EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT THEATRE PIPE ORGANS BUT WERE AFRAID TO ASK!

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THEATRE ORGAN PARTS

Most of us know that a Theatre Pipe Organ works by having wind from an electric blower pass through organ pipes which are actuated by selecting stop tabs, and then playing keys on the keyboards/pedalboard. But for those of us who have never experienced playing at the console, or who have never examined the inner workings of one of these complex instruments, some of the parts we read about can be a mystery. We have thus compiled some brief definitions of typical organ components:

The organ console:

Console – The command center of the instrument. Shaped like an oversized upright piano it contains multiple keyboards, a pedalboard, and a myriad of switches and controls. The console cabinet can vary from plain stained wood to an elaborately carved, decorated and painted work of art. Many times consoles were embellished to match the décor of the theatre in which they were housed.

Gold Ormolu -- Raised wood carvings. They are either painted gold or gold leafed and are typically applied to a white or natural wood console cabinet.

Dogleg Style Bench – The bench for the artist to sit on while playing. The shape is unique to Theatre Organs. Viewed from the back, the feet of the bench straddle the Pedalboard, and curved "dogleg" shaped members rise up to support a flat narrow seat. (Classical organs generally have a rectangular shaped bench with the seat as wide as the feet).

Manuals – The 61 note organ keyboards, played by the hands. Think "manual dexterity".

Pedalboard – The 32 note keyboard consisting of pedals played by the feet.

Stops/Stop Tabs – The colorful plastic (originally celluloid) switches shaped like tablets which are spaced around the horseshoe shaped console. They enable the organist to select different ranks of pipes (flute, violin, diapason, etc) and their low to high pitches (32', 16', 8', 4', etc.) . The nomenclature "stop" comes from the act of stopping (or starting) the flow of air to a particular set of pipes.

Each manual and the Pedalboard are assigned their own set of stop tabs The standard layout of stop tabs around the horseshoe on Theatre Organs, moving from left to right is from bottom to top keyboards. First Pedal stops, then Accompaniment Manual stops (bottom manual), then Great Manual stops (next highest manual), etc.

In addition, stop tablets are used to control organ functions such as turning tremulants on and off.

Bolster -- The face board which contains the stop tabs. A straight bolster can run straight across the console above the uppermost keyboard. Most stop tabs, however, are located along the horseshoe shaped bolster. A console with two rows of tabs around the horseshoe is said to have a "double bolster".

Registration -- The combination of sounds selected by the artist for a particular song. The pedalboard and each manual is "registered" by selecting appropriate stops which blend with each other to make the full ensemble.

Pistons/Combination Action -- The round pushbutton switches located beneath each keyboard are called pistons. They are also sometimes available as "toe studs" or foot switches located above the pedals. Piston switches operate the combination action which allows the organist to preregister "combinations" of stop tabs, and then replicate each combination simply by pushing a piston button, or a toe stud. When a piston is selected, the stop tabs physically move to the on (down) or off (up) position, so the organist can see what ranks are playing. "General" pistons control combinations of stops on all keyboards and pedalboard at once. "Individual" pistons operate only one keyboard.

General Cancel (GC) – A piston which cancels all previously selected combinations. Used to turn off all stop tabs at once.

Sforzando – A piston which when pressed, gives the artist "full organ" with virtually everything playing. In classical organs called "tutti".

Sostenuto Switch – "Look ma, no hands!" A switch on the console enabling the artist to remove his/her hands from the keyboards while the last notes and chords played are sustained (continued). This enables the artist to play counterpoint to the sustained notes.

2nd Touch – An organ keyboard which is pressure sensitive is said to have "second touch". Press lightly on the keys as you play, and the registration you have selected will sound. Press harder on the keys and additional "2nd Touch" stops which you have also selected will be added to the sound. Organs which have 2nd touch available on a particular manual will also have special stop tabs for the available 2nd touch ranks for that manual.

Expression Pedals or Swell Shoes – The volume controls of the instrument. These are the large pedals in the center of the console above the Pedalboard. Each organ chamber can have it's own expression pedal. Pressing down on the pedal with your toes opens the shutters in front of the chamber allowing more sound to escape into the listening space. The more the expression pedal is pressed, the greater the volume. Pulling back on the pedal with your heel closes the shutters and decreases the volume. The term "Swell shoe" is more frequently used with classical instruments. The term **"Under Expression"** means that ranks of pipes are housed in a chamber with their expression (volume) controlled by an Expression Pedal at the console. In some installations, ranks of pipes and percussion instruments are installed directly in the listening space. Their volume level is thus fixed and they are not "Under Expression". **Divided Expression** means that each organ chamber is controlled by a separate pedal. (Some smaller organs only have one expression pedal controlling both chambers).

Crescendo Pedal – The rightmost pedal, next to the Expression Pedals. Pressing on the pedal with the toes enables the artist to add a "crescendo" of sound as more and more ranks of pipes are automatically added to the sound already selected. Pressing all the way down gives full organ. Pulling back with the heel removes ranks from the sound.

Blow Box – In vintage organs with electro-pneumatic consoles, the blow box is a large unit containing electromagnets and valves that send a message to the pneumatic stop switches by way of a signal from the combination pistons. Air goes through the blow box and this box allows pressure through a series of hoses to inflate the different pneumatics that in turn move the stop switches.

