The following article written by Bart Hopkin is reprinted with permission from the Experimental Musical Instruments journal, December, 1993.
E-mail them at: EMI@windworld.com or Write them at:
Experimental Musical Instruments, P.O. Box 784, Nicasio, CA 94946.

Deagan Organ Chimes

By Bart Hopkin

~~~~~TABLE OF CONTENTS~~~~~

Deagan Organ Chimes

Physical Description

Orgin and History of the Organ Chimes

Surviving Instruments

Air Resonance Tuning for Chimes

DEAGAN ORGAN CHIMES

J.C. Deagan and Company is known as a manufacturer of marimbas and xylophones. In fact, it was the company's founder, J.C. Deagan, who probably did the most to popularize these instruments in the United States and Europe, and to standardize their form for use in popular, orchestral and chamber music. What is less well known is that the Deagan Company in its early days didn't stop with marimbas, but actually introduced an extensive line of new and unusual instrument types. Most of them are now pretty well forgotten, yet a few specimens are still around today. This article describes one of them: the *Deagan Organ Chimes* - one of the most interesting and sophisticated instruments from the early Deagan line.

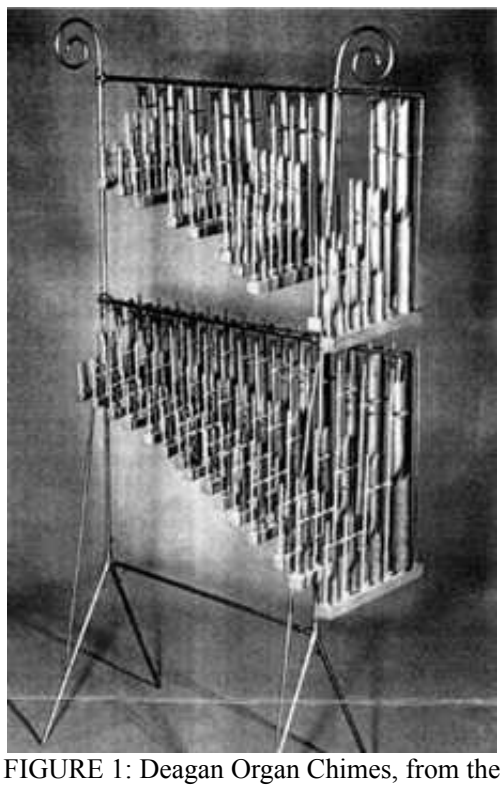


FIGURE 1: Deagan Organ Chimes, from the Arne B. Larson Collection at The Shrine to Music Museum, University of South Dakota at Vermillion.

A few months ago I got a letter from Art Sanders, owner of the Musical Museum, home of an excellent collection of mechanical instruments located in Deansboro, New York. The museum had been keeping a very rare, large set of Deagan Organ Chimes (sometimes also called *shaker chimes*) on loan from the instrument's owners in Connecticut. But the museum was unable to display the chime set properly. Figuring correctly that this was something right up EMI's alley, Art Sanders contacted me to ask if, with the owners' approval, EMI would be interested in keeping the set, making them accessible to people interested in seeing or studying them, and documenting them more fully. I said "Yes!", and soon I was in touch with Mrs. Floris Dinda and Mrs. Geraldine Kelly, daughters of Frank Tinker who had originally acquired the instrument almost 80 years ago. We agreed to a loan arrangement; the daughters Tinker generously provided a great deal of background information, and the Tinker Family Organ Chimes arrived at EMI's humble headquarters in the fall of 1992.

