Restoration of

The Zaharakos Welte

by Durward R. Center

Welte Orchestrions were once to be found in many homes of the socially elite in this country, palaces and castles in Europe and Asia and also in commercial locations such as restaurants, saloons and ice cream parlors. A commercial establishment that had one of these instruments would be considered first class because of the cost of acquiring an orchestrion. They were not only used for background music, but for concert music as well. The latest popular music was available on perforated paper rolls along with all the classics.

Over the years technology progressed, styles changed and the orchestrion became passé. One by one, their numbers decreased. Some were traded in on later instruments, some destroyed by fire and war, and many were just taken out and discarded. Out of about 1,000 instruments made by the German firm of Michael Welte & Sons, only 43 of their early pneumatic orchestrions have survived into the present time. Of these, only five remain in their original locations,

the rest now in private collections or museums. And of that number, only one machine survives in its original commercial location—Zaharakos in Columbus, Indiana.

It was only natural that the brothers Zaharako would choose to install one of these instruments in their beautiful well appointed ice cream parlor in 1908. They purchased a Style #3 Cottage Orchestrion. *(Figure 1)* The Style #3 is one of the smaller machines which Welte offered, but none the less, it was sized just right for the room.

Figure 1

This organ delighted generations of people over the years. The Greek brothers were very proud of their restaurant and its fine interior. They made very few changes through the years. They continued to maintain their orchestrion through the 1940's and 50's when other similar locations had switched to juke boxes to entertain their clientele.

As an interesting note, your writer first saw this organ in 1967 when he was a mere boy in high school. *(Figure 2)* Living and breathing all things pipe organ, he and some friends came from Kentucky to see this unusual instrument. The impression this organ made was to last a lifetime.

As the aging instrument became weaker and more problems began to develop, finding a technician that understood the instrument must have become increasingly more difficult. Repairs done consisted mostly of patchwork and temporary fixes. By the 1980's, its condition had deteriorated such that it required more work than could be done on site. Some parts were sent to Indianapolis for repairs by a player piano repair shop. Unfortunately, the repairer died during this process. This must have caused much concern to the Zaharako family. Most of the parts were returned and reassembled and the organ did play after a fashion but with so much mechanical noise and vibration that it could hardly be called music. Perhaps it had been so long since it played properly, that no one knew the difference.

It was in this condition when in 2006 it was decided to completely restore the instrument back to its former glory. Your writer was honored to have been chosen to do this work. In March of that year, the organ was carefully dismantled, packed and shipped to Baltimore, Maryland. *(Figure 3)*

The intent of a restoration of a rare instrument such as this is to reach a happy medium between keeping it as original as possible and making it play as reliably as it came from the factory, and look fresh and clean—and to make music. Any replaced or new parts that go into the organ should be of a historically correct design. Each restorer must decide which materials and how much modern technology are to be used.

The following is a brief description of the many hours of work required on this project.

Casework

The style of this case is known as Italian Renaissance. Most of the orchestrions built by Welte are of this general style. It was built of a mixture of quarter sawn and rift sawn

Figure 2

Figure 3

Figure 4

Figure 5

white oak. As found, the finish was a garish orange color and had beaded up to a very rough surface. The placement of the organ in front of the kitchen door and next to tables and chairs had allowed years of bumps and scrapes on the case from the floor up to about four feet. There were many splits and missing pieces of molding, not a crisp edge to be found. *(Figure 4)*

There was evidence that the case had been refinished at some point in the past. Brown stain was found on many inside corners. Residue from paint stripper was found in joints and cracks. One can theorize that this was done in the 1950's in an attempt to lighten the old dark finish to a more "modern" look.

As much as possible of the original wood of the case was kept. Missing molding pieces were remade, new oak was spliced into missing areas. The pockmarked surface in front of the roll frame was reveneered. Once repairs were made, the finish was completely stripped, everything sanded and all stained with a golden brown stain to match the original appearance. A French polish finish was then applied, the traditional shellac finish for these instruments and other fine furniture. *(Figure 5)*

All case hardware was refinished, polished and lacquered. The original cabinet locks were dismantled, repaired and reinstalled.

