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Lecture for Westchester AGO, November 9, 2008

[Intro Slide]

In considering how to cover this material, I faced a dilemma: how possibly to cover to broad range of what goes on inside the organbuilder's shop?

When talking to clients or media, I often refer to my shop as being outfitted much like a fine cabinet maker's shop, with the addition of some highly specialized equipment for pipe fabrication and voicing. While this may lack arresting imagery, the description more or less holds up.

In terms of tasks, this translates somewhat, but fails to encompass everything that goes on over the course of various projects. I can, quite assuredly, bore everyone here to tears with discussion of methodology in windchest or reservoir construction.

In preparing this lecture, what I sought to extract for you was not so much the minutiae of what we do, as much as the ethos that informs how we approach our work., because, frankly, I think that is a lot more interesting, and in the end, more instructive. And if, during the course of this discussion, you have a specific question, please don't be afraid to speak up. Just prepare to be potentially bored with my answer.

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Organbuilding basics

Apart from the design tasks, it's frequently said that organbuilding bridges many skilled disciplines. In my experience, these are:

Fabrication: joinery (inclusive of fine cabinetmaking), leatherwork, metalworking

Assembly: pneumatic, mechanical and electrical

Voicing, regulation and tuning.

In these items you have a good interplay of skills. In working with apprentices and new hires, I have noted that if one has some knowledge, skill or experience in one or more of these areas, this can translate well into others. Someone who is adept in good joinery will, with careful study and proper guidance, quickly adapt to the requirements in leather or metal work. What one looks for, or more succinctly stated, what distinguishes the great from the mediocre, is obvious to the trained eye. Moreover, in implementation, what is good often does not attract attention to itself because it functions well and endures. Conversely, things executed poorly cannot help but capture your attention, particularly when they fail. The difference often lies in the time and care applied.

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Why Bother?

This is a photo of the double rise reservoir we rebuilt for the Odell organ at Troy Music Hall. What I want to call attention to here is a minor detail: the dovetail joints in the reservoir well. There are scores of ways to make a wooden box. No big deal, right? But speaking as someone who has done his fair share of joinery, I can't help but admire the time and care that went into this.

The point I wish to demonstrate here is what such details say about a builder's philosophy. What this says to me is that someone cared enough to take the time to do it right, and moreover, do it well. I feel that when I see this kind of workmanship, I must to respect it, and further, make certain that work that comes out of my shop under the very same name has to be its equal.

[Slides – Newport Console]

This is the back (the back!) of the console we just delivered in Newport. All the carving you see here I did myself. The majority of what you see here, once installed, is blocked by a pew, yet of all the parts of the carcase, this took the most time.

Why bother? Why go to such trouble? Two reasons: 1. Because we and the church felt the appearance of the console should be consistent with the rest of the church (the prior one was not). 2. Because even if the lower section of this panel is never scrutinized by another human being, I will know I took the time to make certain it was right.

The bottom line is that it matters. Details are important. Here's the finished product:

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Materials

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I want to take a moment to discuss materials, in that this is something that I think gets a lot of lip service but often not discussed in depth. Quality organbuilding --and by this I mean work that will endure-- demands first rate materials for everything, and often what is surprising is the relatively small cost differential between the mediocre and the supernal when examined in the larger context.

An excellent example of this is demonstrated in something everyone here has experience with: keyboards. You may not know specifically what makes a cheap keyboard different from a well made one, but you can certainly tell the difference when you feel it, correct?

Yet, the price differential when compared to overall costs is not that great. Take, for example, the keyboards used by most electronic organ manufacturers (and some entry level pipe organ suppliers): the key heads are often made from molded plastic, they have short levers, aluminum frames, and generally built for a duty life of about 20 years.

Conversely, the best organ keyboards, have long, solid wood levers (cut from a single slab), hardwood frames reinforced with angle steel, nickel plated pins, silver contacts, the best woven felt and are generally designed for a duty life of about 40 to 50 years (and thereafter can be rebuilt).

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This example translates, rightfully, into everything the organbuilder does. Often the challenge is knowing where to source industrial-quality materials. I'll give you a hint: it's not Home Depot, or Radio Shack.