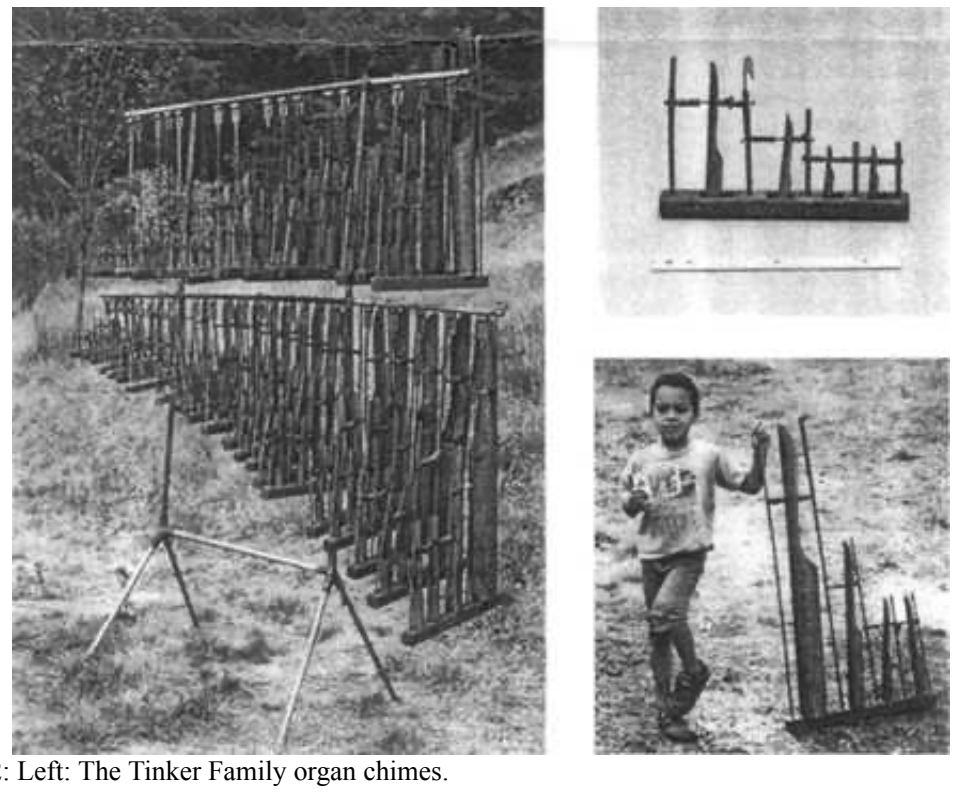


FIGURE 2: Left: The Tinker Family organ chimes.
Right above: The smallest chimes of the set, shown with a one-foot ruler to provide a sense of scale.
Right below: The largest chimes of the set, shown with Shane to provide a sense of scale.

Back to Table of Contents

PHYSICAL DESCRIPTION

What, then, are Deagan Organ Chimes? For anyone familiar with non-western instruments, the easiest answer is to say that they look very much like a set of Indonesian angklungs, but made of metal rather than bamboo. Each individual note actually consists of four specially-shaped, tuned tube chimes of nickel- plated bell metal supported in a frame, as shown in Figure 2. One chime is tuned to a fundamental pitch; another an octave above that, and two more another octave up. At the bottom of each tube are two small tabs, 180 degrees apart, extending another half inch below the stopped end of the tube. When the chime is shaken, the tabs glide back and forth in a short groove cut into the wooden bottom of the chime frame, causing the chime to sound when the tab strikes the wood at either end of the short groove. The instrument taken as a whole is made up of a chromatically-tuned set of these frames, each providing one note in the instrument's range. The frames are designed to be hung on a large rack standing on the floor, which arrays them in front of the player in an immense keyboard arrangement with the naturals in a lower row and sharps and flats in a row above. The whole assembly stands over seven feet high and five or more feet wide. The player sounds the chimes by shaking the frames as they hang in the rack.

I used the word *immense* a moment ago. The largest chime in the Tinker Family set is just over 3 feet long, pitched at E_3 (E below middle C). The range extends up chromatically just over three octaves to F_6 for a total of 38 pipes. The largest sets that Deagan made, according to old Deagan catalogs, contained forty-nine chime frames, for a range extending from G an octave and a half below middle C to G four octaves above that, with these largest sets requiring two floor racks. The floor racks were made with segments of rod and tubing in a utilitarian arrangement designed for lightness, portability, and ease of assembly and disassembly. Deagan's promotional literature declared that the frames could easily be removed from the rack and packed in a trunk "in but a minute's time" (a slight exaggeration, I suspect). Deagan also made a less elaborate version of the instrument, called *Aluminum Chimes*. These had three tube chimes in each frame rather than four, and the available range was slightly less.

