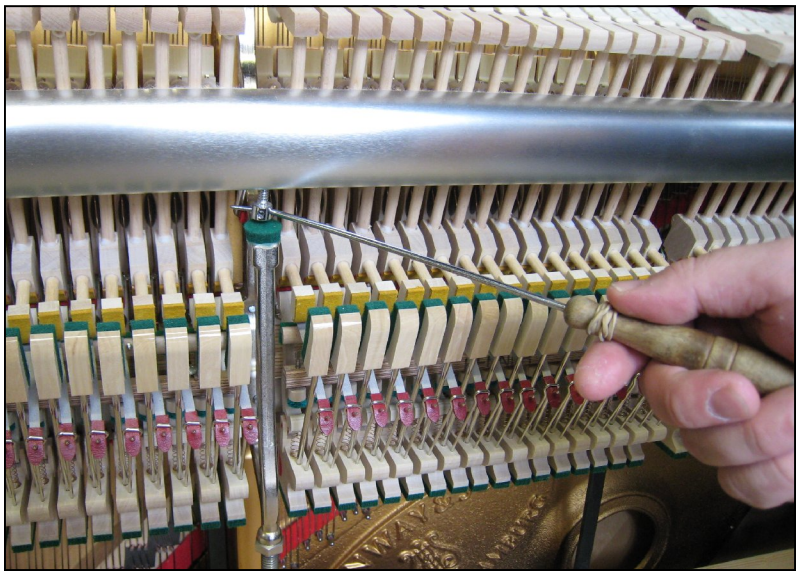


ADJUST CAPSTAN SCREWS / HAMMER BLOW DISTANCE

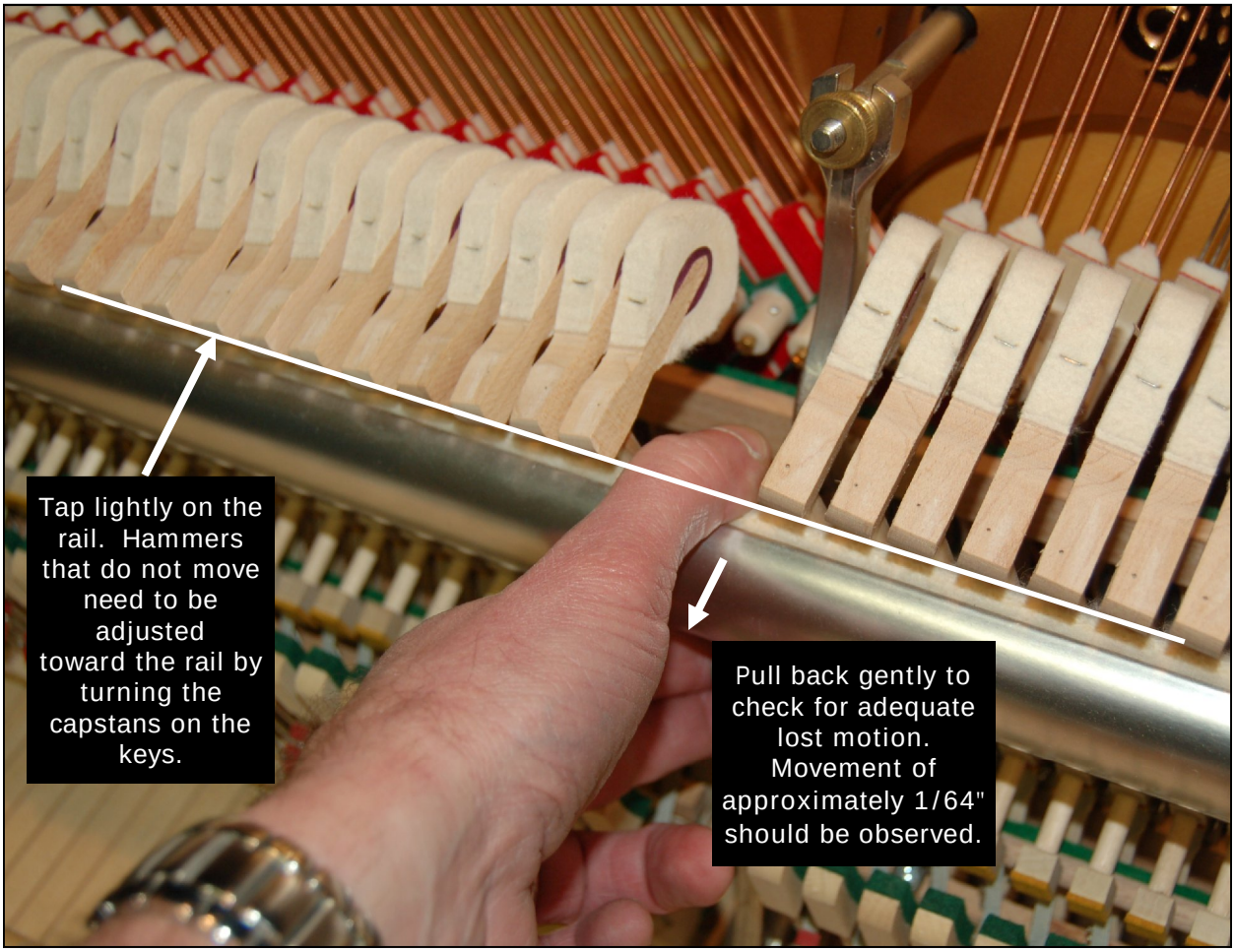
Background: The hammer blow distance for Steinway verticals is approximately 1-7/8 inches.

Step 1. If necessary in achieving proper blow, shim to raise, or iron to reduce the size of the hammer rest rail support felt.

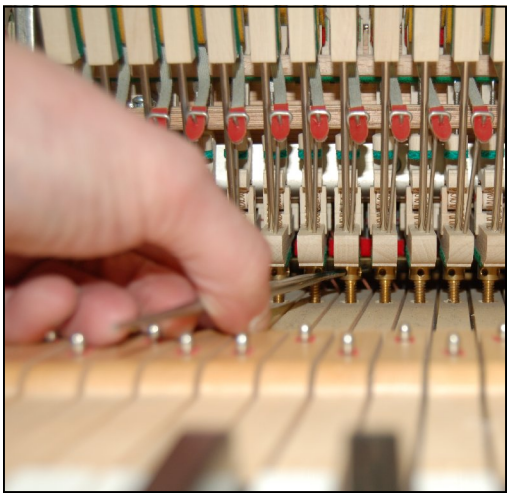
Step 2. Using a capstan tool, adjust the capstan screw up or down as necessary.



The hammershank should touch the rest rail felt with minimal contact. Therefore, the hammershank should follow the hammer rail very slightly if the hammer rail is gently pulled away from the shanks.