The reverse painted glass nameplate had suffered paint losses. It was in painted and stabilized.

The electric clock atop the gallery of this orchestrion was a 1930's-40's addition. It was rebuilt and refinished to match the case if it was decided to put it back.

Vacuum Pump

Orchestrions are pneumatically operated pipe organs. Both suction and pressure are required for their operation. Vacuum is used to read the music roll. The vacuum pump, or bellows, is located at the lower most level of the case. It consists of three feeder bellows and a reservoir to store vacuum. It is basically wood frames and leather. When found, much of the original leather was still in place and very rotten. It had been recovered in numerous places and several times with various materials in an attempt to keep it airtight. Every adhesive device known to man was found including silicone sealant,

staples, caulking and tons of white glue. And, of course, duct tape. *(Figure 6)*

Everything had to be removed down to bare wood. Cracks were then shimmed, new edges spliced onto damaged components, every screw hole drilled, plugged and redrilled for proper size screws.

It was common for organ builders of the period to cover wood portions of the bellows with paper. This was done to increase air tightness and made a nice looking job. Welte used the same red paper as they used on their music rolls. As the vacuum bellows went back together, new red paper was applied. Also found inside the vacuum reservoir was the remains of a Welte advertising poster. This is usually found, but had to be removed for repairs to the wood surface. These posters have been reprinted so a new copy was glued in place. *(Figure 7)*

The leather used is goat skin for the feeder bellows, cowhide for the reservoir, and sheep skin for flap valves and gaskets. The new inner ribs of the feeders are fiber board. All exterior surfaces which are not papered were orange shellacked. *(Figure 8)*

Pressure Pump

The pressure pump is located just above the vacuum pump. It also has three feeder bellows and a large reservoir on top. Pressure is used to blow the organ pipes. This unit was in a similar condition as the vacuum pump and required the same treatment. In addition, the three plates on which the flap valves are mounted had been replaced with plywood. New pine plates were made. *(Figures 9, 10, 11)*

Pumping Linkage

This orchestrion was always driven by an electric motor. The motor was belted to the crankshaft which turned an eccentric that, through levers and connecting rods, moved the feeders of the bellows up and down. As the organ got weaker, erstwhile repairers

Figure 6

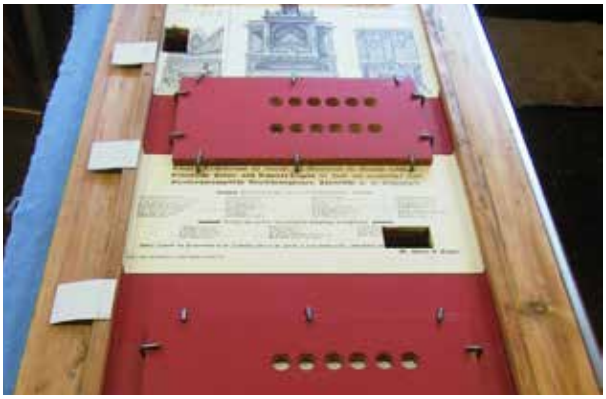

Figure 7

Figure 8

would speed the crank shaft up by placing larger pulleys on the motor and eventually by replacing the original motor altogether with a modern electric gear drive system. This increased the pressures lost through leakage. However, by 2006 the crankshaft was turning so fast as to cause the organ to self-destruct. The original steel connecting rods had one quarter inch of wear in each end and their pins were worn half way through. Replacement rods

Figure 9

Figure 12

Figure 10

Figure 13 Figure 14

Figure 11

were also found in the same condition. The main bearing supports had been modified with modern ball bearings and a crude replacement crankshaft. With the crank turning at about 80 rpm, the shock on the iron castings of the bell cranks and eccentric had caused all of them to crack or break. Not to mention the clattering of all this going on inside the case. *(Figure 12)*

This organ had seen a lot of use!