SAM (Stop Action Magnet) / Syndyne -- Even in vintage consoles, electro-magnetic stop actions were sometimes used instead of pneumatics. Today, when pneumatic consoles are rebuilt, the vintage pneumatic combination action is many times replaced with SAMs. One of the best known companies making these devices is the Syndyne Corporation. As a result, many people nickname these stop switches "Syndynes".

In the organ chambers:

Rank of Pipes - A set of pipes which produce the same sound up and down the musical scale. ie Flute, Violin, Tuba, Trumpet, Post Horn, Kinura, etc.

Chest - A long, winded wooden box with holes in the top for a rank or ranks of pipes to sit into. Under each pipe is a valve that opens when the pipe is to speak. Under the chest is an electromagnet that is turned on when the pipe (or note) is played at the console. This magnet, through a series of pneumatics (small air bags), opens the valve. Air is thus supplied to the pipe, and the note sounds. A unit chest usually holds 61 or more notes of one particular rank of pipes. (Organ keyboards encompass 61 notes).

Offset – An offset chest is usually a 12 note chest that holds pipes that cannot fit on the main chest because of size. It is "set away" from the rest of the rank, hence the term "offset".

Regulator / Reservoir – A unit designed to regulate the wind pressure from the organ blower before it enters the various chests. The regulator portion holds the wind at a steady rate. The reservoir portion comes into play when there is a heavy demand on the wind supply because many pipes are playing at the same time. It serves as a backup to keep the wind pressure up. Different ranks of pipes can operate on different air pressures in the same organ, hence the need for a number of regulators.

Winker or Equalizer-- A small regulator that is usually used to regulate the air pressure to operate tuned percussions or air driven swell shade motors, but not pipes. Wurlitzer used Equalizers (their term for them) on consoles and swell shades.

Dice Box – A small regulator without a reservoir. Placed between the regulator and the chest, it was used by the Robert Morton Company to "fine tune" the wind pressure supplied to the chest. Bob Martin says that he has never seen the device used on other than a Morton Vox Humana rank.

Tremulant or Tremolo -- A very important item in the theatre organ. It is the unit that causes wind pressure to change upwards and downwards from the normal "regulated" pressure in a steady beat or time sequence. The result is that the pitch of the pipes on the chest is varied sharp and flat from the normal pitch, creating the distinctive vibrato that we associate with a human voice. The variance in pitch, or excursion in pitch, spread among all the pipes in the organ creates a very full, throbbing, dynamic sound, that is distinctive to the Theatre Pipe Organ. The tremulant works with a valve to exhaust the air from the source (either the chest or regulator) and can either be self-powered with a bellows that inflates and then collapses to open and close the valve, or electrically with a magnet that operates the valve.

Dump Box – The term for an electrically powered tremulant.

Swell Shades/Shutters – A unit resembling a set of fixed vertical window blinds which cover the opening from the organ chamber to the listening space. They control the volume of sound escaping the chamber. The shades are operated from an expression pedal (swell shoe) at the console. The fixed slats can rotate from a fully closed to a fully open position.

INTRODUCING THE RELAY – THE "BRAIN" OF THE THEATRE PIPE ORGAN

We know that all of that beautiful music is able to come out of a Theatre Pipe Organ because a large turbine, called a "blower" supplies wind pressure to the instrument. The wind travels up metal or plastic wind lines, goes through pressure regulators, reservoirs, and tremulants, and provides wind pressure to the chests upon which sit all the different ranks of organ pipes. We also know that there is a valve under each pipe in each chest. When the valve opens, the wind rushes up through the pipe and it sounds. But, how do these hundreds of valves receive their instructions to open when the organist wants to play their note in their rank of pipes?

The first organs built, long ago, solved that problem very simply. The organ keys were physically connected to the pipe valves. These “tracker” organs obviously had limitations. The console had to be situated right next to the pipes, and flexibility was limited by physical space constraints.

Then the concept of the relay came along. Electro-pneumatic action, controlled by electricity and wind could “relay” instructions to the pipe valves, and the console keys no longer had to be physically connected to the pipes. Perfected by Robert Hope Jones, electro-pneumatic action utilized electrically activated solenoids to open each valve, and low voltage electrical contacts under each key and stop tab to send the commands to the air valves. These relays contained hundreds of switches and miles of wiring. For example, let’s assume we have a 3 manual instrument. Sixty-one keys on each manual times 3 equals 183 switches, plus 32 pedal notes equals 215 switches and that is just to play one rank at 8’ unison pitch! It is no wonder that these relays were cumbersome. Stacks and stacks of switches were utilized. Seeing photographs of 1920’s era theatre pipe organ relays reminds one of the old time telephone switching centers with their banks and banks of switches.

While electro-pneumatic action disconnected the console keys from the pipes, it was still cumbersome with masses of wires running from the back of the console to the relay switches. The sum of these wires could result in a cable as much as 8” or more in diameter!

Enter electronics. The commercialization of the transistor in the late 1950’s revolutionized the use of electricity in switching. The development of the computer in recent decades advanced the process tremendously more.

We use a numbering system based on 10 digits in our daily lives, but many computers use the binary numbering system which is based on only two digits: 0 (zero) and 1 (one). The absence of electrical current represents “zero”, and the presence represents “one” ie, a simple switch, “off” or “on”. Thus organ relays are natural applications for the computer. Add to the mix the development of integrated circuits or “computer chips”, and switch miniaturization has advanced even more dramatically.