The hammers should slightly follow the rail when gently pulled toward the front of the piano. Movement of the hammers should be approximately 1/64". Hammers that move more than this have too much lost motion and should be adjusted accordingly. Alternately, the hammers can be checked for too little lost motion by tapping on the rail. All hammers should exhibit slight movement. Hammers with no movement do not have adequate lost motion to ensure consistent repetition and may cause the jack to hang up on the hammer butt leather. Adjust the capstans as necessary.



KEY LEVEL

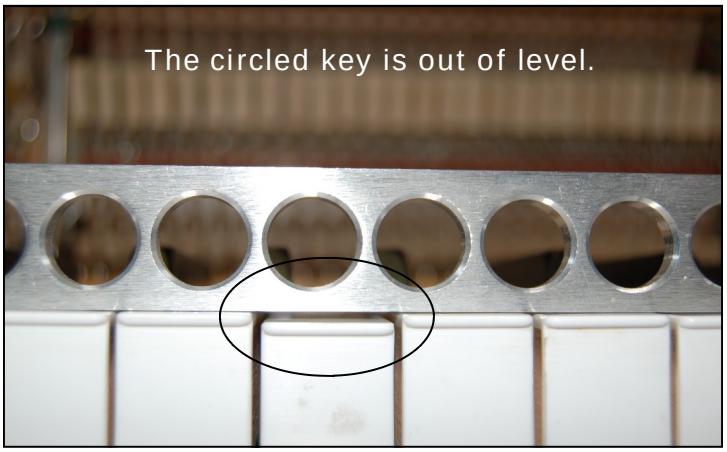
Background: Steinway vertical pianos have a "crowned" key level, which is approximately 1/32" higher in the center than on the ends. While using a crowned key level stick, adjust accordingly by removing or placing paper punchings under the balance rail bearing. When doing key level, be sure there is no lost motion at the butt. This will ensure full action weight on the capstan screws and therefore the keyboard.

HOW:

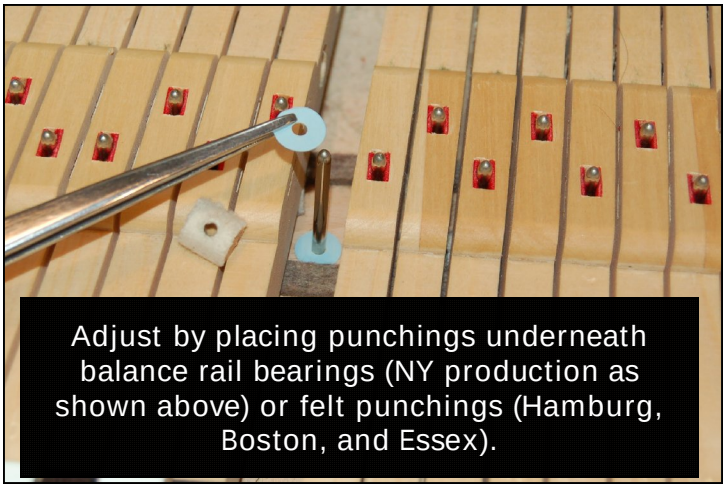
Step 1. Square and space keys—Refer to this section in the "Grand Regulation" portion of the manual.

Step 2. Set naturals—Refer to this section in the "Grand Regulation" portion of the manual. Specifications are listed for all models in the "Tips, Techniques, and Specifications" section.

Step 3. Set sharps—Refer to this section in the "Grand Regulation" portion of the manual. Also, make sure that when the key is depressed, the top of the sharp is approximately 1/32" above its adjacent natural.



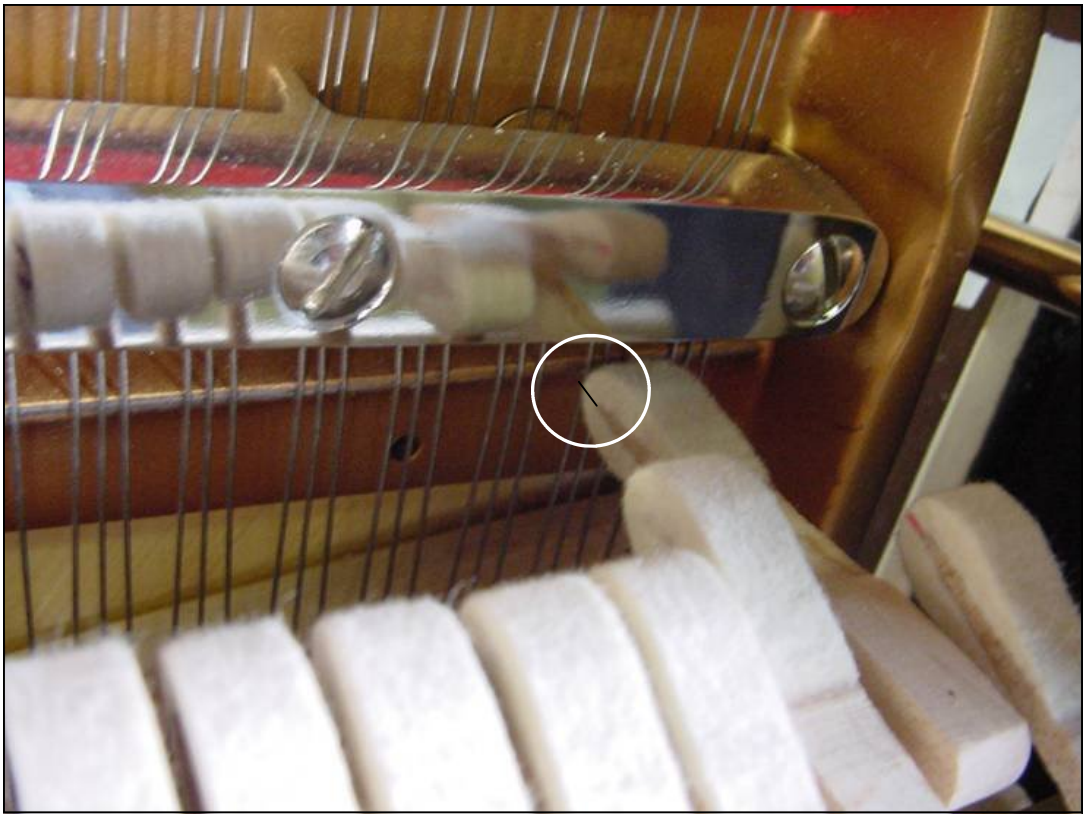
Step 4. Adjust key level—Using a straightedge that contains a 1/32" upward crown in the center, adjust height of balance rail bearings or punchings to level the natural and sharp keys.



Adjust by placing punchings underneath balance rail bearings (NY production as shown above) or felt punchings (Hamburg, Boston, and Essex).

CHECK HAMMER LINE / STRIKEPOINT LINE

Background: Check the straightness of the line made by the strike points of all hammers from bass to treble. (This step is very crucial in the treble region of the scale. Minor changes in strikepoint in relation to the very short strings impacts the tone significantly.)



