The Organists' Manual

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Introduction

This Organists'* Manual is a manual for those who are beginning to study organ or merely taking an interest in organ with no musical knowledge. It will start at the basic foundations of the organ's physical construction and will conclude with the operation of the console.

Musicians from across the world will agree that the organ is the single most fascinating and complicated instrument in existence. The organ is a complex machine that must be 'operated.' With many ins and outs of the operations, this manual aims to introduce and simplify the operative tasks. While it is one of the most complex musical instruments, anyone can understand the organ's operation and appreciate its complexity.

A manual for introducing someone to the organ is especially necessary for musicians. Most musicians who advance to organ-playing have come from a background of piano-playing. Since both the organ and piano are keyboard instruments many of the basic structures of playing can be applied to both; however, the technique and operation are completely different. Therefore, the need arises to teach a beginning organist about these techniques.

Aside from performing on the instrument, there are many parts, knobs, buttons and switches that control various things on the organ, all of which the organist must learn. Someone may quickly become overwhelmed with all of the terminology—the pedal board, stops, ranks, types of pipes, tabs, tremulants, swell boxes, swell pedals, pistons, combination tabs and the different types of organs—and what they do. The Organists' Manual will simplify and explain all of these things.

Understanding how the physical aspects of the organ work and how technology has influenced its operation over time is both interesting and entertaining. The organ is an engineering marvel, as well as a wonderful-sounding musical instrument which this manual will help you to better understand.

*"Organist" will be used to describe anyone reading this manual, including anyone interested in learning about the organ or how to play it.

Chapter 1

Physical Construction

Pictured above is a *theater organ console*

Chapter 1 – Physical Construction

Origin of Sound

Recorded audio—sound that can be captured and reproduced without the original instruments—has not been around for more than 150 years. Before that time, all music was performed live and had to be made by musical instruments. The root of music creation machines is the organ. The organ was used to play music for festivals, carnivals, parties and events of all kinds. Its ability to make a wide variety of sounds and effects makes it most versatile instrument in existence.

What Makes an Instrument an Organ

An organ is essentially a whistle, whether it be played by air produced by the musician or by air stored in a bellow/wind chest (air container) and played with the push of a button/key.

Evolution of the Organ

The most basic organ is a pan pipe or pan flute. A sound is simply created by the musician's blowing air across the pipe creating a whistle noise.

From there pan pipes evolve to portative organs, small musical devices that blew air through pipes activated by the musician. The pipes are to be played by a musician's pressing small buttons at the bottom of the pipes, allowing air that was pumped into the organ to enter the pipes.

They continue to get larger, more improved, more powerful, and more complex. The portative organs then evolved into steam calliopes. A calliope is a specific name used for an organ powered by steam. They provided music for all sorts of events where people gathered. Calliopes are usually fairly large, yet still portable, and often found on trailers pulled by horses.

Steam calliopes then evolved into chamber organs. A small chamber organ is pictured on the left, and a large chamber organ on the right.

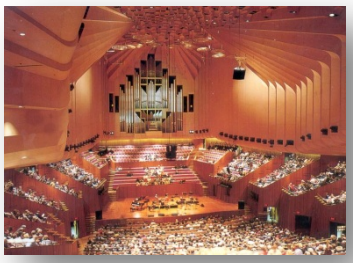
Modern Day Pipe Organs

Jump ahead few centuries and there is now what is referred to today as "pipe organs." The term "pipe organ" generally refers to a theatre organ, church organ or concert hall organ.