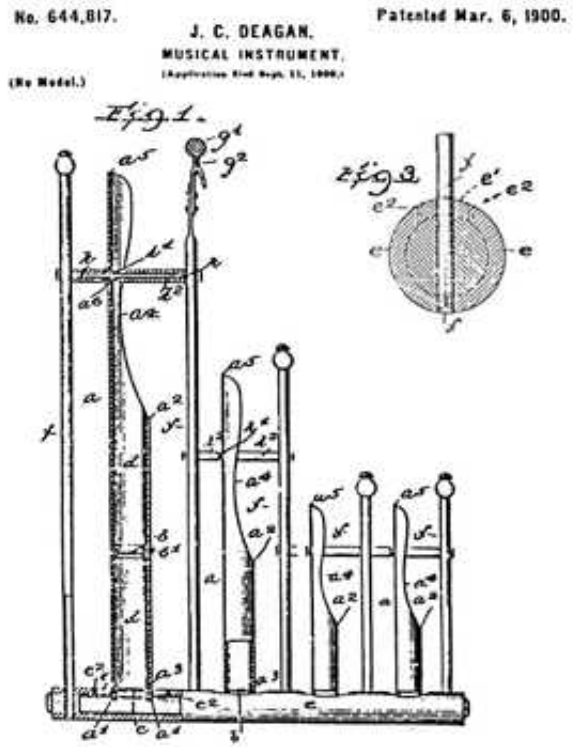
I have said that the chimes were tuned chromatically, which is to say, they were tuned to twelve-tone equal temperament. The Tinker Family set, now 80 years old or more, is badly corroded in places, but the relative tuning seems to have held reasonably well for most, though not all of the chimes. A footnote in one of the promotional pieces for the instrument (this one from a Wurlitzer catalog ca. 1913) reads "All Deagan Instruments [are] tuned to International low pitch A-440 unless otherwise specified." Whatever the original tuning, the Tinker Family set is a bit below A-440, and I have heard that another surviving set is slightly sharp.

These tuning questions lead to one of the most important features of the organ chimes - a feature which Deagan's promotional literature, perhaps in the interests of trade secrecy, never mentions. The promotions speak of the rich, full tone of the chimes, but they don't say what makes the tone so rich. Here's the secret: each tube chime is air-resonance tuned. The resonant frequency of the air enclosed within the hollow tube matches the fundamental pitch of the ringing metal itself. The two reinforce one another, just as with a marimba bar and its resonator tube hanging below (something J.C. Deagan knew a bit about). The resulting tone is much fuller, louder, rounder, and less clangy than the metal tone alone. And while the air resonance frequency coincides with the fundamental in the metal tone, it does not match the metal's inharmonic partials. Thus, it enhances the fundamental and discriminates against the inharmonic partials - an effect that contributes to the clarity of pitch and the reduction in clanginess.

It is by means of the special cutaway shape of the organ chime tubes that the agreement is achieved between the metal chime tone and the air resonance. By removing more or less metal in the right places, an experienced chime tuner would have been able to adjust the air tone and the metal tone independently, with the goal of making the desired coupling between them at the desired pitch. Deagan describes the process in the patent he took out to cover the organ chimes (U.S. Patent #644,817; see Figure 3). The organ chime tube, unlike simpler tube chimes, is closed at the lower end. This lowers the air-resonance frequency by about an octave below what it would be if both ends were open, and makes the resonance a bit stronger and more focused. See the appendix at the end of this article for more on the air resonance

tuning.

Figure 3: Drawings from one of the organ chimes patents, dated 1900.



Many small variations and discrepancies exist among surviving sets of organ chimes, and they often don't display some of the features described in Deagan's original organ chimes patent. For instance, in the patent Deagan carefully describes special features for reinforcing the tabs at the base of each tube and transmitting the percussive impulse, yet the surviving Tinker set lacks these features. The patent also speaks of slideable end stoppers for tuning the air resonance, as well as dual resonance chambers (divided by the stopper set in the middle), both of which appear to be absent in most of the surviving instruments.