Another example: Stock Preparation

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Hardwood stock preparation is among the things that I take special interest in, as this is an often overlooked (and admittedly unexciting) operation. Again, what distinguishes the differences of good from bad can be subtle. Some rush to get components into production, become careless, and pay the price down the line.

For example, we tend to think of hardwoods as being inert: the tree was long dead by the time it went to the sawyer and the kiln, right? Wrong. The reality is that hardwoods are constantly reacting to ambient conditions, and the joiner (or, in our case) organbuilder that ignores this does so at his peril.

Just as with the relationship of pipemaking to voicing, stock selection and preparation set the stage for what will take place later on. I won't bore you with details (though, again, feel free to ask) but what it comes down to is: acquisition and retention of knowledge about how hardwoods behave and religiously consistent application in preparation, joinery and finishing.

Mechanical, electrical and pneumatic systems

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This topic could easily be an entire lecture unto itself, so I am just going to touch on a couple of major points so we can move on.

A functioning pipe organ, even a simple one manual continuo, depends on the consistent interplay of systems, and it is in these areas where more theoretical knowledge comes in to play.

Now, I say this, being fully cognizant of how my father (who was assuredly a much different type of organbuilder) would react to such a statement. He spent his life working and in and around these systems and had intuitive knowledge of how they worked. He didn't need anyone to explain to him, for example, that a 90 ohm chest magnet consumes roughly 1/3rd of an amp of power at 12 volts DC to decide what size rectifier to install, or that a cubic inch of water weighs 0.036 lbs in order to figure out how many ingots (or hymnals) to put on top of a reservoir to get it up to 3 inches of pressure.

The point being that one can become a proficient "mechanic" by swapping parts until the problem goes away, but when complex problems in systems arise, to diagnose them effectively, you need theoretical understanding on some level.

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In the case of my father, there's an excellent example in his way of explaining how a pitman-pouch chest worked: imagine the pipe pouch at rest, with pressure inside and outside the pouch as being equal, and the pouch is held in the closed position by a spring. My father described this as a burden being held aloft by a man and a boy: together, they are strong enough. But take the strength of the man away (by exhausting the pouch to the outside air, thus creating a pressure differential) and the boy cannot maintain the burden alone. Thus the pouch collapses, the valve is opened, and the pipe above speaks.

The rub, in organbuilding, is that there are scores of mechanical, pneumatic and electrical systems that all ultimately serve the same function: to open a valve that gives an organ pipe access to a regulated supply of air under pressure. With specific or anecdotal knowledge, you can diagnose the problem of one system. If one possesses theoretical knowledge as well as practical experience, you can diagnose them all. To execute a repair, you need skills, preferably developed in the shop.

Pipemaking

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In the creation of a pipe organ, it's amusing to note that the act of voicing is often regarded as a magical, poignant event, since the reality of the final result is utterly dependent on circumstances that are set beforehand. In this I refer to decisions that must be made as part of the tonal design process. These decisions are, to name a few, establishing pipe scales, metal type and thickness, wind pressure, placement and treatment (mouth width, languid thickness, languid bevel angle, ears/bridges/beards) of same. These factors will ultimately govern the final potential of a given set of pipes. These decisions must be nailed down by the organbuilder before one sheet of metal is cut.

Of course, for the organbuilder there is a wealth of anecdotal data to draw from, but that does not obviate the fact that scale and treatment decisions must be still be thoughtfully made.

I'll digress for a moment here to talk about pipemaking:

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In the last hundred years, pipemaking has evolved to a certain degree, as a separate, individualized skill set in the organbuilding industry. This differs somewhat from the German/European model, where, for example, the German national training program requires mandatory training in all skill areas, including pipemaking. Conversely in the big American shops, the pipe shop and its staff often function autonomously, and don't "cross contaminate" with other departments. So, as implausible as it seems, it's possible to work in

the domestic organbuilding industry for your entire career and never once have to solder a pipe. Similarly, someone can work in a pipe shop their entire career and never once voice a pipe or tune it.

As a function of that, what we have is a collection of national and international independent "pipe only" shops, which supply a portion of the industry.

This trend, however, is experiencing a minor reversal, and I would like to think that's a healthy sign of continued movement away from the "factory" business model (where suppliers and subcontractors are routinely employed and in-house operations are divided in the interest of optimization) and more towards the (if you'll forgive the use of this term) "atelier", where studied, knowledgeable artisans apply a broad range of highly developed skills with a paramount focus on quality. This difference is often described as being "boutique" organbuilding, but in reality, what it truly is, is just "more traditional" organbuilding.