Also tremendously helpful has been the development of multiplexing. Multiple streams of data are simultaneously transmitted down a wire, single file, and reassembled at the other end. This has enabled the mobility of consoles, since that huge mass of wiring coming out the back can be replaced by a tiny multiplexing wire.

Is it any wonder that many 1920's electro-pneumatic relays have ended up on the junk pile in favor of modern computerized versions?

Today's computerized organ relays are truly marvels. They no longer just "relay" the message, making the proper pipe sound when a key and stop tab is pressed. They can transpose your piece of music (You can play the music in one key and the pipes play it in another). They allow organists to enter hundreds of preset combination pistons. They allow musicians to design their own crescendo (adding ranks to the sound as the crescendo pedal is depressed), and sforzando ("full" organ) combinations. They also feature record/playback. The performance is captured by the computer, and it can be duplicated (by the computer playing the organ) at any time. Musicians can now play back their performance on the organ, while accompanying themselves on another instrument such as a piano.

Vintage thus meets modern. The computerized relay has become the "brain" of many of today's Theatre Pipe Organ installations.

BY THE NUMBERS - THE MATHEMATICS OF PIPES IN A RANK

If you have ever examined a Theatre Pipe Organ specification, you will note that different ranks can be composed of different numbers of pipes. Why is this so?

If we examine organ keyboards (manuals) we find that the standard compass is 61 keys (as opposed to a traditional acoustic piano, which has 88 keys).

If we start at Middle C near the center of the keyboard, and play all the white notes in ascending order, we will be playing up the scale in the key of C Major. The familiar do=C, re=D, me=E, fa=F, so=G, la=A, ti=B, do=C. If you count the notes from the starting C to the higher C, you will find that there are eight. Thus the use of the term "octave" to describe the segments of notes that are repeated up and down the keyboard (at higher or lower pitches). The C we ended at is said to be one octave higher than the one we started at.

So, it stands to reason that the number of pipes in a rank must be related to multiples of 8, correct? WRONG! It is a bit confusing! Let's go back to our C Major scale. We play 7 notes (C,D,E,F,G,A,B,), not 8, before we start to repeat. (The eighth note is C, the first note of the next octave.) OK, so the number of pipes in a rank must be related to multiples of 7, correct? SORRY, CHARLIE, WRONG AGAIN! Since we are playing the scale in the key of C Major, we have neglected to count any of the black keys, the "sharps" and "flats". Examine an octave on the keyboard and you will find 5 black keys (C#=Db, D#=Eb, F#=Gb, G#=Ab, and A#=Bb). If you played all keys (white and black) as you ascended up from middle C, you would be playing the “chromatic” scale. With 7 white keys in an octave and 5 black keys, the number of pipes in a rank must be related somehow to multiples of 12, correct? ABSOLUTELY RIGHT!

O.K, lets go back and take a look at our organ keyboards. We find that the lowest note on the manual is a C, and we note that there are two full octaves below middle C. Examining further, we find that there are three full octaves above middle C, but that the highest note on the keyboard is a C (ie the first note of another octave). Now we have counted 5 full octaves of 12 notes each, plus the high C. 5 octaves times 12 notes per octave=60, plus 1=61 notes, VOILA!

So, each rank in a Theatre Pipe Organ must be composed of 5 12 note octaves plus the high C, or 61 pipes, correct? NOT QUITE.

Let’s stop here and define pipe organ “footage” nomenclature. The foot designation printed on an organ stop tab is related to the length of the lowest pipe on the keyboard. Thus an 8’ stop is composed of 61 pipes, the longest in length (a C played at the bottom of the keyboard) being approximately 8’ long. The lowest pipe on the keyboard of a 4’ stop is approximately 4’ long, of a 16’ stop is 16’ long, etc (the lengths halve or double – 1’,2’,4’,8’,16’,32’, 64’)

Let’s say you sit down at a console and select an 8’ Vox Humana stop. Every one of the 61 notes will play at “unison” pitch (the same as on an acoustic piano), necessitating 61 pipes. Now, let’s say the same organ has a 4’ Vox Humana stop available on one or more of the manuals. Select this stop and all notes will sound 1 octave higher than unison. If the rank only had 61 pipes, the topmost 12 notes on the keyboard would not be able to play. Thus to offer the Vox Humana ALSO at a 4’ pitch, the organ builder has to add 12 more small pipes at the top of the scale. The rank would consist of 6 octaves of 12 pipes=72, plus high C = 73 pipes. (When playing the 4’ stop, the lowest 12 pipes would go unused, and when playing the 8’ stop, the highest 12 pipes would go unused).

The same thing works going in the other direction. Let’s say you have a stop which the organ builder wants to make available at 8’= unison pitch, 4” = one octave higher, and 16’ = one octave lower. To include the bottom octave on the keyboard when the 16’ stop is selected, 12 more large pipes are required. Thus we would need 7 octaves of 12 pipes plus high C, or 7 times 12=84, plus high C = 85 pipes.

The compass of a standard pedalboard is 32 notes or two and a fraction octaves. With so few notes, the pedalboard utilizes no more pipes than the manuals, and thus is incidental to our mathematics of pipes in a rank.

Using the math above, we can create a chart to determine the number of pipes in a rank.