HOW: Raise or lower any individual hammers which are out of line by warming the hammershank and applying upward or downward pressure on the hammer.

ACTION ALIGNMENT

Background: To achieve accurate and consistent voicing of any piano, it is important that the hammers travel straight towards their corresponding strings. Traveling, spacing and burning operations, although independent, have combining results. Therefore, repeating the following steps is appropriate.

HOW:

Step 1. Travel hammershanks—By lifting several hammers off the hammershank rest rail, observe each hammer's path of travel. All hammers should move straight toward the strings, and not to the left or right. Correct hammers that are traveling incorrectly by adding traveling paper underneath the butt flange.

Step 2. Burn hammershanks—All hammers should be uniform in alignment, and not twisted to the left or right. Correct by heating the hammershank with an alcohol lamp, heat gun, or a heated hammershank-bending pliers. While the hammershank is heated, gently apply a twisting force on the hammer in a corrective direction. This operation may need to be repeated to achieve stability. (See photo on previous page.)

Step 3. Space hammers to strings—The spacing of hammers is correct when all hammers contact their corresponding strings squarely. Loosen the butt flange action screw, relocate the hammer and retighten if necessary. At this time, correct string spacing within the trichords.

Step 4. Align Whippens

Background: The whippen is in correct alignment when:

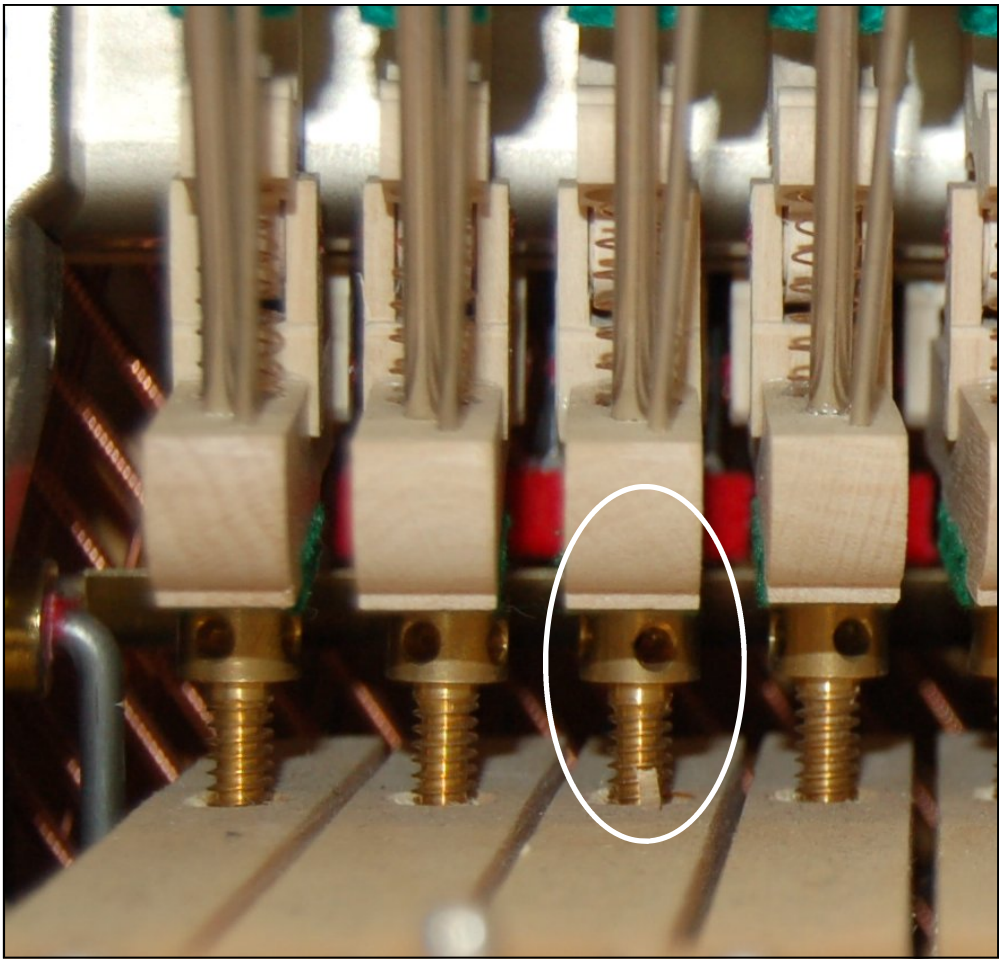
A) the jack is centered to the butt, and

B) jack toe is centered to the regulating button.

HOW: While loosening the whippen screw, one can move the whippen to the left or right. By adding traveling paper between the whippen flange and the flange rail, one can shift or tilt the whippen left or right. Sometimes a compromise is necessary in spacing between the capstan, jack, and the regulating button. Position the whippen so the best results are achieved between all points.

Step 5. Alignment of Capstans and Whippens

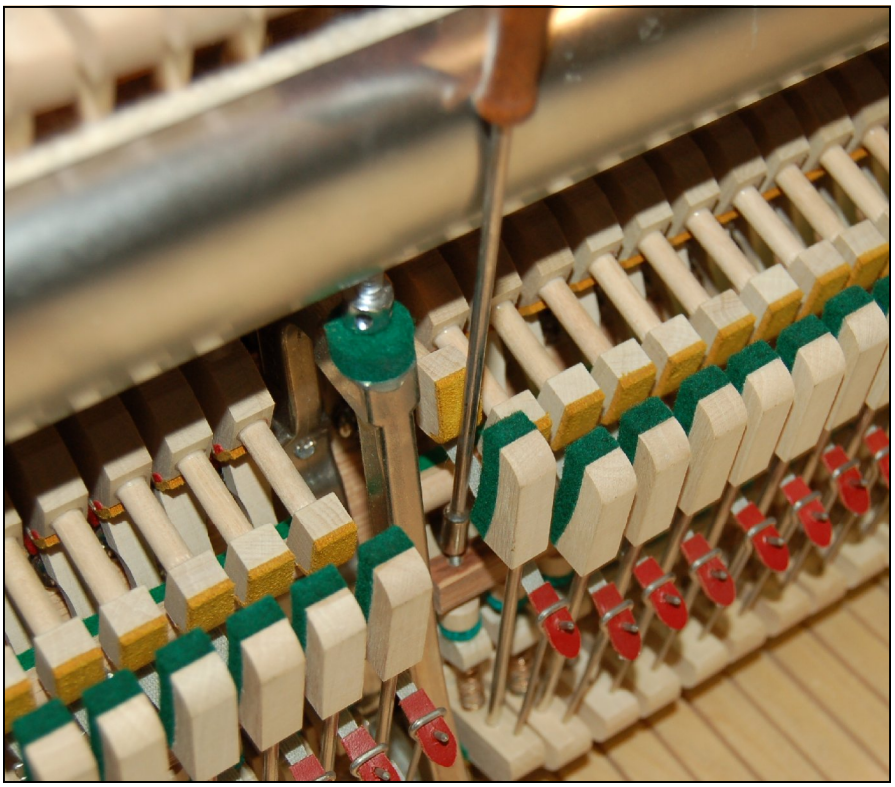
NOTE: The capstans should be centered underneath the whippen cushions as shown below.