It was decided to start fresh and reproduce the entire linkage system. Welte used several different styles of drive systems. The Zaharako's Welte used a large 40 inch spoked bicycle wheel on the crankshaft. This wheel/pulley was found in the basement of the store. The motor was belted directly to this wheel via a round leather belt. This type of drive is known on two other Weltes. However, for this restoration, a later, more durable, Welte design was used. This required a new 18" drive pulley and a countershaft pulley to be cast in iron. In all, nine new castings were made and machined. A new pattern was made for the 18" pulley. Other parts were cast using originals as patterns. *(Figure 13, 14)* In addition, 33 bearing screws, washers, five connecting rods and pivot bearings were made, all in the style of the Welte. The electric motor was mounted on top of the case as it had been originally.

One other modification was the addition of a swivel joint for each of the three connecting rods at their attachment point on the three

Figure 15

Figure 18

Figure 16 Figure 17

Figure 19

feeders. It is surprising that this was not found on an organ of this vintage. Instead, an earlier design of a single screw through the rod was used. This was prone to early wear and noise.

The front and rear crankshaft bearing support boards were replaced using quarter sawn Beech as per original. Beech was commonly used by organ builders in Europe, but sometimes was prone to warping in longer lengths. Welte used the quarter sawn cut to minimize the possibility of warping and binding of the crank shaft. The crank shaft bearings were cut directly in the wood with brass oil tubes mounted above each bearing. The bell crank pivot bearings were mounted on the front board with the eccentric on the end of the crank shaft. *(Figure 15)*

Since it was expected that this organ will continue to see a lot of use, a modern electric motor was installed. Also, instead of round leather belting, round urethane belts were used. These items are quite reliable and will require little maintenance.

Pneumatic Stack

The pneumatic stack is a pneumatic relay which takes the signal from the music roll and determines what function to actuate. It is located behind the roll frame. It consists of 68 delicate leather pouches and valves that admit vacuum to leather pneumatics that, in turn, pull down wires connected to the wind chest where the organ pipes are mounted. Also in this unit are the register controls which turn on and off different sets of pipes.

There is little room for leakage or lost motion in the components of this unit for proper playing of the organ. As found in 2006, numerous modifications and repairs had been made. *(Figure 16)*. Splits within the channeling had rendered the registration functions inoperable.

All components were dismantled, stripped of leather, glue and finish in preparation for repairs and releathering. Areas with splits in the channeling were replaced and all channels and air ducts were sealed with shellac so as to be completely air tight.

The leather pouches were replaced with .010" kangaroo leather. New paper bleed discs were installed. The original wood lifter discs were reused and glued on the pouches.

New conical wood valve buttons were obtained from a German organ parts supply house. These were then modified to be an exact match to the original Welte valves. The valve faces were covered with a double layer of thin kangaroo pouch leather. Two of these valves were installed on each of the new valve wires. *Figure 17* shows the new valves held to the proper spacing while being cemented to the valve wire with shellac.

The pneumatics were stripped, but the top finished surface with original lettering was saved. These pneumatics were recovered in thin kangaroo leather and then sealed with egg white to eliminate seepage through the leather. *(Figure 18)*

Finally, the stack was assembled but left open until the organ could be powered up. Then, after any regulation required to the bleeds, it was sealed with paper. *(Figure 19)*

Roll Frame

The roll frame is the beautiful ornate unit seen behind a glass door below the pipes. It represented the latest design by Welte. It was the fully automatic rewind model. The perforated music roll is mounted here where it passes over the tracker bar and is wound up on the take-up spool. The tracker bar is a wooden plate with 75 holes, each corresponding to a note or function in the organ. Each hole is connected via a brass tube to the pouches of the pneumatic stack. As a perforation in

Figure 20

the roll uncovers a hole in the tracker bar, vacuum is released causing the pouch to rise, opening its valve and admitting vacuum to its pneumatic which then collapses and through a pull wire, opens a valve in the wind chest causing a pipe to sound. All this happens nearly instantaneously so that rapidly repeated notes can be performed. This system must have mystified people seeing it in operation in the late nineteenth century.