Number of Octaves of Sound	Number of Pipes	Number of pitches available (2’, 4’,8’,16’, etc)
5	61	1
6	73	2
7	85	3
8	97	4

There are exceptions to our chart however. If we take the Loew’s Jersey Wonder Morton as an example, the specifications include a “Concert Violin TC” with 73 pipes, available at 3 pitches – 16’, 8’, and 4’ (not two pitches). How can this be? Shouldn’t there be 85 pipes? The answer is in the “TC” designation. It stands for “Tenor C”. When you see this designation on the 16’ stop tab, it indicates that the organ builder has not added the 12 pipes to cover the lowest octave on the keyboard below “Tenor C” when the 16’ stop is selected. Those keys will simply not sound.

Another exception concerns the Wurlitzer company. In many of their organs (when it was not otherwise specified by the buyer), they would offer a stop such as the Vox Humana at 8’ and 4’ pitches, but only build a 61 pipe rank. The additional 12 pipes at the top of the scale needed to complete the 4’ pitch were not added, “hoping” that the organist would never use the top 12 keys on the keyboards when playing the 4’ stop.

Given all of the above, we can now better understand why organs contain “offset chests” as defined earlier. Let’s say for example, that an organ chest holds 3 ranks of 61 pipes each. From our math we know that each rank on that chest will be available at one pitch. But what if the organ builder wants two pitches available for one of the ranks? He simply provides a separate “offset chest” for 12 additional pipes for that rank.

One last note: tuned percussions (xylophone, glockenspiel, etc) generally offer far fewer notes than the 61 available on the keyboards. They play in the center of the manuals at the pitches they normally would play at in an orchestra. If you try to play higher or lower on the keyboards, you will encounter dead notes!

WHAT MAKES THE THEATRE PIPE ORGAN UNIQUE?

Five important things distinguish a theatre pipe organ from a classical or church organ. Most of these differences are attributed to Robert Hope-Jones, the father of the Theatre Pipe Organ. They are:

1. Unification and extension.

2. Exclusive use of electric (or electro-pneumatic) action.

3. High wind pressures and “tremulants”.

4. Tuned and untuned percussions, and sound effects (toy counter)

5. The horseshoe shaped console utilizing stop tablets.

Unification and extension gives the theatre organ its unique flexibility. As described in the previous article on “number of pipes in a rank”, theatre organ ranks are extended by adding pipes above and below unison pitch. A rank of 61 pipes at unison pitch with 12 added pipes at the low end of the scale and 12 more at the high end of the scale (a total of 85 pipes) enables a theatre organist to play THREE stops at 16’, 8’, and 4’ pitches from ONE rank of pipes. A non-unified classically designed organ, utilizes THREE "straight" ranks of 61 pipes each or 183 pipes to accomplish the same thing!

Unification also makes it possible to have the same stop available at ANY keyboard and/or the pedals, each stop tab playing the same rank independently (This, along with the use of the same rank for stops at several pitches, is why a theatre organ console has many more stop tabs than ranks. The organ designer can specify the stop at several pitches wherever desired on the keyboards/pedal once the extended rank is included in the organ.) In a traditional church organ, a rank of pipes is playable ONLY from ONE manual or the pedals, or from more than one manual via inter manual couplers (Couplers are rarely seen on a true Theatre Organ).

Electro-pneumatic action was being tried by several organ builders around the turn of the 20th century. Hope-Jones’ design was very fast, and became the standard for the Wurlitzer company. Electro-pneumatic action is considered by many to be the single most significant contribution to the development of pipe organs. Previously, most pipe organs were operated by *tracker* actions, whereby the keys were PHYSICALLY CONNECTED to the pipe valves via wooden trackers. Electro-pneumatic action eliminated this by using wind pressure, controlled by electric solenoids, to operate the pipe valves, solenoids and pistons which control and operate the various stop tabs, keys and pedals on the console. The console was thus able to be physically detached from the organ! All signals from the console were transmitted by an electric cable to an electro-pneumatic relay, and from there to the pipes and effects in the organ chambers. Even this was cumbersome, however, as the cable connecting the console typically was huge containing hundreds of wires. Today's modern computerized relay systems enable complete portablity of consoles utilizing only a tiny wire connection from the console to the relay.

Hope-Jones also demonstrated that **higher wind pressures** than used on church organs would allow pipes to more accurately imitate orchestral instruments. The higher pressure causes the pipes to produce harmonic overtones which, when mixed with other pipe ranks create the desired effect. He was influenced by the work of English Organ builder Willis , who was running his bigger reeds at higher pressures. Hope-Jones wanted as much power as possible to fill his organ venues, and applied the high pressure concept throughout the ranks of his instruments. High wind pressures enabled the development of ranks that are unique to theatre organs and allowed any rank in the organ to function as a solo instrument. The higher pressures were possible due to the advent of high-velocity, motor-driven blowers and wind regulators. The addition of **tremulants** to the theatre organ (regular pulsations of air through the pipes causing a throbbing effect) gave the Theatre Organ "That great big beautiful sound which wraps itself all around you", and is probably the most noticible thing sonically to distinguish a Theatre Organ from a Church Organ.

A fourth distinction of theatre organs is the availability of **tuned and untuned percussions**. In keeping with the idea of a "unit orchestra," pneumatically- and electrically operated orchestra tuned percussion instruments such as piano, xylophone, wood harp, chimes, sleigh bells, chrysoglott and glockenspiel were attached to the organ, playable from the keyboards. The additon of **non- tuned percussions** such as drums, cymbals, and wood blocks, and "toy counter" **sound effects** such as sirens, doorbells, train whistles and bird calls allowed the theatre organ to better accompany silent movies.