ADJUST LET-OFF

Background: Adjusting the let-off on the vertical piano also regulates the only escapement of the vertical action system.

HOW: Rotate the let-off regulating screw through the regulating rail. Let off the hammers approximately 1/16" from the strings.



REGULATE BRIDLE STRAPS

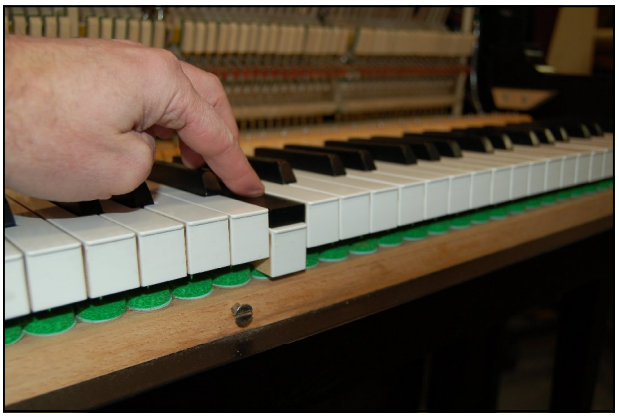
Background: Bend the bridle strap wire in or out so that when the soft pedal is engaged, the whippens do not move. The soft pedal should move the hammers halfway toward the strings. When the key is removed the strap should prevent the jack from slipping underneath the hammer butt felt.

The bridle strap wires are carefully bent with finger pressure.

ADJUST KEY DIP / SET BACKCHECKS

Background: The key dip on the vertical piano is approximately .400 inches.

Step 1. Set key dip on naturals—The key dip is made by using a touch block as a guide and removing or adding paper punchings underneath the front rail cloth punchings. This should result in an aftertouch approximately the thickness of a new penny.



Step 2. Regulate Backchecks

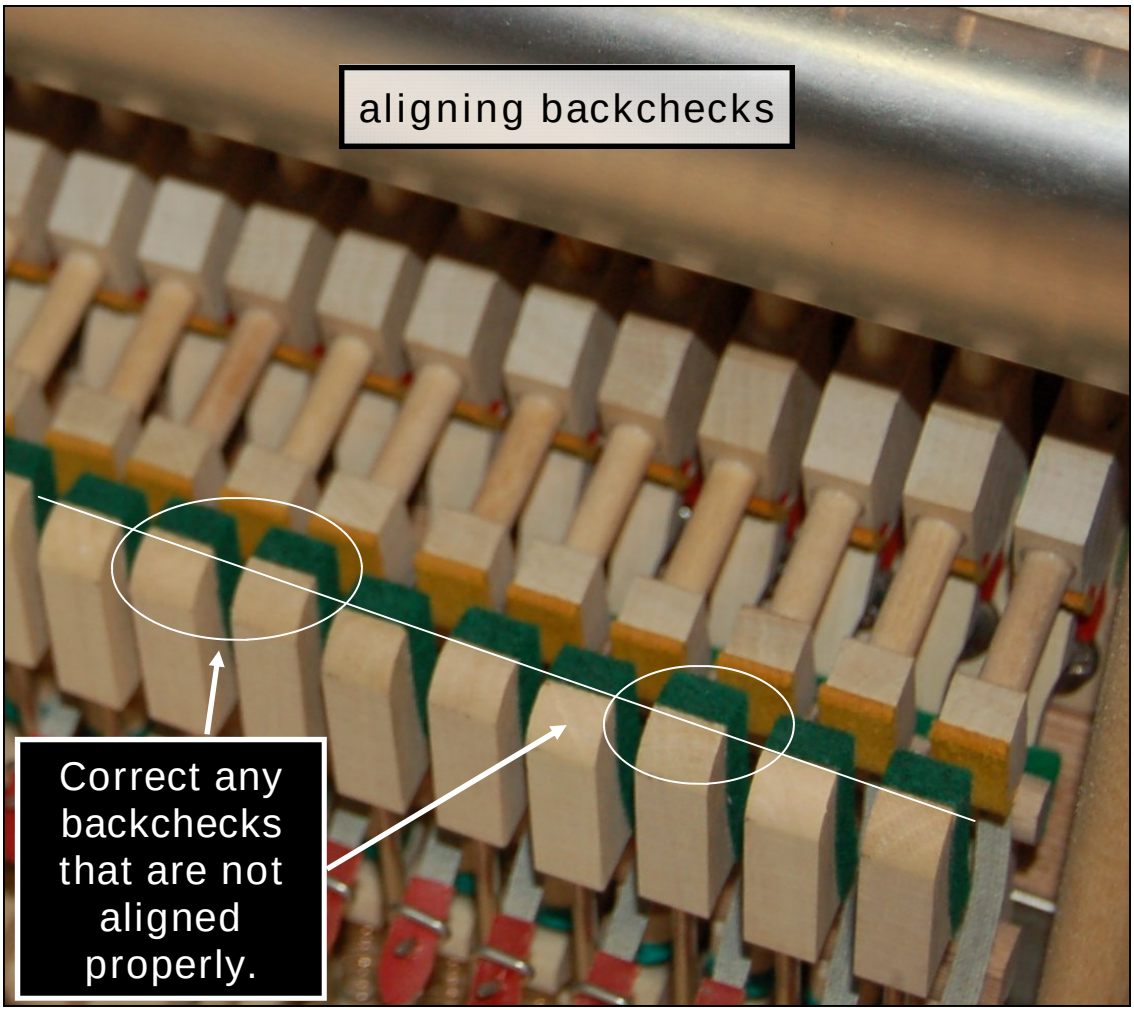
NOTE: Adjust the backchecks by bending the backcheck wires so that the hammer "catches" approximately 1/2" from the strings.

Space backchecks—Make certain that the backchecks and the hammer butt checks are centered and square. Bend the backcheck wire as necessary by using a wire-bending tool as shown in the photo above.

Square backchecks—Use a straightedge as a visual aid to square each backcheck to form in a straight line. Use parallel pliers to twist any backcheck that is not parallel to the straightedge.

Set backchecking guides—Using several natural keys as guides in each section, set the angle of the backcheck by bending the backcheck wire in or out so the hammer is "checked" approximately 1/2 inch from the strings.

Align backchecks—Align all remaining backchecks to the guides, forming a straight line. A straightedge may be used to check this alignment.



