Are You Still Regulationally Challenged?

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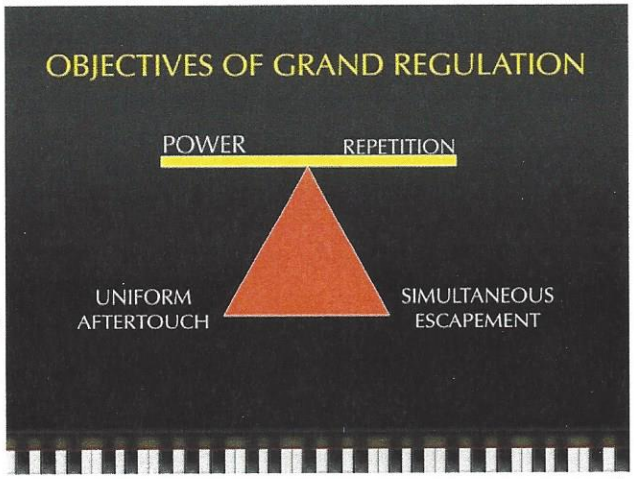
8 Steps

REGULATION

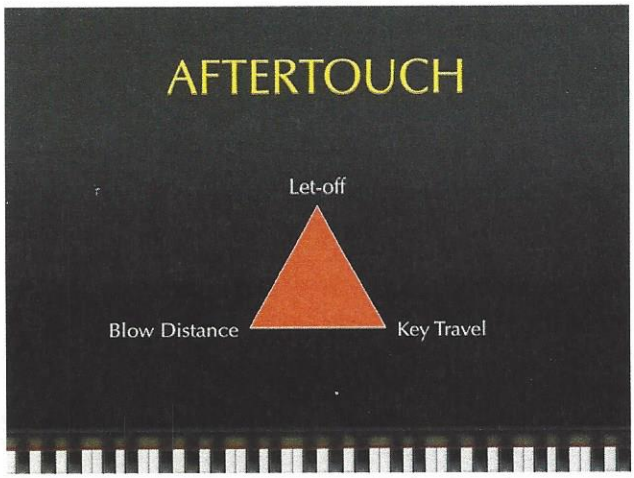
Interrelated procedures used to maximize control and evenness, given a preference in touch.

Pre-Steps

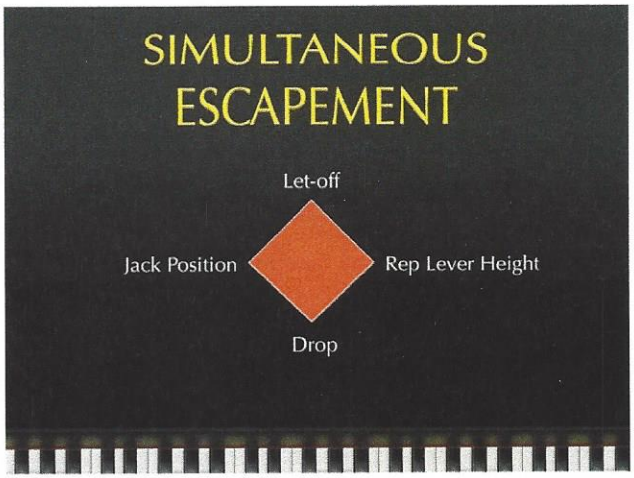
1. Action Prep. (clean, tighten, bed)
2. Friction (remove excess)
3. Alignment (shanks, wips, keys, level,..)
4. Regulation (8 steps)



Grand regulation balances the demands of power and repetition by building a foundation of **Uniform Aftertouch** and **Simultaneous Escapement**.