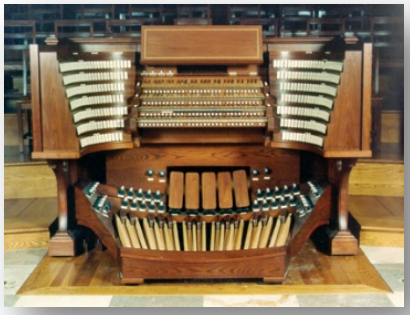
Below are some pictures to help identify the most common types of modern-day organs. An organ can be classified by any of the following characteristics:

- Façade – the outer case of the organ that displays all of the pipes and woodwork
- Sound – the unique tone resonated from each type of organ
- Console – the control deck of the organ that contains all of the keys and controls to the organ

Large Chamber Organ



Concert Hall Organ



Pipe Organ *Console*

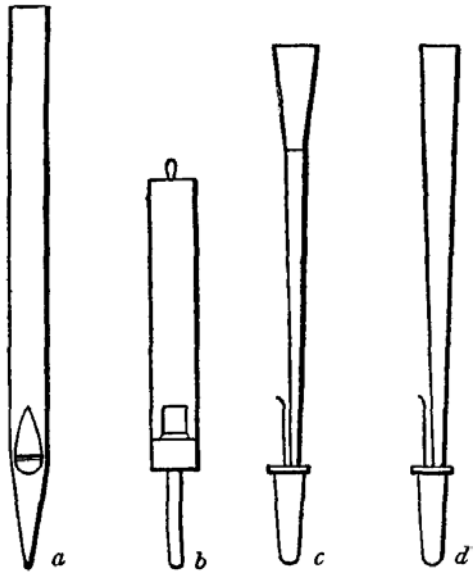
Chapter 2

Internal Operation

Pictured above is an *organ chamber*

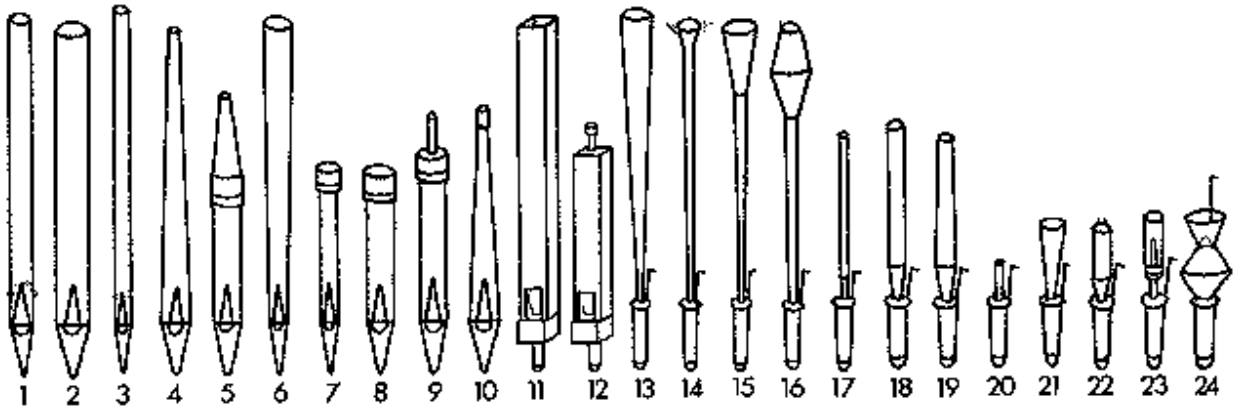
Chapter 2 – Internal Operation

Flue and Reed Pipes



All pipes in an organ can be broken down into one of two types—flue and reed. Each has a very different sound that can even be detected by the untrained ear. While difficulty to describe a 'sound' via a textual document, a flue pipe sound can be described as a soft whistle, and most closely resembles the sound of a flute. Reed pipes are much louder than flue pipes and sound nasally. Imagine holding your nose while singing different notes; this would sound close to the sound of a reed pipe. Reed and flue pipes sound different, operating in entirely different ways in terms of physical construction.