Step 3. Adjust key dip on sharps—Since the backcheck line has been established, adjust the key dip on the sharps by backchecking the sharp with its adjacent naturals. Add or remove front rail paper punchings as necessary, until the hammer on the sharps is in alignment with its adjacent natural hammers when backchecked. At this point, check to see that the sharp key, when depressed, is above its adjacent natural keys the approximate thickness of a penny. Also, check to see if the amount of aftertouch is equal on the sharps and naturals. Make finer adjustments in either the backchecking or the key dip, to achieve consistency. Samples that are correct can be measured with a gauge as shown below and replicated on the remaining sharps.

Hint: As the action becomes worn, a compromise of adjustment may become necessary. It is suggested that key dip, and evenly spaced backchecked hammers be maintained at the expense of an uneven line of backchecks.

CHECK DAMPER REGULATION

Background: As the damper pedal is depressed all dampers should start to lift off the strings simultaneously. As the damper pedal is then released the damper heads should return to the strings squarely.

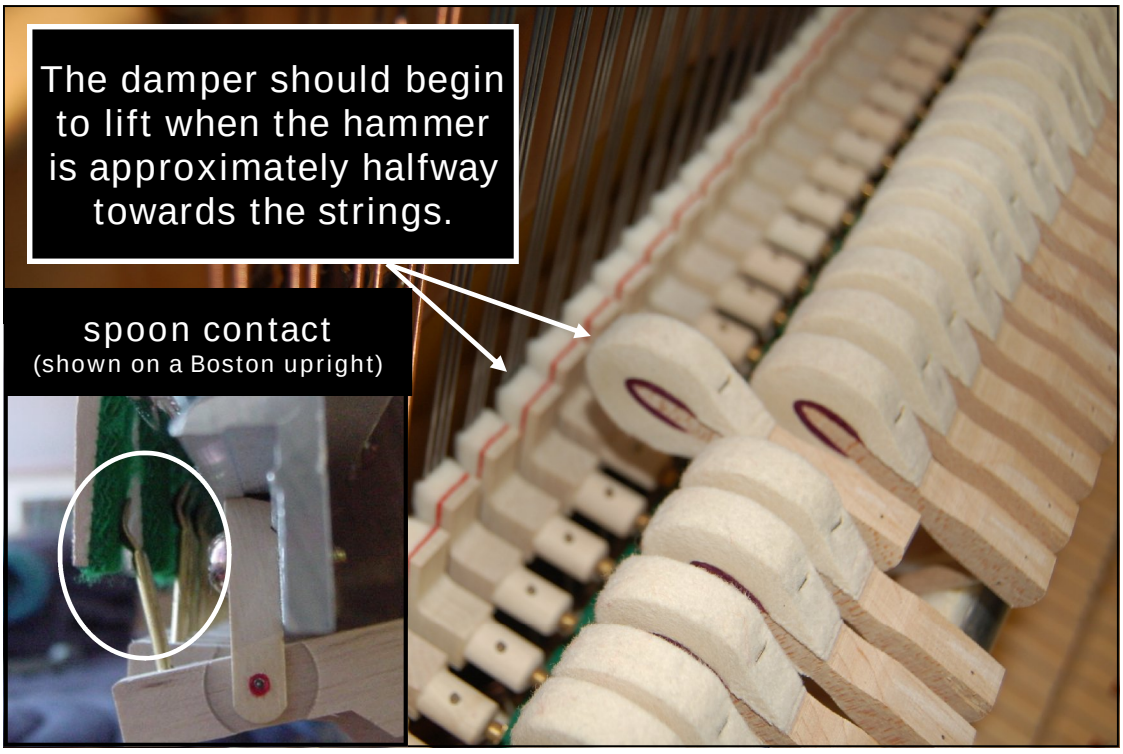
Step 1. Bend the damper wires so that:

Each damper head sits squarely and firmly on its corresponding note;

When the damper pedal is depressed all dampers start to lift off of the strings at the same time.

Step 2. Check damper touch / timing—Adjust each damper spoon located on the back end of the whippen so that the damper begins to lift when the hammer is approximately halfway towards the strings.

NOTE: To readjust the timing of the dampers, it is helpful to set sample, or guide notes first. Then, remove the action to the workbench and adjust each spoon, between the guides, forming a straight line. Recheck for damper timing when the action is reinstalled in the piano.



SOSTENUTO REGULATION

Background: The sostenuto mechanism fitted in recent vintage Steinway & Sons vertical pianos will be found in two different forms, but they both have much in common. We will refer to one as the "felt tab" and the other as the "neoprene tab." The basic principles of operation (which are the same as in the grand piano) and adjustments are described first, and the individual characteristic of each design follows.

The damper levers are equipped with what we will call a "tab." The tab's position is adjustable. The "felt tab" is a small unit glued to the end of a short threaded wire turned into the bottom of the damper lever which allows for horizontal alignment by bending the wire front to back, or vertical alignment by screwing the wire up or down. The "neoprene tab" is screwed to a small metal cylinder mounted on the damper wire, held by a setscrew. Horizontal alignment is made by shimming between the tab and cylinder or shaving away neoprene, and vertical alignment by raising or lowering the cylinder on the damper wire. (The cylinder rests on the wood at the top of the damper lever.)

The sostenuto rod is held in bushed mounts screwed to adjustable brackets. Since the felt tabs project from the bottoms of the damper levers, the rod is mounted to the keybed. The neoprene tabs on the damper wires require the rod to be mounted on the action brackets almost level with the damper stop rail. In both cases the position of the rod and the angle at which the "lip" rests may be adjusted front to back horizontally, or up and down vertically by screws, slotted flanges, or by appropriate shimming.

Having understood the above, it simply remains to make the necessary adjustments to all the sostenuto tabs so that they are aligned as straight as possible in both the horizontal and vertical positions, and then to align the sostenuto rod lip so that in the rest position it does not interfere with normal damper functions. With the sostenuto pedal depressed, the lip of the rod will engage any tab on a damper lifted from the string, holding that individual damper off the string after the key is released, and for as long as the sostenuto pedal is depressed. The unengaged dampers must continue to function normally.

VERTICAL SOSTENUTO ADJUSTMENT PROCEDURE

Required tools: You will need a .050" Allen wrench to tighten or adjust the sostenuto red-felt tabs on the backs of the damper levers, in case any of them have gotten loose or out of alignment. Other tools needed are parallel pliers, a damper wire-bending tool with a 45-degree slot, a straightedge, and a vertical action support.