As with the rest of the organ, the roll frame was badly worn from years of use. *(Figure 20)* Most bearing and shafts were worn or scored. The nickel plating was corroded and pealing. The wood take-up spool was deeply scored by the rewind-stop finger. The remains of the original brass tubing were not salvageable. Oil and grease were everywhere.

Most importantly, the tracker bar had been replaced. The original bar was found with the organ, but it had split and warped beyond the possibility of restoration. While the replacement did function, it was not made with the quality or specifications of Welte and had to be replaced. New Welte type tracker bars have been made in the past, but with luck, an original Welte tracker bar was acquired for use here. Spare Welte parts are very difficult to find.

The scored area of the take-up spool was filled with epoxy and then turned on the lathe to

Figure 21

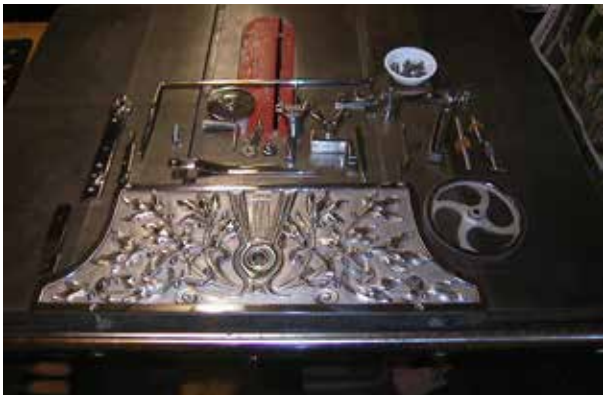

Figure 22

Figure 23

Figure 24

blend in the repair. Both shaft ends of the take-up spool were badly worn. Each end was cut off, bored and a new shaft extension pressed in, then turned to the proper dimensions. *(Figure 21)*

The iron and steel portions of the roll frame which had been nickel plated were sent to a metal refinisher who specializes in replating of vintage mechanical devices with Watts nickel. Watts is an old process that was used in the original plating. *(Figure 22)* As added protection, all nickeled parts were lacquered.

Remaining shafts and bearings of the roll frame drive system were remade or trued. A micro-switch was added to the control system to activate the electric motor. The original open mercury switch was left in place, but no longer functional. A missing lever and linkage were made to facilitate the manual control of the organ. *(Figure 23)*

Finally, all new annealed, polished and lacquered brass tubing was installed to connect the tracker bar with the pneumatic stack. *(Figure 24)* Then the completed roll frame was finally reassembled. *(Figure 25)*

The roll frame is driven by two separate sources. A belt drive from the crank shaft moves the roll frame during rewinding of the music roll. For moving the roll forward in the play position, the wind motor is used. This is a speed controllable motor operated by vacuum. It uses three pneumatics which turn a rotary valve and drive shaft. The pneumatics were recovered with kangaroo leather with exterior folds. New bearing pins and connecting rods were made. *(Figure 26)*

A reproduction of a Welte tracker bar pump was installed to the left of the roll frame. These were found on most organs, perhaps as an option. This is an important maintenance tool used to suck lint out of the tracker bar ports. New rolls can shed enough lint to clog the ports. *(Figure 27)*

Figure 25

Figure 28

Figure 26

Figure 29

Figure 27

Wind Chest

All the organ pipes sit atop the wind chest which contains a pallet valve for each pipe. These valves are opened by pull down wires from the pneumatic stack. This type of chest is known at a ventil wind chest. Each rank of pipes, or register, is controllable separately as dictated by the music roll.

The leather valve facings on the pallet valves had been replaced, as well as the pallet pull wires. It was felt for optimum operation, they should be stripped and redone to factory specs. All channels were resealed with shellac. A double layer of sheep skin was used for the valve facing and kangaroo leather used for the tail hinges. *(Figure 28)* New pull wires were installed to move the valves. New return springs were made. *(Figure 29)* The top surface of the wind chest was then covered with a leather

Figure 30

Figure 31

Figure 32

Figure 33

gasket and the toe boards attached. The bottom of the chest was sealed with paper and the bottom boards attached. *(Figure 30)* The ventil pneumatics which control the registers were recovered with kangaroo leather. This unit is mounted on the right end of the wind chest.