Flue pipes work in the same way that a whistle does: by moving air across a slit surface to create a sound. Reed pipes create sound by blowing air across a reed. A reed is an extremely thin piece of material made of metal or wood that vibrates very quickly back and forth when confronted with air. Reed pipes work in the same way that a kazoo toy does. A reed pipe most closely resembles the sound of a saxophone. Flue pipes have a very simple operation, while reed pipes are more complex in construction. In the drawing to the right, 'a' and 'b' are



Flue pipes:

1 Principal
2 Flute
3 Viole
4 Spitzflute
5 Koppelflute
6 Trichterflute
7 Quintaton
8 Gedeckt / Bourdon
9 Rohrflute
10 Spitzgedeckt
11 Open Wood
12 Stopped Wood

Reed pipes:

13 Trumpet
14 Schalmei
15 Oboe
16 English Horn
17 Krummhorn
18 Dulcian
19 Musette
20 Regale
21 Tricher Regale
22 Vox humana
23 Rankett
24 Baerpfeife

flue pipes, and 'c' and'd' are reed pipes. 'A' is a metal flue pipe, and 'b' a wooden stopped-flue pipe.

Sound Modifying Variables

In addition to a pipe being a flue or reed pipe, the sound that a pipe produces can be further modified with its material. For example, a wooden pipe creates a soft, mellow, warm sound, while metal pipes create a bright, nasally, trumpet-like sound. Metals pipes can be made from lead, tin, copper, aluminum, gold or silver. Each type of metal produces a different sound. Wooden pipes are generally expensive nowadays, and are often made of whatever wood is readily available—most often mahogany or other hardwood. Wooden pipes are squared and made from planks glued together on each side to form a rectangular prism–shaped pipe.

Shape can also alter a pipe's sound. Wooden pipes are usually square-shaped, while metal pipes can be conical-, cylindrical- or triangular-shaped. Open and stopped pipes are other contributing factors to altering a pipe's sound. Open pipes have no covering on the top and the sound is free to leave the top of the pipe and enter the surrounding air, while stopped pipes have a wooden or metal stopper on the top that changes the sound and pitch of the pipe.

Ranks

Each row of pipes of a specific material, shape and size is referred to as a "rank." Organs can quickly build up to thousands of pipes with just a few ranks. For example, a single rank would consist of conical-shaped, tin, metal flue pipes, with a pipe to represent each of the 61 keys on the keyboard. To change the note (pitch) each 'conical-shaped, tin, metal flue pipe' produces, its size would be changed. Increasing the size would be lowering the pitch (played by a key on the left side of the keyboard) while decreasing the size would be raising the pitch (played by a key on right side of the keyboard).

The organ builder can then make a simple modification to that rank of pipes, such as changing the metal to copper, which then creates an entirely new rank of pipes. Through these small modifications of material, shape and size, several hundred ranks can exist in an organ. The name given to these specific ranks usually corresponds to orchestral instruments to which they sound similar, such as the flute, tuba, trombone, violin, cello, piccolo, and many more. Pipes with a certain set of characteristics (conical shaped, tin, metal flue pipe) will be referred to by organ builders and organists as its orchestral match—the Rohr Flute, which is a rank in the pipe organ.

A snapshot of one of an organ's chambers is pictured to the right. This chamber hosts six ranks. You can see how each rank of pipes differs in shape, size and metal. The smallest pipes in a rank can be as small as a pencil's width, only a few inches tall, and make high-pitched whistle sounds. The largest of these pipes that produce booming, wall-rattling bass notes can be over 50 feet tall and several feet in diameter.