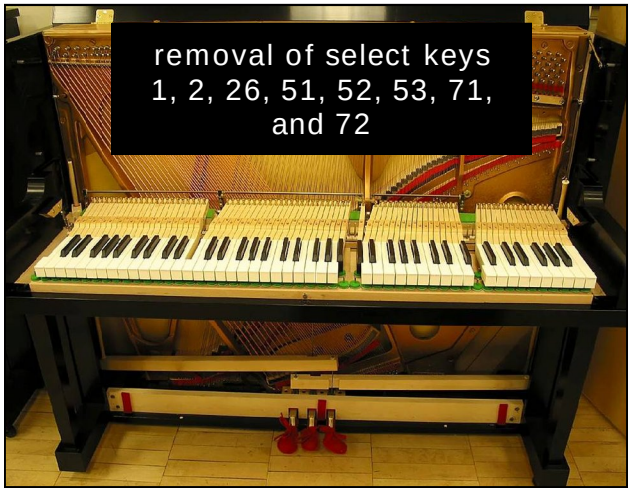
Here are some procedures and tips for vertical sostenuto adjustment:

Preliminary Steps: Ensure that the action brackets are secure (the slightest difference in the vertical position of the action will affect the relationship of the sostenuto rail and tabs). Therefore, make sure that the action and hammer strikepoint are set and secure, and that the action is regulated, especially for key height, key dip, lost motion (capstans) and damper spoon lift.

Remove action from piano and support it upside-down on a workbench with the dampers facing toward you.

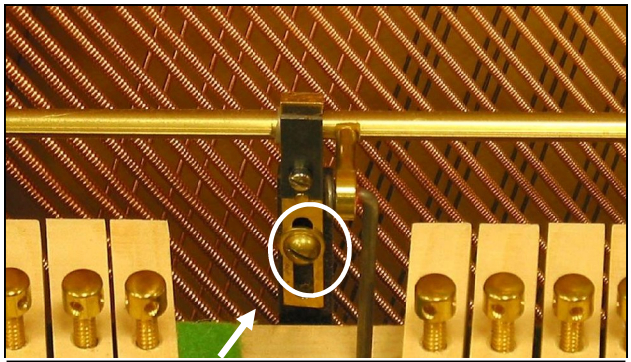
AT THE PIANO:

Remove keysticks 1, 2, 26, 51, 52, 53, 71, and 72 in order to gain access to the four sostenuto rod height adjustment screws. The rod height adjustment screw is the lower screw (larger head) near the top of each sostenuto bracket.



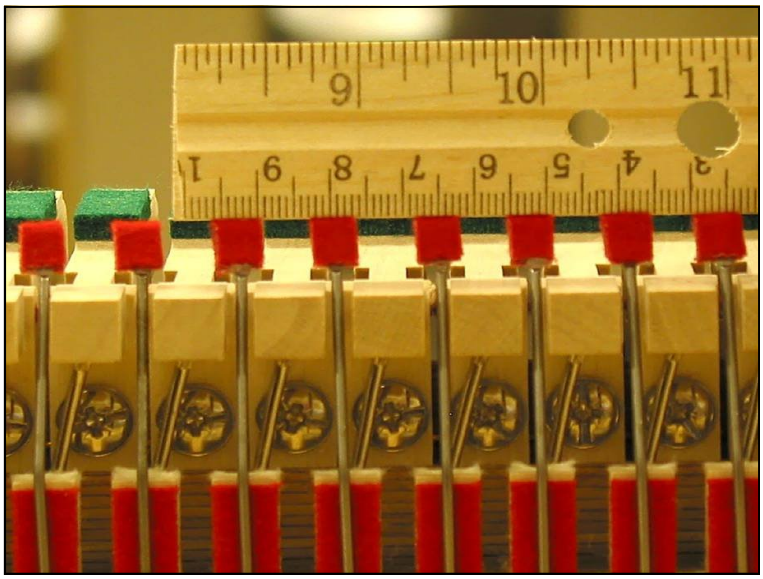
The left to right position of the sostenuto rod assembly is already set at the factory by the positions of the bracket screws in the underside of the keybed. This is set according to the position of bracket #3 for equal clearance of the sostenuto rod “cut-out” on either side of the protruding plate bar.

The upper screw (smaller head) near the top of each bracket holds down the nylon-bushing plate. These are adjusted in the factory by tightening, then backing off one turn. They should not be loose but they should not bear too tightly against the nylon bushing or the rod will not be free to rotate.



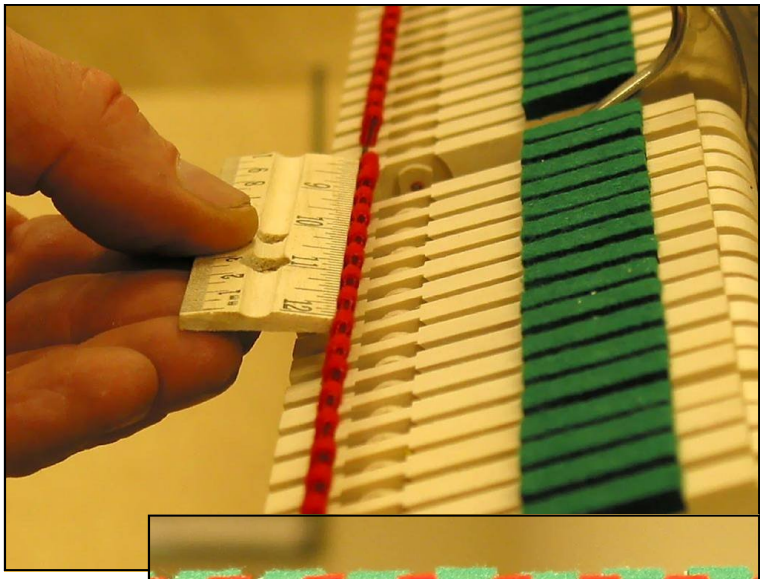
AT THE BENCH: **TAB ALIGNMENT**
(Action should be upside-down, dampers facing towards you.)

IMPORTANT: The red-felt tabs need to be aligned very precisely up and down, fore and aft. This has already been done at the factory, but it wouldn't hurt to check them. Use a straightedge across the tops of the tabs to find and realign any that are high (top photo).