Percussion

Orchestrions were designed to play orchestral and operatic transcriptions, so naturally, they had percussion instruments. This organ has a bass drum, cymbal, snare drum and triangle. All were intact, though not operating well. After refinishing, new skin heads were put on both drums. The cymbal center hole was broken out. This was repaired and a new mount made. A new triangle striker was made.

The bass drum beater unit is vacuum operated and has a large hammer which strikes the drum and cymbal. It also has two smaller beaters to simulate a tympani roll. These beaters and their pneumatics required replacement. *(Figure 31)* Interior pouches and valves were also replaced.

An interesting bit of graffiti was found inside the bass drum shell. It is the signature of a workman and "Freiburg 1907". *(Figure 32)*

The snare drum action is vacuum operated. The coil of tubing behind it is part of a pulse delay mechanism that triggers the drum hammer on and off for a fast repetition drum roll. The original coil was to badly damaged to be reused and was replaced. *(Figure 33)*

An additional feature of this organ is a swell shade—a movable flap in the top of the case to control volume level. This is controlled pneumatically by the music roll.

Pipework

Tonally, the most important part of any instrument is the pipework. This organ was fortunate in that its 184 pipes had remained in very good condition. A general cleaning and cosmetic work was given them. The wood pipes

Figure 34

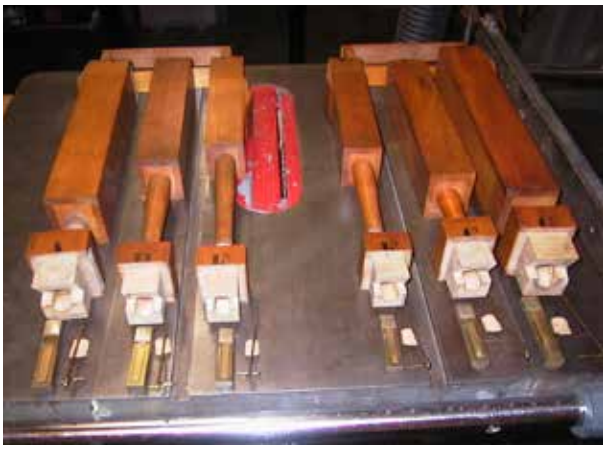

Figure 35

had their tuning stoppers releathered, or their tuning slides removed and cleaned. The silver tin pipes in the very front of the display had all dents removed, tuning scrolls remade and were then polished and lacquered. The brass pipes also required dent removal, polishing and lacquering. These pipes had lost their regulating plugs. These are wood sleeves fitted inside the bottom of each resonator and bored out to control the volume of each pipe. *(Figure 34)* Each brass pipe fits into a reed boot which contains a tunable free brass reed. These were also in excellent condition and only required cleaning. *(Figure 35)*

After the organ was powered up for the first time, the wind chest was blown out and then the pipework installed. *(Figure 36, 37, 38)*

At last the organ was ready for its final regulation and ultimate goal—to make

Figure 36

Figure 37

Figure 38

Figure 39

Figure 40

Figure 41

music. This was accomplished over several weeks. All the components of the pneumatic action are interrelated and must work together. The final regulation controls the promptness of the action and its ability to repeat rapidly. The pipework must be tuned and then voiced so that each pipe is the same volume and tone as its neighbor within each register. Each register must be balanced to blend well with the others. Percussions must be adjusted to the right level. *(Figure 39, 40)*

The reward of these many hours of work is hearing the finished instrument once again sound as it did in 1908. An additional bonus is knowing that this organ is back in Zaharakos where it will be cared for and appreciated for many years to come.

Durward R. Center stands next to the restored Welte at Zaharakos in 2008. *(Figure 41)*