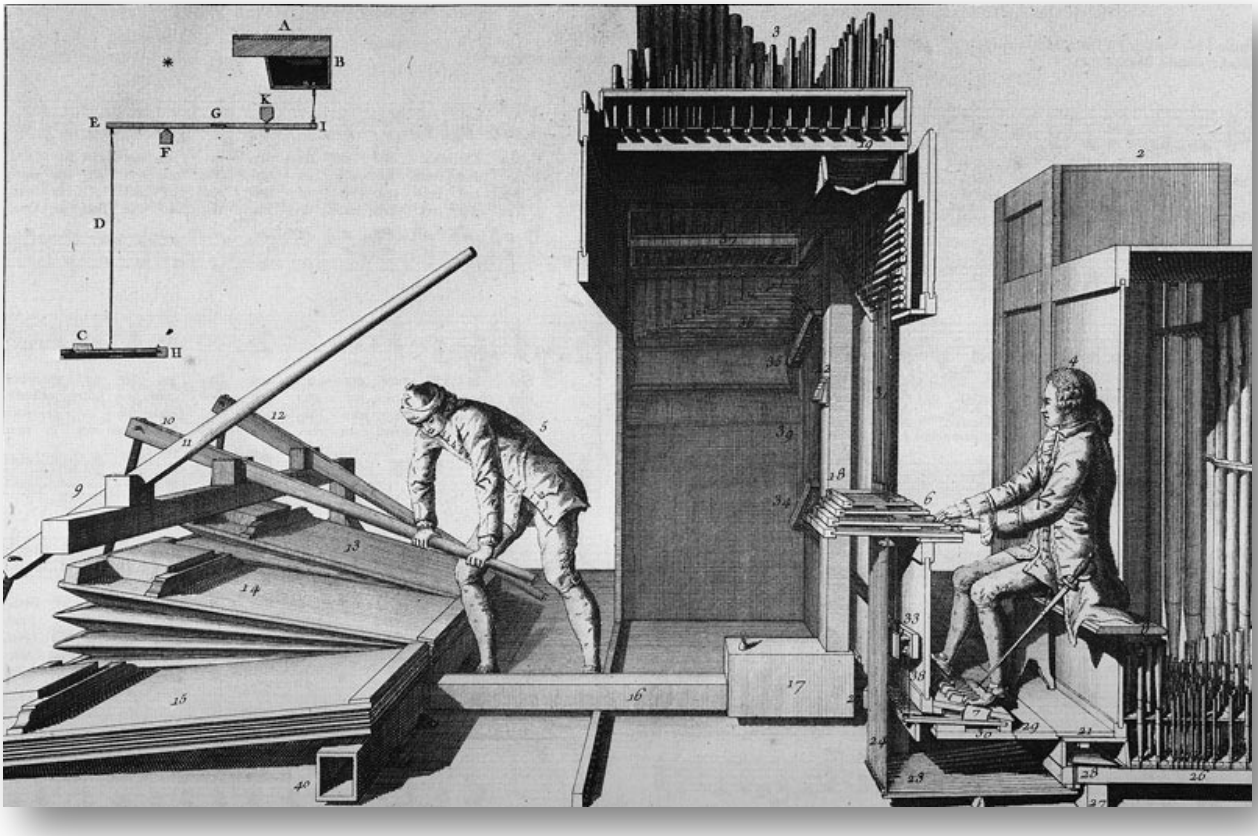
Wind Chest

After a key is pressed at the console and the valve to a pipe has opened, air flows into a pipe from the **wind chest.** The wind chest is a large part of the organ, made from leather and wood, which holds the air for all of the pipes. Its purpose is to store and regulate the air that is delivered to the pipes. Consistent air flow through a pipe is very important. Too much air can cause the pitch to go sharp (higher than in tune); too little can cause the pitch to go flat (lower than in tune). These fluctuations can make very nasty sounds come out of the organ.