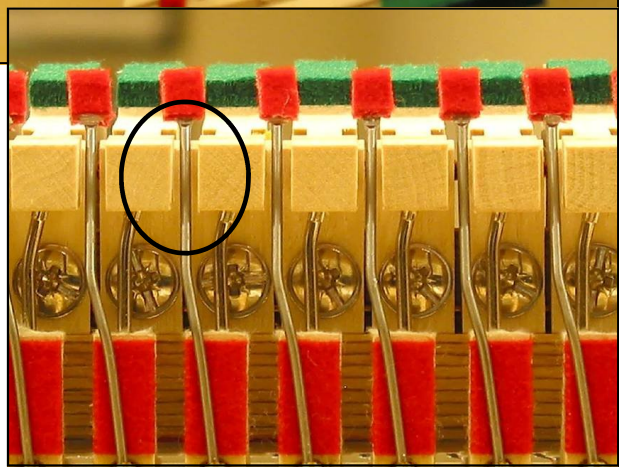


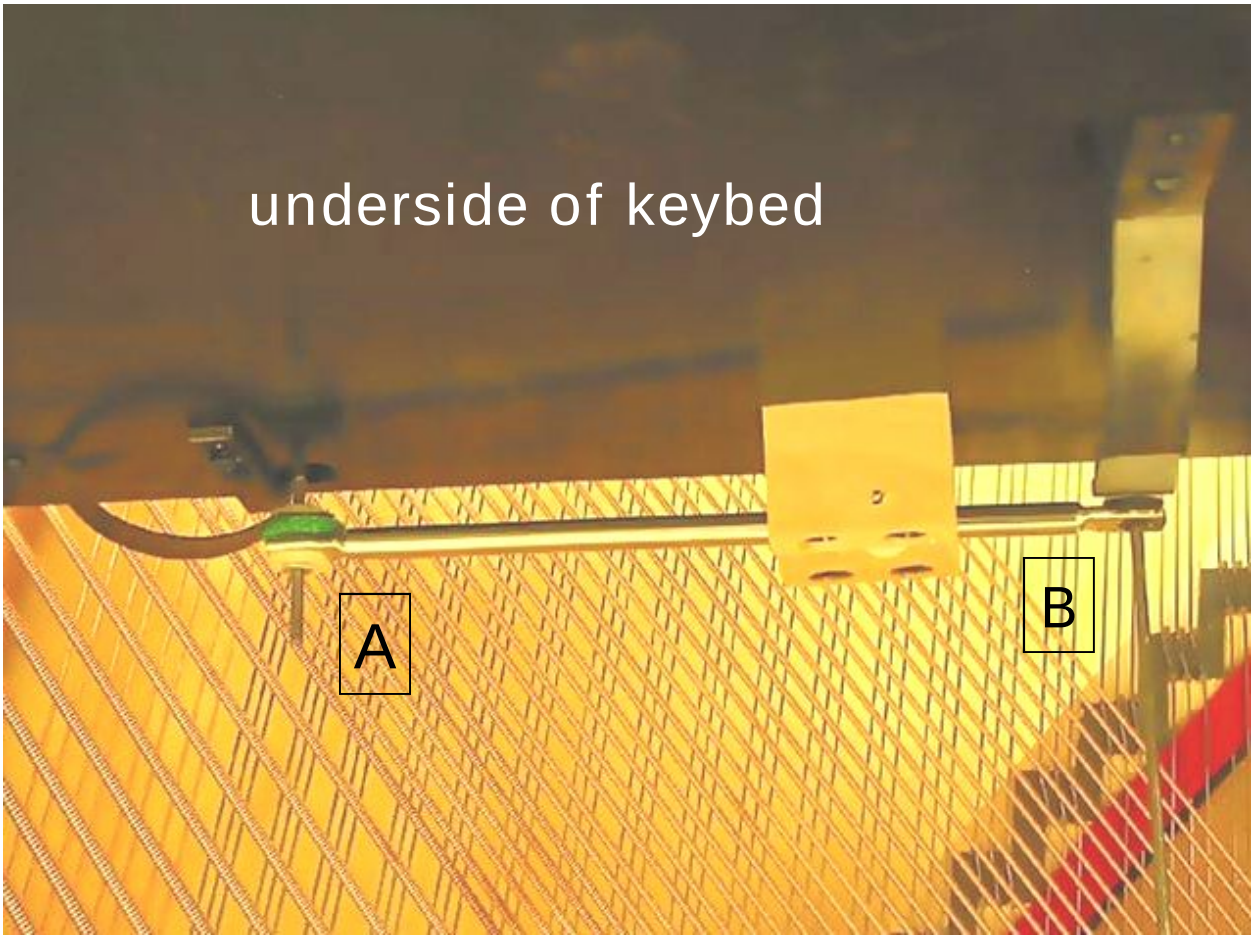
Use the .050" Allen wrench to adjust. Then check for low ones. Whenever high-and-low adjustments are made, fore-and-aft adjustments are necessitated.

Next check for fore-and-aft tab alignment with the straightedge and adjust the alignment by using a damper-wire bending tool. The bend in the wire is at the very edge of the wooden damper lever.



IMPORTANT: While adjusting, the sostenuto tab wires should also be centered between the whippens (see circled example). For your information: The top treble section (only) has dogleg bends in the wires. These dogleg bends are factory-set with the use of parallel pliers and the damper-wire bending tool. Also, note #54 has a special bend in the wire to keep it away from the protruding plate bar. For the high-and-low setting, at the factory we set the tabs so that a minimal amount of wire extends beyond the whippens. The fore-and-aft setting has the wire approximately flush with the nearest edge of the bird's-eye notch in the whippen support.





Step 1. Sostenuto Blade Orientation (Rotation)

Beneath the keybed there are two points of preliminary adjustment. Performing these two adjustments will set the correct rotational orientation of the blade on the sostenuto rod.

The screw with the leaf spring (A) should be adjusted so that it doesn't touch the underside of the keybed when the middle pedal is depressed. An adjustment at this screw usually needs to be compensated by an equal adjustment at the other (longer) screw (B). Both screws are adjusted by turning their respective nuts.

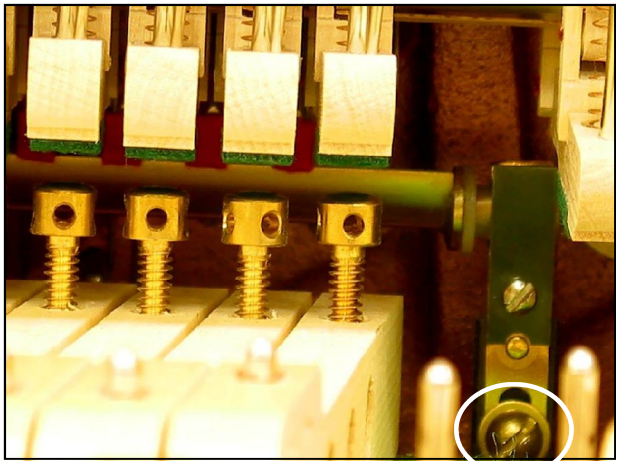
HOW: Adjust the longer screw (B) until the "cut-out" or U-shaped piece in the sostenuto rod is flat and perfectly horizontal (with the middle pedal not depressed). This adjustment will give you the correct sostenuto blade orientation.

Hint: If necessary, bolster under the middle pedal with felt in order to prevent the U-shaped portion of the rod from contacting the undersides of the whippens when the pedal is depressed. Caution: Bolstering under the middle pedal with felt reduces the “throw” or rotational travel of the sostenuto rod.

INSTALL THE ACTION IN THE PIANO.