The fifth and final thing which distingishes theatre pipe organs from classical instruments is the design of the console. A traditional organ console was not adequate to encompass all the stops on a theatre organ since the large number of draw knobs required would make the console so huge as to be unmanagable by the organist. Thus, the **horseshoe console** was born. Based on a curved French console design and using stop "tabs" instead of drawknobs, the horseshoe console now allowed the organist to reach any stop or control while playing any piece of music. The smaller stop tabs permitted the addition of many more stops along the curve of the horseshoe than could be accommodated on a traditional console.

THE CONFUSING WORLD OF PIPE ORGAN TUNED PERCUSSIONS

Have you ever sat down at open console and been confused about the nomenclature on the percussion sections of the stop rail? This article will *attempt* to sort out the differences.

Let's start out with the metal instruments – "Chimes" generally mean a set of tubular hanging bells struck by mallets, similar to those seen in an orchestra. Easy enough.

"Glockenspiels" are familiar to most people from being heard at parades in marching bands. They are structured in the form of a 25 note lyre for this purpose. In orchestras and organs, they are a series of metal bars, usually with a 30 note compass, located high in the piano range of notes. Some have resonators (hollow metal tubes with the bottom stopped, placed beneath the bars to "resonate" the sound). Struck with a mallet, each bar sounds 2 octaves higher than the written music, thus the "tinkly" sound.

"Orchestra Bells" are generally considered identical to the "Glockenspiel". In some organs Orchestra Bells have the option to be hit repeatedly when the note on the console keyboard is pressed (reiteration). Glockenspiel stops, on the other hand, generally do not feature reiteration. In fact, if you sit down at a console and see a stop labeled "Glock" and another labeled "Orch Bell re-it", most probably there is one metal bar instrument in the chamber. Select the "Glock" tab and the bars are struck once. Select the "Orch Bell re-it" tab and the same bars are struck repeatedly.

There are two more names for similar instruments: "Chrysoglott" is a Wurlitzer term synonymous with "Celesta". Both are basically a Glock-like instrument that plays one octave higher than the written music (rather than 2) and with a softer sound.

So, if you sit down at an unfamiliar console and want a bell-like tinkling sound, Glockenspiel, Orchestra Bells, Chrysoglott, or Celesta should do the trick. Just be careful to note which are set up to reiterate, and which aren't!

A vibraphone or vibraharp, is a unique tuned percussion. Made with metal bars and metal resonators it generally has a 3 octave compass located in the middle of the piano keyboard range (lower than Glock / Orch Bells). The instrument sounds exactly at the point of the written music, not octaves higher or lower. The combination of metal bars being being struck by mallots with metal resonators beneath can result in the sound echoing too long. In an orchestral vibraphone, felt dampers and a pedal are utilized to dampen the sound, similar to a piano pedal. What makes the vibraphone sound unique, is a series of rotating discs which open and close the tops of the resonators, thus creating the vibrating sound for which the instrument is named.

Now on to the wood instruments- Xylophones are wood bar instruments, J. C. Deagan's experiments proved that rosewood from Honduras produces the best sound. The note compass is usually 3 ½ octaves, set higher on the piano keyboard than the vibraphone, but lower than the glock. Xylophones produce sound one octave higher than the written music. The metal tube resonators beneath the bars are generally fairly short. The tone has a dominant 5th that distinguishes it from the other tuned percussions. This all results in the familiar "boinking" type sound when the bars are struck. Some organs offer a reiteration option on their xylophones.

The Marimba or Marimba Harp is a close cousin to the xylophone. Originating in Africa and Central America, the first Marimba's had wood bars and wood gourd resonators. Today's Marimba has thinner wood bars than a xylophone, and the lower notes are wider. Marimbas can encompass 5 octaves in the middle of the piano range. Their metal resonators are generally longer than those of a xylophone. The instrument sounds at the same pitch as the written music (not one octave higher as in the xylophone). This combination of bars and resonators results in a lower range, mellower, more resonant sound than a xylophone. On theatre organs, Marimbas are often set up with a reiteration option.

The Harp Terminology – Didn't you all think a harp was a stringed orchestral instrument, (generally the guts of a grand piano turned on end), which is played usually by a charming lady in a flowing dress who plucks the strings? So did I, and so do virtually all on-line dictionaries! It appears that somewhere along the way the theatre organ industry adopted the name to mean a struck tuned percussion which tries to imitate a stringed Harp. According to the "Encyclopedia of Organ Stops", Harp bars can be wood or metal (distinctly different sounds!). It appears that a Harp plays at the same pitch as the written music. Thus the term could stand for a metal bar Vibraharp type instrument (without the vibration), or it could stand for a wood bar Marimba type instrument. One source indicates that if you see "Harp" on the stop rail along with "Marimba", the bars of the same instrument in the chamber will be struck once if you select "Harp" and repeatedly if you select "Marimba".

The mallets – Since all these instruments are percussion ie the tuned bars are struck by something, this brings up the subject of mallets. Mallet heads can be made of yarn, rubber, wood, plastic, metal, or can be one of these materials covered with cloth. Naturally, the material used will affect the sound. There does not seem to be any consistency here, and orchestral musicians like to experiment with different materials.

The suspension – Since the bars on all these instruments vibrate to create the sound when struck, how they are connected to the frame is very important. Old dried out hard rubber connections when replaced with a softer material can have a dramatic positive musical effect!

Are we still confused, or is everything now clear as a bell?? (pun intended).