If you take a look around at what is going on with top builders in the business today, you see variations on this. In my opinion, this latter model is more in line with the tradition, and, as such, is more sustainable. I think that's important, in that it has the advantage of a pedagogical tradition: skills and knowledge are refined, retained and passed on. I would add also that this approach makes not just better organbuilders, but superior organ restorers.

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So, let's return to pipemaking: Prior to forming, pipe metal is "sized" meaning that whiting (gum arabic, + water + calcium carbonate) is applied to prevent unwanted eutectic reactions, (i.e. – to prevent solder from sticking where you don't want it). You have the basic components of a pipe, which are prepared and cut from templates and forms: feet, languids, bodies. Pipes are then carefully joined with solder, using specialized jigs and soldering tools. Once the pipes are joined, the sizing is washed off. Sounds easy, but it isn't.

A good pipemaker will make sure there are no burrs on the lower edges of his languid stock, also make sure the components are perfectly aligned, that flatting is straight and true, that toes are well formed, that solder seams are properly done, along with many, many other details.

Pipes that are well made set up circumstances that can make voicing easy. For example, I personally appreciate it when a pipemaker leaves the languids set consistently high, as it just makes my voicing prep work go much faster.

Voicing

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The first stage of voicing is preparation: scribing the cutups (the height of the mouth opening) and cutting them, setting and beveling the toe openings, setting the lips and languids, initial nicking (if any) and skiving of cutups (if needed).

Prep work is sometimes done by apprentices, and some builders order their pipes from their pipemakers fully prepared. Cutup schedules are most often worked out with a proportional divider. In some cases, the ratio of mouth height to pipe diameter will change over the compass. Other times, especially in the case of arched mouths, the mouth height is already recorded and transferred as coordinate points on a worksheet or scale stick. I have, for example, several different scale sheets and sticks for certain Odell and Skinner arch cutup schedules, and special sticks for locating the nodal point on harmonic pipes. I use combinations of new and old technology to work these factors out, including my System Rensch slide rule, duplications of old shop jigs, and measurements worked out in my CAD software. There are, one could say, many paths to the same door.

Ultimately, as in all things, is pays off greatly here to be meticulous, and this among the things that separate the mediocre from the truly great, in my opinion. Consistent preparation work requires skill, concern and patience. When prep work is done you can set the pipes to initial speech, which is done by manipulating the languid (and the lips, if needed) to the position where speech is optimal.

There is some divergence of opinion as to how best to approach the final stages of voicing (and subsequently, tonal finishing). Some builders don't do the prep work until they are on site, others do most (if not all) their voicing at the shop. Final decisions about volume should, in the opinion of most, only be made on site, but being in the ballpark helps. It can be useful to bring samples and set Cs in the room and use them as references in the shop, as well as setting Cs relative to each other with divisions and across the entire organ.

It is worth noting that pipes on a windchest can behave differently than they will on the voicing machine, particularly if the two have differing mechanisms. It is possible, for example, to voice a set of pipes and find once they are on the chest that issues arise because of placement, ditching or hole schedule differences. Pipes also behave differently on slider chests because the onset of speech is slightly slower when compared to electropneumatic (pitman) or electromechanical (direct electric) chest configurations. The best voicers take all these factors into account. To coin a phrase, it is quite easy to "get into the weeds" with a set of pipes if you don't consider as many factors as possible.

An experienced voicer will also understand when it is necessary to arbitrarily bend the rules, manipulate scales, etc.

Maintenance, Myths and Realities

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- Good tuning practice: you know it when you hear it.
- What sets up the best circumstances for tuning?
- Why do I have to turn the heat on?
- Nominally, pitch is in correct range, within 5 cents of A435 or A440 (depending on the instrument) at normal climate settings (68 to 70 degrees F with moderate humidity)
- Should base pitch (convert 435 to 440) be arbitrarily reset? Avoid it if you can.
- Temperaments should be in range, and corrected or re-set if needed
- Pitches between manual divisions should be consistent and corrected, if need be.
- A good tuner approaches an instrument with a strategy, working "back to front".
- Priorities: Choruses, Flutes, Strings, Mixtures, Reeds.
- Being aware of (and adjusting for) drawing or other effects (like organ tuners shading the pipes!)