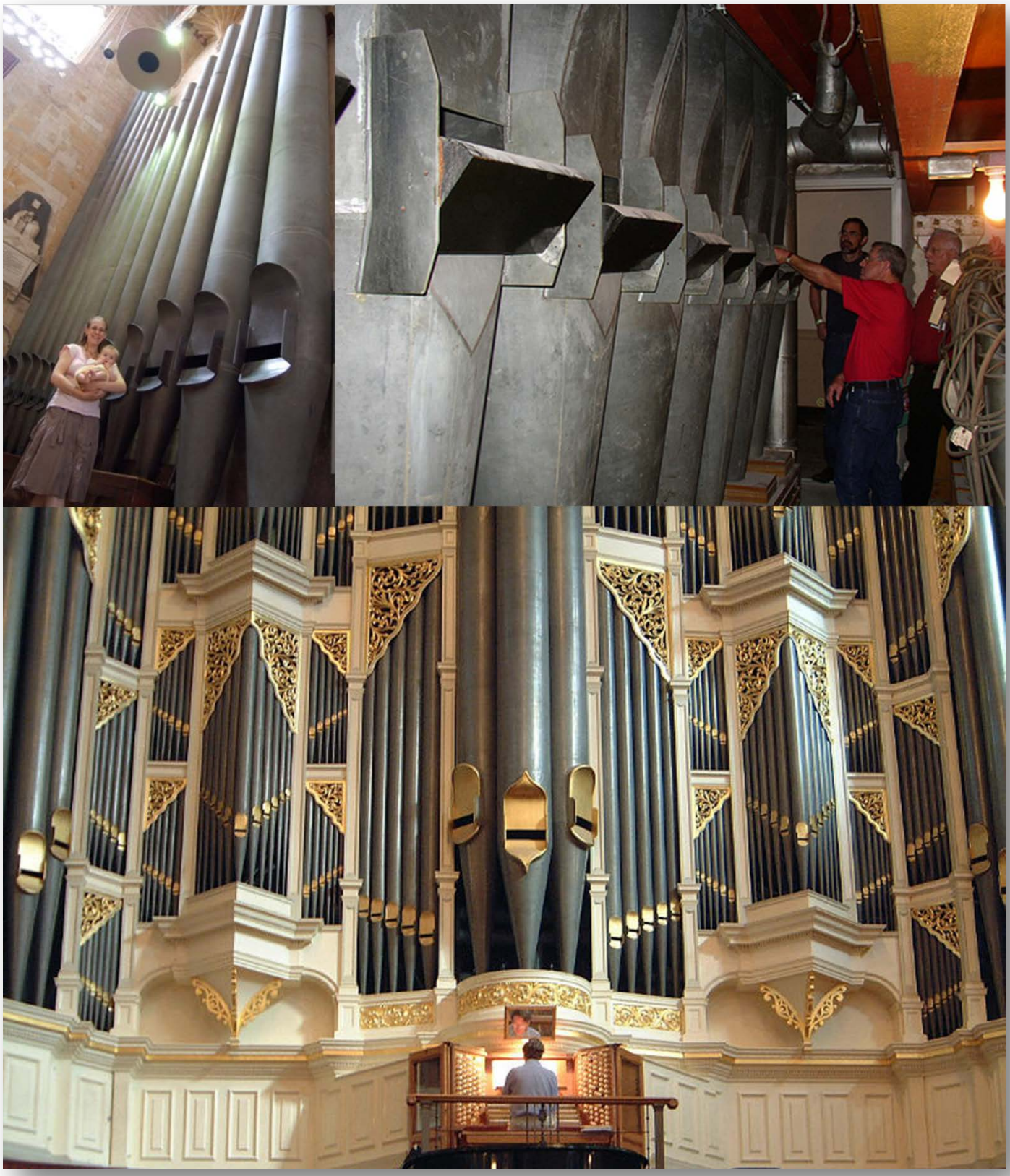
An organ's wind chest works the same way that a city's water tower does: regulating and providing equal water pressure to all of the townspeople. If pumps provided water directly to the townspeople, during peak hours the water tower would run dry because the pumps would not be able to keep up, and during off hours the pumps would over-pressurize every plumbing location. With a water tower, the pumps can refill the water tower to full volume during off peak hours; or in our case the blower can refill the wind chest when the organist rests between notes.

Blower

The wind chest is filled with air from a **blower**, which is essentially a large fan. When all of the air has exited the wind chest, the fan inflates it again.



An ancient pipe organ pumped by an assistant of the organist



The images above shows some large pipes from the pedal bass division

Chapter 3

Console Operation

The six manual, 28,604 pipes, 463 rank Wanamaker organ in the Macy's Department store in Philadelphia is the largest fully functional organ today.

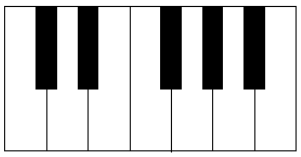
Chapter 3 – Operating the Console

Console

The organ console is where all of the action happens; the organist is seated and operates the organ from here. Consoles range greatly in size and style depending on the type and size of the organ they control.