The problem with all this is that there are few standards or agreements as to specifications for these instruments. The percussion manufacturers and the organ manufacturers did and do what they please regarding instrument design and nomenclature.

Bottom line: Do not despair! When trying out an organ which is new to you, experiment with the tuned percussion stops to determine the sound and the range on the keyboards, listen with your ears, and have fun!

DEAGAN TUNED PERCUSSIONS

Frequently we hear that theatre pipe organs come equipped with Deagan tuned percussions, often chimes. We present here some background on this great percussion maker from the past.

John Calhoun Deagan, musician and manufacturer, was born in Hector, N.Y. on Nov. 6, 1853, the son of Irish immigrants. He attended public schools in Ohio and Raines College, and in 1871 enlisted in the U.S. Navy. While his ship was in English waters he studied music at the University of London. He eventually became a nationally known performer on the clarinet. A series of lectures in London by Hermann von Helmholtz, German physicist, aroused his interest in the science of sound, and later, while serving musical engagements in various parts of the United States, he conducted experiments with the sound of musical instruments. His first product was an improvement upon the crude glockenspiel, which as a German importation had appeared in one or two American orchestras. He succeeded in transforming the rough pieces of metal into a set of perfectly tuned bells, which soon became standard orchestra equipment. Deagan began to manufacture these bells in 1880.

Later he developed many other musical instruments, including the xylophone using Honduran rosewood for the bars, organ chimes, Swiss handbells, and orchestra bells. He developed the marimba from a jungle novelty into an accepted musical instrument. He evolved the original marimbaphone with metal into the vibraharp, the drawn tubular cathedral chime for pipe organ and orchestra use, and the steel bar celeste and wood bar harp for pipe organ use. In 1910 he developed the dinner chime. Another of his products was a radical improvement in carillons for churches and public buildings.

Starting as a one-man operation in St. Louis he began to manufacture the instruments he had invented. He moved the business to San Francisco in 1893, and finally to Chicago in 1897. By 1898 he was devoting his full time to manufacturing. The business was later incorporated in 1913 as J. C. Deagan Musical Bells, Inc. Three years later the name was changed to J. C. Deagan, Inc. He was president of the corporation from its inception until his death in 1934.

In 1910 Deagan persuaded the American Federation of Musicians to adopt A=440 as the standard universal pitch for orchestras and bands, thus settling a long dispute. The standard was accepted by the US government and generally throughout the world. Deagan was also deeply interested in astronomy, geology, chemistry, and all branches of physics, particularly the theories of light and sound, and he was considered an authority on pitch and acoustics.

Following his death, the company continued to thrive under the leadership of first his daughter-in-law Ella Smith Deagan, then her son, "Jack" Deagan, and daughter, Jayne Deagan Evans. In 1978, the company was purchased by the Slingerland Company, and then sold to Larry and Sandra Rasp (Sanlar Corporation) in 1984. Today, Deagan glockenspiels and chimes are marketed by the Yamaha Corporation based on the trademark and patented designs of the "Grand Old Man" of musical percussion instruments. Deagan tower bells and chimes continue to ring throughout the world as an enduring tribute to the genius, inventiveness, and musical contributions of John Calhoun Deagan.

TONAL FINISHING - MAKING THE THEATRE PIPE ORGAN SOUND GREAT!

Ever hear the term "Tonal Finishing?" We attempt to sort it all out here.

Just what is **"Tonal Finishing"**? It is a process that has been around for centuries and is practiced by organ builders worldwide. Also known as **"voicing"** or **"regulating"**, the process is meant to meld together the sounds of the various pipes and ranks in the instrument to create a series of gorgeous ensembles.

Tonal finishing takes place at the end stages of building or refurbishing an organ, and is clearly the most important step in achieving perfection. An organ cannot be properly regulated at the factory. The effects of the size of the organ, the resonance of the chambers, the size of the venue, and the acoustics of the building all come into play.

Once the initial installation or refurbishment of an organ is complete, what you really have is sets (ranks) of tin, wood, and sometimes brass whistles operated by an air turbine, and controlled by a console. An exact tuning of every pipe and rank in the instrument will enable the playing of music, but what will the music sound like? Unless you are unusually lucky, Not Much!

In addition to regulating each rank, note by note, to ensure even volume **within** the rank, the volume or power must be adjusted so that the **ranks blend and complement each other**, and one does not drown the other out. Building a set of "terraced" ensemble volume levels in the organ that are each coherent, yet work together to build larger ensembles, is the ultimate goal in organ tonal finishing. In addition, the speech or tonal color of many ranks can be adjusted, particularly the reeds, to vary the brightness of the tone from mellow to raspy. Ranks can also be "contoured" so that the sound varies from the bass register up to the treble.

Voicing Reed Pipes:

Reeds have two major parts that determine the overall tone and volume. The first is the resonator, the familiar pipe tube that is sometimes cylindrical (clarinets, krumets), sometimes conical (tubas, trumpets), and sometimes capped (vox humanas, French horns). The second, and hidden part, is the reed (also known as the “tongue”) and the shallot on which it is held. This assembly is at the bottom of the pipe (resonator) and is contained in the block where the resonator ends. The mechanism of reed and shallot is mounted into the block and housed in the boot of the pipe, which can be removed to allow the technician to work on the reed.