The two most important and basic sostenuto adjustment steps remain:

Step 2. Sostenuto Rod Height

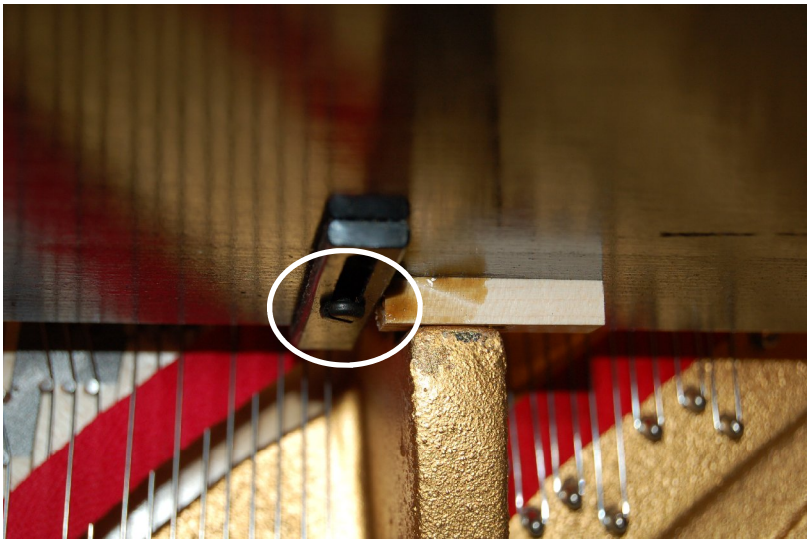


To adjust the rod height, sight between the capstans and whippens using one hand to gently raise and separate the whippens from the capstans, while simultaneously depressing the middle pedal with the other hand. The red-felt tabs should visibly extend 1/16" below the very top edge of the sostenuto rod blade.

Adjust the sostenuto rod height accordingly, one section at a time (see circled screw). Start low and carefully adjust upward to the precise position.

Step 3. Sostenuto Fore-and-Aft Adjustment

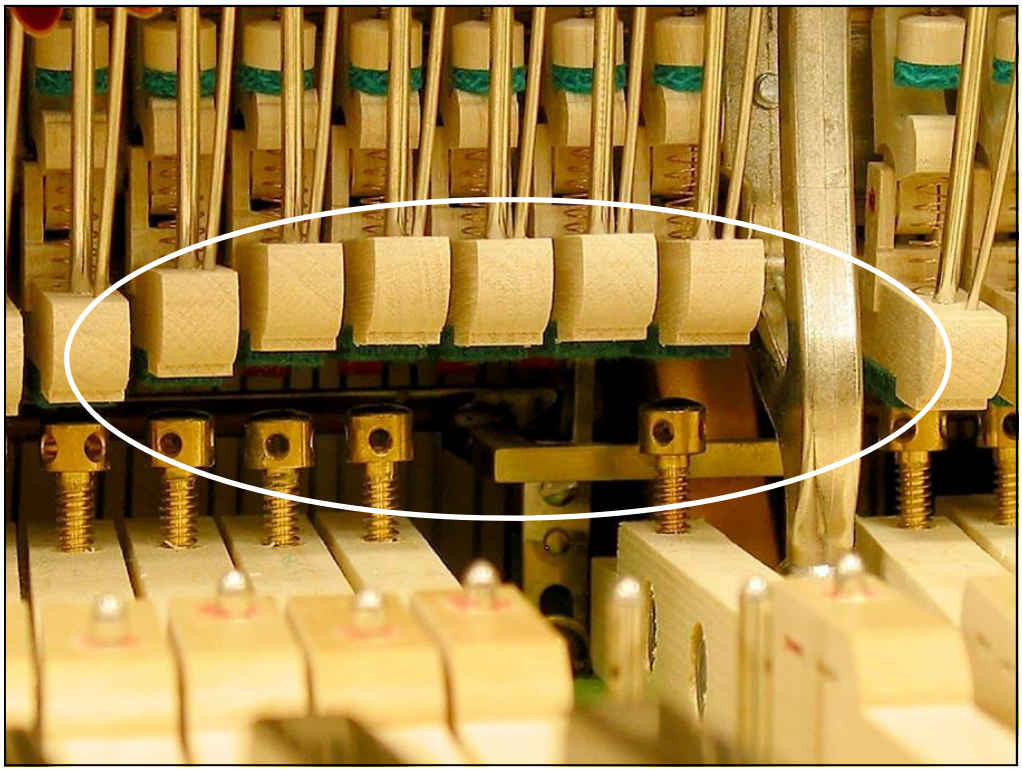
Once the rod height is established, check each key individually for sostenuto action. Adjust the fore-and-aft position of the sostenuto rod by loosening the sostenuto rod bracket screws on the underside of the keybed (circled in photo below). Check for effective sostenuto catching on individual keys per section and adjust accordingly. Adjust from the aft towards the fore for security of catching but with minimal follow-through of the damper levers. Observe the sostenuto action movement of the damper felts from above after each tentative adjustment. Play each key and depress the sostenuto pedal. The sostenuto lift should be slightly greater than the damper-spoon lift, enough to allow clearance between the rail and the tabs when keys that are not caught are played while the sostenuto is engaged.



Note: If the adjustment is too far to the fore, the sostenuto rod cut-out U-shaped piece will contact the protruding plate bar: Check there for clearance. Tighten screws and you're almost done.

ADDITIONAL ADJUSTMENTS:

Check for sostenuto rod "cut-out" (U-shaped piece) clearance against underside of whippens, and bolster middle pedal with red felt (below pedal) if necessary. Worn-out felt under the pedal or improper adjustment may result in raised whippens as shown in the photo below.



Check sostenuto tab at note #53 for side clearance against the sostenuto rod cut-out U-shaped piece. Check sostenuto tab at note #54 for clearance against the protruding plate bar.

Test the effectiveness of the regulation by playing each key and depressing the sostenuto pedal to ensure that the sostenuto tabs catch.

Also check the regulation by depressing the sostenuto pedal fully, then striking notes 1–67 to make sure that no sostenuto tabs catch.

ADJUST PEDALS

Step 1. ADJUST SUSTAIN (RIGHT) PEDAL

Regulate the pedal connection to the trap lever at the trapwork adjustment screw (circled above) to eliminate lost motion where the dowel connects to the damper lift rod. Continue this adjustment to leave a small amount of lost motion between the damper lift rod and damper levers (approximately 1/8", 3 mm). (When the strings are manually pushed toward the soundboard, the damper must follow by the dimension of this lost motion.) The pedal movement is limited by blocking-off felt glued below the pedal so that the dampers will be lifted clear of the strings by at least 1/8" (3 mm) when the pedal is fully depressed.

Step 2. ADJUST SOSTENUTO (MIDDLE) PEDAL

The rod functions correctly when those dampers lifted by depressed keys and/or sustain pedal remain in the raised position when the sostenuto rod is rotated by depressing the sostenuto pedal. The unaffected dampers must continue to function normally. The pedal is blocked off similar to the sustain pedal except with thinner felt to hold the dampers slightly further from the strings than in the sustained position. If adjustment is necessary, refer to "Vertical Sostenuto Adjustment Procedure."

Step 3. ADJUST SOFT (LEFT) PEDAL

Eliminate lost motion between the pedal and the connection to the hammer rest rail. Adjust the thickness of block-off felt below the pedal, and between the hammer rest rail and action bracket, to reduce hammer blow distance by half when the pedal is depressed.