Manuals

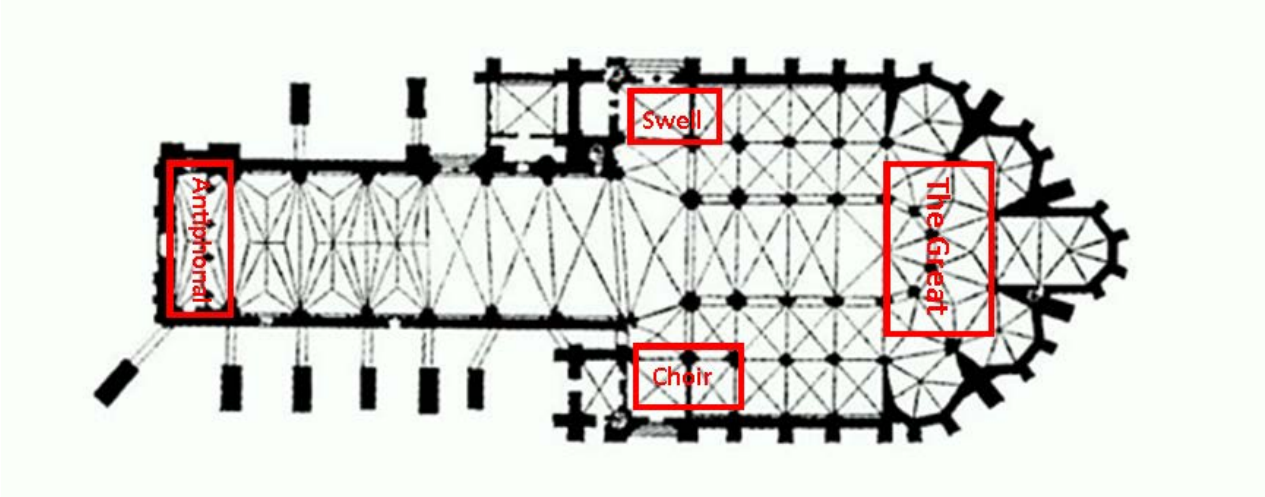
The manuals are the keyboards on the organ. Most organs contain several manuals; the sole purpose of this is for controlling a specific organ. Although the instrument as a whole is referred to as an organ, most organs contain several "organs" within them.



Organs within Organs

"Organ" refers to a specific chamber of pipes. The first organ is referred to as the "great," which is the main organ. The great contains the most pipes and is played by the middle manual. The great is usually positioned above the organist. Other organs are the **swell, choir, solo, echo, antiphonal,** and **fanfare.**

The name of which a specific organ is referred to be determined by the ranks of pipes that the organ contains and by the position in the room that holds the organ. Most cathedral pipe organs have four organs. The image below shows the position of each organ in the hall.



The great organ (positioned at the front) contains the most ranks/pipes. It is seated directly above the organ console.

A photo taken from the inside of a *swell box*

The swell organ is of special note because all of the ranks of pipes are contained inside of a box surrounded by shutters that is controlled by a foot pedal at the organ console. Since an organ pipe has constant volume and can only be in a state of 'off' or 'on,' the organist normally wouldn't have any control over the volume of the organ. The organist controls the volume of the ranks inside the box by having several ranks of pipes in a "swell box" and using the shutter to confine the sound.

The choir organ in this cathedral is to the left of the congregation. The choir organ features soft pipes that mimic a singing choir.

The 'antiphonal' or 'echo' organ is in the back of the cathedral. The organist can play this organ with a specific manual on the console. Its purpose is to add an ethereal surround effect.