The sound of a reed pipe is the result of a combination of factors including the shape and style of the resonator, its harmonic length, and the metal out of which it is made. (For example, Wurlitzer used brass for its trumpet resonators because they felt that it had a better, more orchestral sound.) Also contributing to the sound of the pipe is the reed and shallot. The reed is a thin piece of metal (brass or phosphor bronze) whose thickness is measured in thousandths of an inch. (The reed takes its name from the bamboo reed used in the common clarinet or saxophone.) The shallot is the hollow brass tube with a flattened face and an opening in that face against which the reed vibrates. The physical configuration of the shallot affects the type of sound produced as does the shape of the reed. A thinner reed tongue generally gives a brighter sound. A thicker tongue, especially one with added weights (like a high pressure tuba), gives a darker sound. The amount the reed moves away from, and back to the shallot in its vibration is the reed's amplitude and causes the pipe to be either louder or softer. The greater the amplitude of the reed, the louder the pipe will be when it is in pitch. Adding "curve" or decreasing "curve" at the bottom of the reed, changes its amplitude. The voicer adjusts the reed with a specially shaped tool called a curving block (a heavy piece of metal with one or several different curve forms in it). He/she puts the reed on the block, and applies "curve" (or decreases it) by rubbing the reed with a burnishing tool. The tuning wire, which moves up and down the reed to allow for tuning, also allows the amplitude to be changed to some extent. The further down the wire is on the reed, the less amplitude and vice versa. Changing the amplitude also changes the pitch or frequency of the reed however, so the voicer, when changing the volume of the pipe, will first set the volume with the amount of curve or the tuning wire, either increasing (louder) or decreasing (softer) the amplitude of the reed, and then tune the pipe with the slide or scroll at the top of the resonator to either lengthen or shorten the resonator to put it in pitch. The shorter the pipe, the higher the pitch, the longer the pipe, the lower the pitch. Once the pipe is voiced, the process of tuning the pipe is usually just a matter of moving the tuning wire slightly to allow the reed to be put back where the voicer wanted it when he tuned and voiced it originally. Voicers leave marks on reed pipes to help put things back where they wanted it. These marks are usually just small lines made with a sharp knife. There is a voicer mark to indicate where the slide at the top of the resonator should be, and also another one on the shallot to tell how far in the shallot is to be inserted in the block of the pipe. (Note: Some reed pipes, like a Wurlitzer brass trumpet, have no scrolls or slides. On these pipes the whole body of the pipe slides up a small tube at the base and is held in place by a small clamp. Still other pipes, like a Wurlitzer English post horn have no resonator adjustment at all. On these pipes all the changes to volume must be done with the reed alone.)

Reed voicing is complicated and involves delicate parts. Reeds are easily bent, twisted or creased by well-meaning amateurs. It's best to leave the process to the experts or at least to someone who is very experienced. Those who wish to learn the craft should find a professional to study with, and practice on some old unwanted pipes from a broken set.

Voicing Flue Pipes:

A flue pipe is really just a whistle, and as such responds to greater or less wind pressure to determine its volume. Flue pipes include the string, diapason and tibia/flute ranks in the organ. The way a voicer works on a flue pipe is much less complicated than on a reed pipe. Although the upper lip, the languid (the flat bottom of the mouth area inside the pipe), and windway (the little slot that allows the air to pass up from the bottom of the pipe and blow across the upper lip) are sometimes adjusted for proper speech, the majority of voicing is done just with the toe hole at the very bottom of the pipe - the larger the hole, the more wind and the greater the pressure in the pipe, making a sound wave with a bigger amplitude, therefore creating a greater sound volume. The voicer has a special tool for making the size of the hole bigger (a toe reamer) and one for hammering the toe closed (a cone shaped hammer that looks like an egg cup). Wooden pipes, like tibias and concert flutes, have a lead toe to allow changes to be made one way or the other. If you open it too much, you can just hammer it closed again. Some large wood pipes have a built-in adjustment gate at the bottom so that you don't have to remove the pipe to change the amount of wind. When you change the opening in the toe, you have to retune the pipe by making it longer or shorter accordingly. For instance, if you blow into a whistle and increase the pressure, the pitch goes up. The same thing happens with an organ pipe. So when you open the toe, you need to make the pipe longer (with a slide at the top or stopper if the pipe is a stopped pipe) to compensate to lower the pitch. In the inverse, if you decrease the amount of opening, lowering the pressure in the pipe, you have to shorten the pipe to raise the pitch.

Voicing is an extensive process of trial and error to determine what characteristics blend together best for the particular instrument being voiced. Voicers spend years learning the process, and obtaining an experienced professional for your organ is the key to success. But, the world of music is driven by personal taste, and even professional voicers can disagree as to the best sound.

Theatre Organs have an additional set of variables that give us that "lush sound that wraps itself all around you", namely the tremulants. Different ranks can be controlled by different tremulant mechanisms. The speed and depth of tremulation can be adjusted from a light trem to a deep vibrato. Again, personal taste enters the mix.

Finally, some organs are built with "celeste" ranks. A celeste is the duplication of an existing rank. Celestes can be found in several pipe ranks including string, flute, quintadena, and dulciana. The celeste rank is tuned slightly sharp or slightly flat relative to its twin. When a "celeste" stop is chosen, both ranks play, creating a unique delightful sound. Of course, that sound must meld with the rest of the ensemble!

Bottom line: When a Theatre Pipe Organ installation is complete and the instument tuned, are you done? Absolutely not!!   Voicing by a professional is necessary to bring the instrument to its full potential, creating a concert caliber installation.