The 3 components of Aftertouch



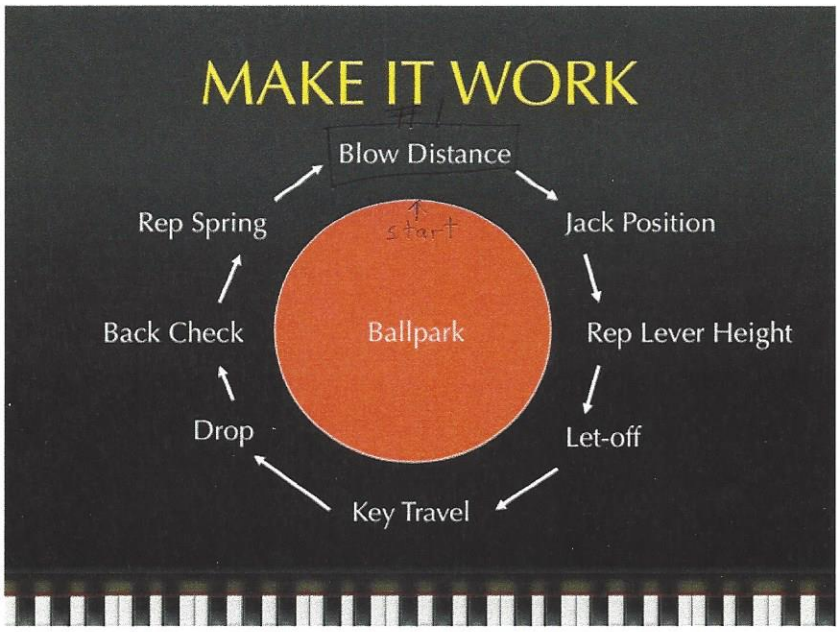
The 4 components of Simultaneous Escapement

BEFORE YOU START

Efficient and accurate regulation will be difficult if hammer shanks are on the rest cushions, key travel is insufficient for the action to cycle, jacks are "cheating", repetition springs are weak, hammers will not check, or there is no visible sign of drop. If during the regulation process any of these conditions appear, correct them before continuing.

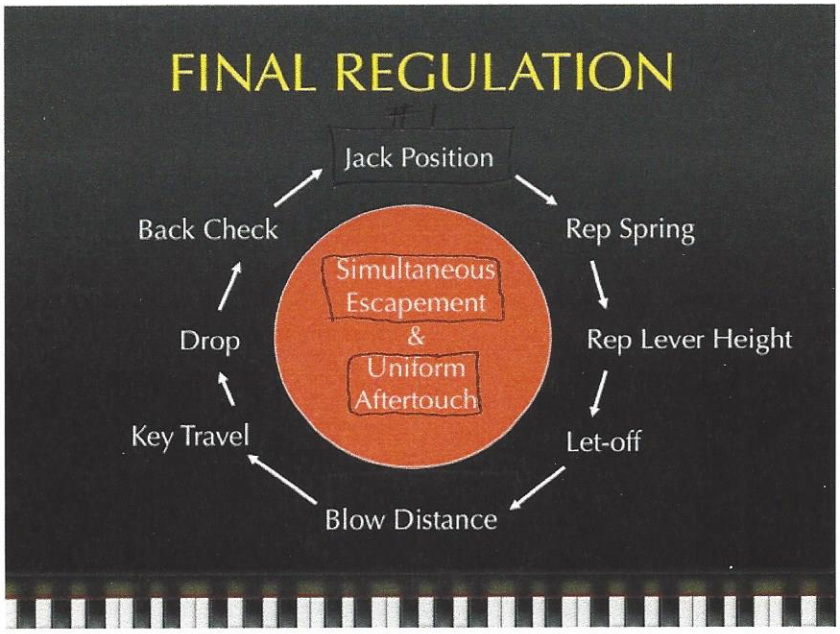
"MAKE IT WORK" PROCEDURES

Roughing it in — (Before Fine Reg.)