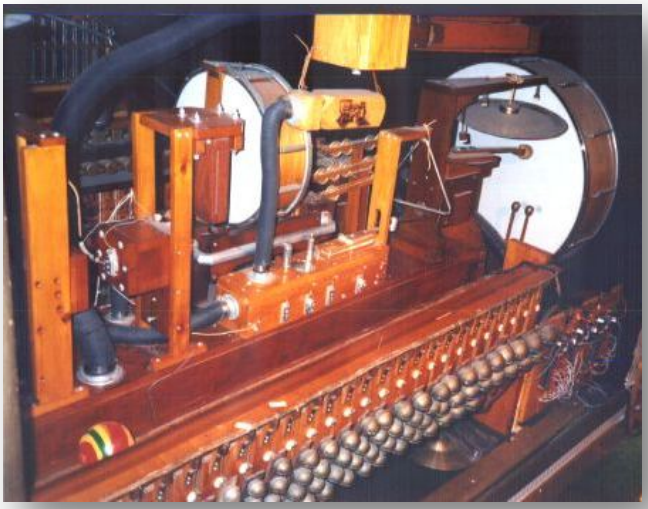
There are many other types of organs contained within organs that are not mentioned in this manual. Each however, serves a specific purpose. The larger the instrument is, the more likely it is that it will contain more organs within the organ.

Keep in mind that all 'organs within the organ' are controlled by the same console, just by different manuals/keyboards.

Stops

Stops are the hundreds of knobs and tabs on the console that control all of the functions of the organ. Ninety percent of stops on an organ control ranks; the other stops control things that are specific to that organ. Each keyboard manual has its own set of stops. Pulling out a stop activates a rank. For example, if one were to pull out the trumpet stop listed underneath the "Solo" category, the trumpet rank would then become active. If the organist now played a note on the "Solo" *manual* (the top keyboard on the organ console) a pipe would sound that resembled a trumpet, i.e., bright and triumphant. What makes an organ unique is that you may pull out multiple stops at once. This makes for an endless amount of possibilities and combinations of sound. If the trumpet and flute stops on the solo manual are both pulled out, then when playing a note on the solo manual, pipes from the trumpet and flute rank would speak. One may pull out a different set of stops for each manual, which allows the organist to simply just move his or her hands to a different keyboard to play an entirely different set of sounds.

Percussion



Organs contain percussion instruments such as drums, chimes, sleigh bells, cymbals, and full size grand pianos. All of these instruments are played by the organist at the console. Most percussion instruments are contained in the *great* organ. All percussion instruments are electro-pneumatically played due to their physical position of being away from organist at the console.

A snapshot of some percussion instruments inside of an organ is pictured to the right. The cymbals, crotales and dangling triangle can be played via fixed drumsticks and mallets that are electronically moved when an organist presses a key on the console.

Pistons

Pistons are cylindrical buttons positioned below the keyboards; they memorize stop combinations so that the organist can quickly switch between playing a trumpet and a flute on the solo manual, to playing a violin on the solo manual.