THEATRE ORGAN MANUFACTURERS

When we speak of vintage Theatre Pipe Organs, we tend to focus on the major manufacturers. Wurlitzer is the most commonly known name, and rightly so. The company produced over 2,000 instruments, which is over twice their nearest competitor. Robert-Morton, the second most prolific manufacturer, produced almost 900 instruments. Third in line was Kimball with a production of about 650. Fourth was Moller with about 560. Fifth was Barton with just over 300.

Sixth was Marr & Colton with about 300. Seventh was Wicks with about 240, and eighth was Kilgen with just over 200.

Most of these names are familiar to GSTOS members because we are fortunate to have these manufacturers represented in the organs we restore, maintain and visit. We have Wurlitzers at the Union County Arts Center, Brook Arts Center, Rahway Srs Center, Oliver residence, Trinity Church Clifton, and the console of the Heitz organ in New Hope. The Robert-Morton company is represented by the huge Wonder Morton at Loew's Jersey City, and by the Panos residence organ. Until recently we could hear a Kimball instrument at the Galaxy Triplex in Guttenberg. We still have one within driving distance in Delaware at Dickinson High School. Our Trenton installation is a Moller, and another, maintained by our New York friends, is located at the New York Military Academy in Cornwall-on-Hudson. We have no Barton organs in our area, but the hybrid organ at Northlandz in Flemington is mostly Marr and Colton, and a Marr and Colton console now controls the Griffith Beach organ in Newark Symphony Hall. We have no Wicks theatre organs, but Opus 1, the first organ ever owned by GSTOS at the Mayfair Theatre in West New York, is a Kilgen. So, GSTOS is very fortunate indeed in having representation from 6 of the 8 largest manufacturers!

But what about the non-major companies? The late David Junchen in his "Encyclopedia of the American Theatre Organ, Vols I &II" identifies and describes an astounding 90 American firms that built Theatre Pipe Organs. Of these, only 30 firms built 20 or more instruments. The other 60 built 19 or less each, some as few as one or two! Reading down the list, some names are familiar from the church organ world (Austin, Page, Welte, Wangerin, Tellers, Skinner, Shantz). Others such as Griffith Beach have local interest. Junchen identifies only 10 organs ever built by Earle Beach in partnership with the Griffith Piano Company. All were installed in northern New Jersey: three in Elizabeth, two in Paterson, and one each in Newark, Newton, Passaic, Ridgewood, and West Hoboken. Three of the 10 still play today, an amazing percentage given the number of theatre organs which have been destroyed over the years. Thus, when we talk to other theatre organ enthusiasts about the Newark Symphony Hall, Martin residence, or St. Jude's Church, Lake Hopatcong Griffith Beach organs, we must realize that this brand of instrument is unique to us and is little known outside our geographic area.

ORGAN BLOWERS

In our last article, we wrote about American Theatre Pipe Organ manufacturers as listed in the "Encyclopedia of the American Theatre Organ Vols I & II". We indicated that the late David Junchen, the author, was able to identify an astounding 90 firms who have manufactured theatre pipe organs over the years. Many of these companies had built only a few instruments, and Junchen indicates that 60 of the 90 firms built 19 instruments or less.

The key to Junchen's ability to root out these 90 companies centers on his access to records on the blowers used by these organs. (The blower is the large electrically operated turbine which supplies air pressure to the instrument.) Junchen states that only 3 blower firms are known to have supplied over 99% of all the blowers used in American theatre organs: Spencer, Kinetic, and B.F. Blower.

By far the largest organ blower manufacturer is the Spencer Turbine Company of Windsor, Connecticut, which built and builds the "Spencer Orgoblo" centrifugal blower. As of 1985, Junchen indicates that Spencer, which is still in business today (www.spencerturbine.com), had manufactured over 37,000 organ blowers since 1905. Wurlitzer was their biggest customer.

The second largest producer was the Kinetic Engineering Company, which later was owned by M.P.Moller, Inc. They built about 23,000 blowers.

The output of these two firms accounted for over 90% of the blowers sold in this country through the 1950's.

A much smaller firm, the B.F. Blower Company, built about 1,300 "Simplex" blowers, about half of which went to Kilgen organs. Of the other half, only a few ended up in theatre instruments.

A fourth small company, the Zephyr Electric Organ Blower Company, was also in business as part of the Schantz Organ Company. These blowers were used primarily on Schantz classical instruments, although about 1,000 were believed to have been sold to other manufacturers, mostly for small church organs.
Thus the vast majority of Theatre Pipe Organs in America are equipped with "Spencer Orgoblos" or "Kinetic" Engineering blowers.

ORGAN IN THE LEXICON

There are a number of phrases from the organ world that have integrated themselves into our general English lexicon. Two come to mind immediately.

The first is: **"pulling out all the stops"**. This of, course, refers to the stop controls on classical organs that operate by pulling out draw knobs located on either side of the keyboards. Pulling out all of them gives full organ sound, and thus has come to mean "giving full effort" at a task.

The second is: **"all the bells and whistles"**, referring to the toy counter sound effects (bells, whistles, horns, sirens, etc) featured on a theatre organ. Something with all the bells and whistles has come to mean "fully loaded with accessories".

Are there any more organ terms out there being used by the general public?
If you know of any, please let us know!

Credits: John Becica, with the assistance of Dave Kopp, Bob Martin, Bob Molesworth, and Tony Rustako