- **Blow Distance** – Set hammer shanks about one shank thickness off rest cushions.
- **Jack Position** – Jack must not "cheat" from under knuckle.
- **Repetition Lever Height** – Jack must return under knuckle when tripped.
- **Let-Off** – Hammer should block lightly against the string.
- **Key Travel** – Natural key travel slightly deep of dip block. Sharps set to produce the same rise at capstan as the natural keys.
- **Drop** – Hammer drops noticeably below let-off.
- **Back Check** – Hammer catches so bottom of tail is roughly in line with neighboring shanks.
- **Repetition Spring** – Hammer must rise as quickly as possible without *objectionable* kick in key.

FINAL REGULATION PROCEDURES



Touch-Up

- **Jack Position** – Consistently align rear side of jack in line with rear side of knuckle core.

- **Repetition Spring** – Hammers must rise consistently, as quickly as possible, but without an *objectionable* kick in key.

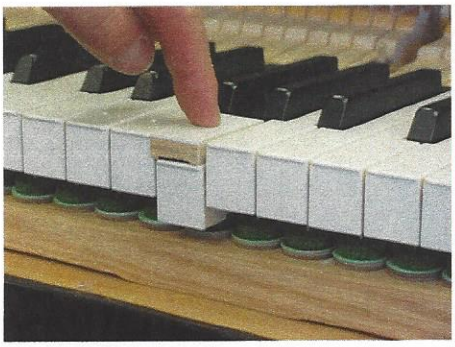
- **Repetition Lever Height** – Tripped jack must return fully to the rest position, without lost motion.

3 mm ~ 2 mm , 1 mm (1mm – 4mm)

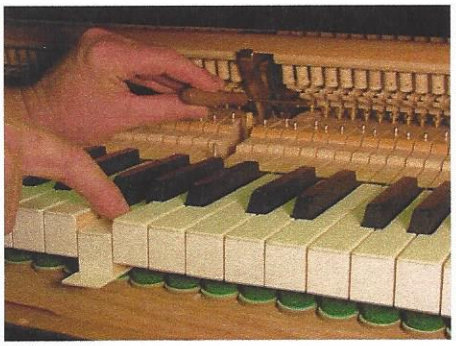
- **Let-Off** – For best control, hammer escapes as close to the string as possible, without interfering with the vibrating string

~ 46 mm (41mm – 48 mm) 0.050" 10mm

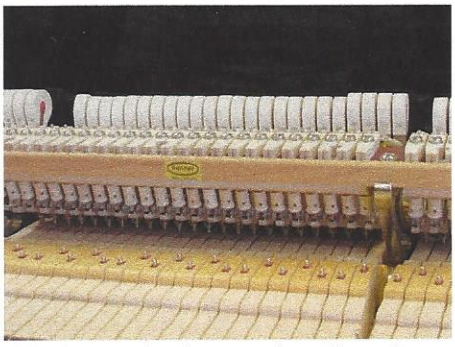
- **Blow Distance** – Set blow distance to achieve the preferred aftertouch when dip is set to 10 mm.



Set dip to 10 mm at end of each section



Adjust blow on samples to achieve aftertouch 0.050"



Set hammer line between the end samples

FINAL REGULATION PROCEDURES (CONTINUED)

- **Key Travel** – Set to key travel to create ***Uniform Aftertouch***. 10mm 0.050" (use aftertouch gauge)

Re-create the aftertouch on the remaining notes by inserting or removing front rail punchings. Aftertouch should be the same on all keys.
0.050" 0.050"

- **Drop** – Adjust drop screw to create ***Simultaneous Escapement***. (Jack tender contact exactly same time as drop screw contact) ~15mm, 5/8"
- **Back Check** – Hammer catches as close to the string as possible without dragging on back check. (Push down on hammer while depressing key)

NOTES

- **Hammer Rest Rail** (if present) should be set about one shank thickness below the shanks.