    - What should I be paying? About $50 to $70 per man hour is typical, inclusive of travel time.
    - How long should it take? An organ of 20 to 25 ranks should not require more than a half-day unless it is being repitched or regulated. $400 to $500 is typical

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Tuning Issues: Unsatisfactory conditions or results: what are areas of concern? What causes some tuning problems?

- First question: Stable to begin with? If not, why?
- Issues: temperature stability and stratiagraphy
- Winding issues, pressure drops, drawing, starving
- Mechanical issues, loose tuning sleeves, drooping languids
- Cone/scroll vs. sleeve. Cone is more stable, but more prone to damage from inexpert handling.
- How temp. and humidity affect overall tuning: for metal flue pipes, roughly 1.6 cents for every Farenheit degree deviation below or above optimum. Coefficients for wood and reed pipes differ, which is why they seem "out"more often.
- Mixtures and reeds: how often to tune? Answer: often enough.
- Unstable reeds: some common causes (dirt, loose wedges or wires)
- Seasonal adjustments: good or bad? Generally: bad.

- What over-tuning can do over time: damage scrolls, prematurely wear stopper leather. If you are tuning every pipe in the organ every time, something is either wrong with the organ, or the organ tuner.

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On site repairs: what to expect

- Knowing the instrument and establishing priorities: what can reasonably be accomplished with time and resources available?
- Such things are, typically: ciphers, murmurs, dead notes, speech issues
- Patchwork repairs (blown out reservoir gusset)
- Major issues with simple solutions
  - Action adjustments, adjusting nuts, replacing broken parts
  - Control valves: something can shut down a whole section of the organ
  - Wiring, mechanical or component failures: rare, but relatively easy to fix.
- Major issues with significant on-site repair: isolated releathering, large reservoirs (too large to remove)
- Major issues that require dismantling and offsite repair: windchest overhauls, regular reservoirs, console overhaul (requisite rewiring), repacking pipe stoppers, pipe washing/repair
- Cleaning: why is it necessary (80 years of dirt + pipes = speech issues) and when to do it (your mileage varies, but once about every 30 to 40 years is good).
- The tipping point to major rebuilding or restoration?

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Project Planning

- Get professional advice
- Obtain (or develop) a comprehensive evaluation
- Prepare short and long term goals
- Target specific repairs, and recognize which items should be deferred
- Recognize the threshold to restoration or rebuild
- Additions/alterations (consider carefully; don't put the cart before the horse)
- New organ projects

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Timelines:

- Understand that the best shops frequently have backlogs, often 1 to 3 years
- On site repairs tend to consume more time and resources
- Major projects often take months to complete
- Delays are inevitable and should be factored in
- New organs typically require anywhere from 18 months to 3 years from design concept to installation

My advice: get the bad news up front and prepare for worst-case scenarios.

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Consultancy

- What scenarios require a consultant? Ask yourself, do you need informed guidance, or are you (and committee members, if any) prepared to take the time to research on your own?

If you employ a consultant, trust them, but don't rely solely on their judgment. You owe it to yourself and your congregation to learn as much as possible about your instrument. It can only help you!

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- A consultant can help you:
  - Refine the scope of your project and establish priorities
  - Vet bidders, but necessarily choose them (look for credentials: AIO, APOBA, ISO)
  - Navigate issues of trust between firm and client
  - Facilitate communication, i.e. - be a "translator"
  - Help assure (but not guarantee) that both parties meet their obligations

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- What qualifies a consultant? Look for:
  - Sympathy and impartiality (preferably not an Allen rep!)
  - Documented professional experience (some time in an organ shop, AIO/AGO membership)
  - Musical knowledge
  - Sound judgment, honest agenda
  - An undertstanding of the nuance between theoretical and practical knowledge

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- How should one conduct business with a consultant?
  - You get what you pay for.
  - Free advice is rarely free, and even more rarely impartial.
  - Use the same care in selecting a consultant as you would an organbuilder.
  - Request an agreement of some kind in writing.
  - Establish a fee schedule in advance, either by a percentage of the overall project, or by an hourly rate.