Pedal Board

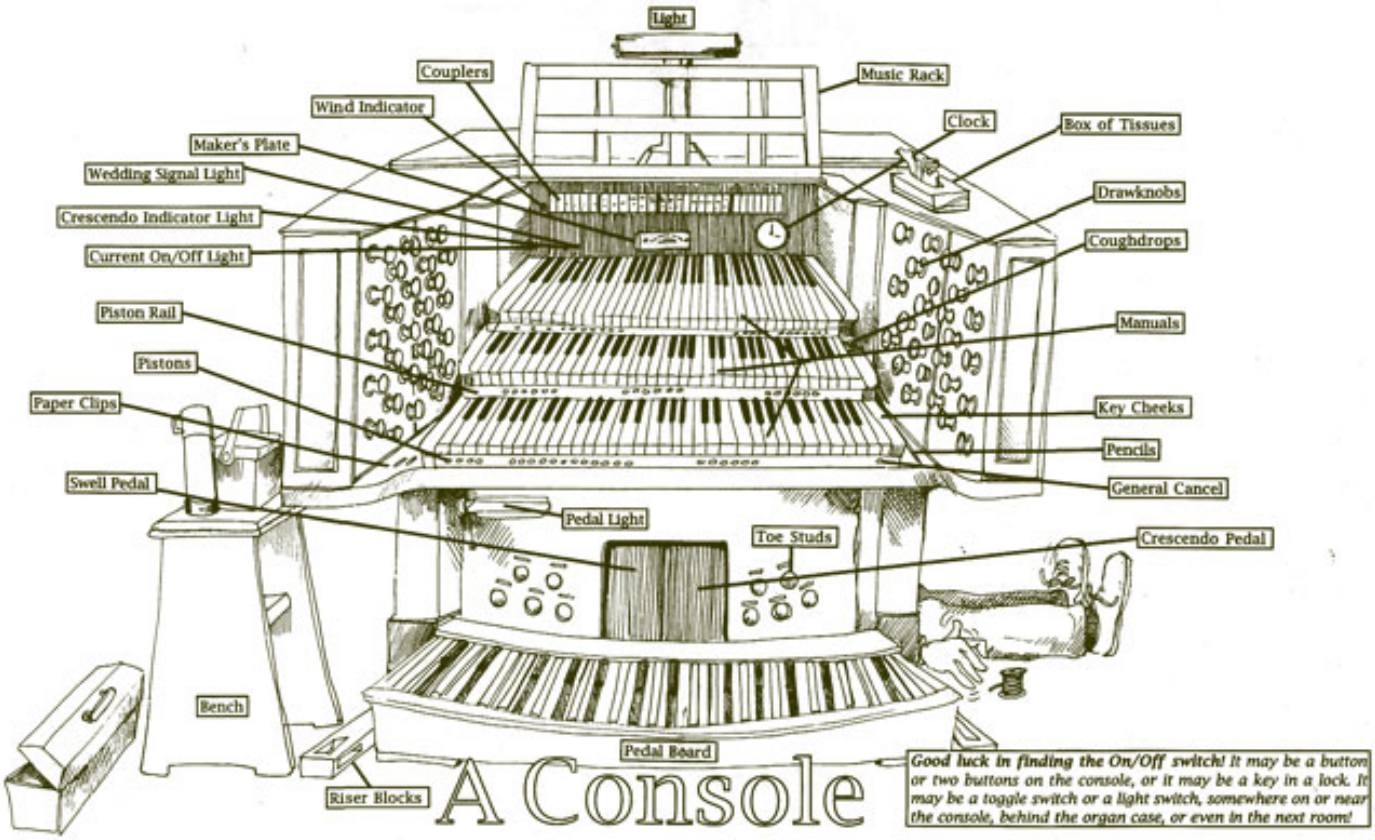
The pedal board, a keyboard for the feet, is one of the most notable characteristics of a pipe organ. The pedal board mimics a keyboard for the hands except that the keys are longer and larger so that they may easily be played by the feet. Although possible to play a high pitched melody on the pedals, the pedal board is most often used to play the bass line notes in a song. The pedal pipes are the largest inside of the organ.

Crescendo and Swell Pedals

The larger flat square pedals above the pedal board are the crescendo and swells pedals. The swell pedal is what controls the shutters on the swell box (swell organ) as noted earlier in Chapter 3. The crescendo pedal adds in a specified set list of stops one at a time, increasing the volume of the organ. For example, when the crescendo pedal is depressed all of the way, all of the stops on the organ would be out, while depressed halfway only half of the stops would be activated.

Toe Studs

Toe studs are the circular foot buttons above the pedal board and beside crescendo and swell pedals. A toe stud servers the same purpose as a piston, only it can be accessed by the feet. This comes in handy when both of the organists' hands are tied up but the need to switch registrations exists. Registration is the term used to refer to a specific set of stops.



A pipe organ console with all of its parts labeled

Consoles From Organ to Organ

Consoles can differ greatly in appearance and layout from organ to organ due to the many various controls on it. These designs are up to the organ builder. You will find that organs of a specific area of the world are similar to each other i.e. French, German, and English organs.

Summary

While this manual only briefly covers the inner workings of the pipe organ, it is a marvel of construction and engineering feats. The pipe organ was truly before it's time when first constructed. With pipes placed around a concert hall, or cathedral, it was the first introduction of what we know as modern day surround sound, or multi-channel audio. It was also one of the first instruments ever created and has grown and evolved throughout time to one of the largest most powerful instruments known to man.

"To my eyes and ears the organ will ever be the King of Instruments."

Wolfgang Amadeus Mozart

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