Aftertouch affected by - ① let-off, ② blow, ③ dip.
Decrease blow = stronger spring.
Decrease let-off = decrease aftertouch.
Increase dip = increase aftertouch.
Increase blow = decrease aftertouch.
Nothing affects let-off.
Drop affects nothing.
Simultaneous escapement affected by ① let-off, ② jack position, ③ drop, ④ Rep. lever height.

REGULATION

Taken as a whole, the object of the regulation process is easy to describe. The short paragraph below neatly brings together all facets of regulation, and can serve as a definition of the entire procedure:

> *When a piano is played, mechanical energy is imparted by the pianist into the front of the key. This energy is used to propel the hammer, via a system of levers, into the string, initiating the piano's tone.* ***The purpose of regulation is to minimize the loss of energy to this system, giving the player as much control as possible over the velocity of the hammer.***

The concept of the entire process then, is simple. The number of steps, and therefore the number of separate skills needed to complete the regulation process, and the interactive nature of these steps, are what make the task seem daunting. Taken individually, none of these skills is particularly difficult to master. How all of these steps relate to one another, and to the system's over-all efficiency, is a more complex issue. Although there is a certain logical progression to the steps involved in regulation, any attempt to create a comprehensive, ordered list of these procedures which, if followed precisely will yield consistent, high quality results, is bound to be both extremely lengthy, and in practice, inefficient. Every service situation is unique. Ever-present time restraints force technicians to make judgments as to what procedures to focus on, and what degree of perfection can be attained in the time allowed.

It may be useful here to draw an analogy with the tuning process. When learning to tune (aurally), we generally follow someone else's written list of steps – a "bearing plan" - when setting a temperament. Along with these plans, there are usually a greater or lesser amount of notes regarding checks and explanations for these steps. At first, we continually refer to this plan, and compare our progress to it by using the accompanying notes. As time goes on, we wean ourselves from having to refer to others' instructions and learn to make our own judgments "on the fly". When we reach a certain level of maturity as a tuner, we realize that no two tuning situations are identical, and we are unconsciously altering our learned procedures in order to manage the situation at hand. If an experienced tuner were to write down his/her entire thought process on any given tuning, it would encompass volumes - and it would differ significantly from the same type of description that he/she might give of a different one of their own tunings.

The point is, that without even being consciously aware of it, we are constantly recreating our own "bearing plans" and referring to our own "notes" that have accumulated over years of experience and study. All of this happens more or less instantaneously. When an experienced tuner examines a piano to be tuned, he/she can make what amounts to an extremely complex diagnosis within a matter of seconds. All matters of pitch adjustment, pin tightness, and character of sound are quickly analyzed, and by the time we sit down to actually do the work, we know exactly what to do and how long it will take. No longer having to refer to anyone's notes or checklists, we can stay several steps ahead of ourselves. There's nothing extraordinary about this – as piano tuners, that's what we're supposed to do.

The ability to make quick, complex judgments as to the proper course of action is more prevalent in the field of tuning than it is in regulation. Part of the reason for this, as mentioned above, is that most technicians have performed far fewer complete regulations than they have tunings. This lack of experience can lead to an incomplete awareness of the *musical* value of proper regulation. The fact is that within a given time frame, time spent regulating a piano can often effect a greater musical improvement to the piano than voicing can. [As we'll see later, the quality of voicing is actually dependent, to a significant degree, on the quality of regulation]. Sometimes the opposite is true, but the ability to quickly assess a situation, and make decisions as to how to invest your time, is a crucial skill for an efficient, and therefore valuable, technician.

The "Four Steps" of regulation

The ability to perform efficient regulation is predicated on the development of two separate disciplines: the mastery of each individual skill, and a thorough understanding of how these skills combine to produce a desired overall effect. With practice, and some instruction, mastering individual regulation skills will take care of itself. Developing an understanding of the interrelation of these steps, and learning to apply this information to improve efficiency are matters that are, by nature, considerably less clear-cut. For this reason an attempt has been made to simplify the entire process by placing all of the individual procedures into four distinct categories:

1. Action preparation
2. Friction
3. Alignment
4. Regulation

Taking a list of procedures normally associated with regulation, each separate procedure can be distributed into one of these four categories. In a general way, these four categories follow one another in sequence – the completion of each category laying a foundation for the next. Now we can begin to think of "regulation" adjustments as simply different facets of just four steps (table 1). One advantage of this arrangement can be illustrated by using it to help analyze an action intended for regulation: using the list below, a thorough analysis can be made by drawing on just four well-ordered observations.

Table 1 Regulation Procedures
Step 1
Preparation
Tighten action screws
Tighten action cavity and cabinet screws
Tighten plate bolts
Clean and lubricate action cavity
Bed balance rail
Bed front rail
Sample regulation
Step 2
Lubrication/Friction
Check (and lube) action centers
Lubricate keypins
Lubricate knuckles
Ease keys, balance and front rails
Ease balance rail holes
Step 3
Alignment
Square keys
Space keys
Align shanks
Travel shanks
Vertical hammer alignment
Align wippens
Repetition lever height
Jack position
Back-checks (angle)
Back-checks (squared to tail)
Damper wire alignment
Damper up-stop
Adjust pedals
Damper lift
Level keys
Key travel (uniform)
Hammer/string alignment
Step 4
Regulation
Hammer travel (hammer line)
Spring tension
Let off
Drop
Back checks (checking distance)
Key travel (after-touch)

The logic behind the order of these four categories can be summed up as follows:

1) *Action Preparation* – Action components are cleaned, secured or firmly mated (as with the key-bed to key-frame arrangement).

2) *Friction* – Areas of excess friction are discovered and corrected. *Excessive* friction is that which causes an action part to impair the mechanical efficiency of a note, damper, etc. to a musically significant extent.

3) *Alignment* – These procedures involve the arrangement of action components in such a way that the transfer of energy from part to part is most efficient. The nature of these procedures differs from the nature of the Regulation procedures, in that their placement is either right, or it's wrong – at least within the framework of a particular action. As examples, a hammer shank is either moving straight up and down, or it's not; the key-set is either perfectly level, or it's not; etc...

4) *Regulation* - By contrast, *Regulation* procedures can take on a range of values, and what is "correct" can often be dictated by circumstance, or simply be a matter of taste. The ranges of acceptable values for these procedures fall within narrow, well-defined limits. Even these small variables, though, when manipulated, can effect profound changes to the response of the piano.

This brief outline should be viewed as a "bearing plan" for regulation – a tool to use for the development of a foundation of efficient and confident regulation.

Table 1 also illustrates a design for the order of steps that we will use in this seminar. The procedures in each of the four categories are split into two groups. Those that are NOT highlighted in yellow can all be completed at the beginning, with the action removed from the piano. They represent the first pass through the "four steps". The procedures that are highlighted in yellow must be performed with the action in the piano, and represent the second pass through the "four steps".

The values for Regulation adjustments (and their relationships to one another) can vary. This process determines the character of the regulation and how it affects the overall performance quality of the piano.

The relationship between hammer blow and key travel is the most fundamental relationship in action regulating. All other regulating procedures can be thought of as simply making this relationship work more efficiently and comfortably.

The range of viable values used in each of these procedures can be defined by conventional limits and/or the physical constraints of the parts themselves. *Manufacturer's specifications should be thought of as guides rather than fixed, objective measurements.*

An example of a **conventional limit** is the choice for the relative amount of repetition lever spring tension. There is really no definition for the upper limit of this tension. It can be thought of as that point at which the kickback felt by the player after releasing the key becomes objectionable, or that point at which checking becomes difficult. Both of these variables, though, depend on the player's preference, and/or technique.

An example of a **physical limit** to a regulation parameter is allowing so much after-touch that the jack slaps against the repetition lever window when the key is played. We will try to define these limits for each Regulating procedure.