So what does a well-tuned set of organ chimes sound like? To get a mental sound-image, recall that, with the multiple-octave chimes within each frame, each note is doubled at the octave and again at the second octave. Remember too that the sound is produced by shaking - thus, the tone typically is not a single peal, but an ongoing series of rapid chimings at the sounding pitch. They run together in a continuous sound lasting for as long as the player continues to shake the frame, for a chiming tone which at the same time has the sustained quality of a wind or bowed string instrument. With its great clarity of pitch and the fullness of the air-resonated tone, the instrument rings out with good volume and carrying power, and a certain bigness of tone. It is tempting to draw comparisons to Indonesian instruments, both because of the organ chimes' physical resemblance to angklung, and the association of metal percussion with gamelan. Despite the organ chimes' western tuning, there is a quality to the sounding effect that does share something, subjectively speaking, with some Indonesian music. But the music that organ chimes have most often been used for, in keeping with the times and places they've been used, have been Christian hymns, Christmas carols, old-fashioned British and American popular songs, patriotic songs, and the like - all of which can be rendered charmingly on the chimes in one, two, even three or four parts.

Back to Table of Contents

ORIGIN AND HISTORY OF THE ORGAN CHIMES

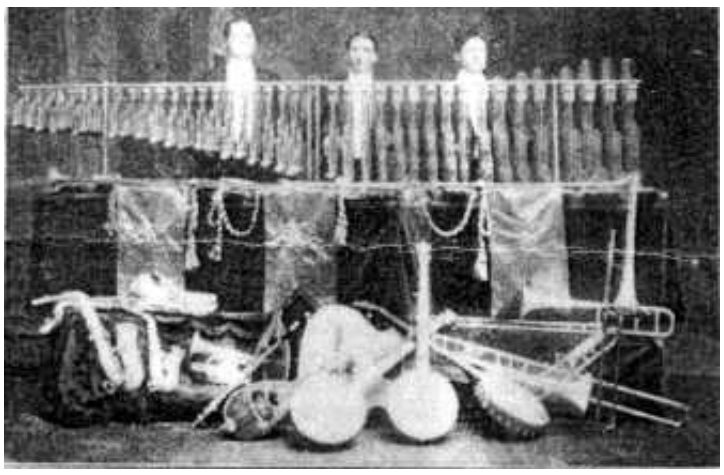
John Calhoun Deagan, the original force behind J.C. Deagan Company, began making xylophones the latter years of the 19th century, completing his first "orchestral quality" xylophone in 1888. From that time until 1910, he made xylophones on order to the buyer's specifications. After 1910, standardized models with model numbers were introduced. In those early days Deagan also specialized in producing a wide range of hand bell sets. At the same time, he seems to have experimented with a variety of other innovative instrument types. The organ chimes were among the earliest of these, bearing U.S. patent dates of 1900 and 1901. The name *organ chimes* seems to have been created in part in reference to the sustaining quality of the tone when the chimes are continuously shaken, and in part to the octave duplication within each organ chime tone, by analogy to the composite nature of organ registrations.

How Deagan developed the organ chime design is anyone's guess, but the similarity in shape and overall conception to the Indonesian angklung is too strong to ignore. The bamboo angklung shape is virtually identical, as is the arrangement of multiple sounding elements within a framework, and the technique of playing by shaking. While angklungs in Indonesia are most often hand-held, they are sometimes rack mounted as well. The air-resonance tuning likewise can be found in well-made angklungs.

Circus World Museum in Baraboo, Wisconsin, houses an excellent collection of early handbills, postcards, newspaper advertisements and the like pertaining to circuses and other early popular entertainments. The collection is complemented by the private collection of Fred Dahlinger, Jr., director of the Robert L. Parkinson Library and Research Center (affiliated with Circus World). Mr. Dahlinger has come up with newspaper advertisements placed in the *New York Clipper* in the years 1896 and 1897 by J.C. Deagan, featuring something called "Bamboo Chimes." Here, then, is a likely candidate for the missing link. On the other hand, Mr. Dahlinger also notes that The Circus World collection contains a Barnum and Bailey poster from 1889 showing (somewhat obscurely) something called the "East India, Melodious, Tubular, Metal Piano." This, he speculates may have been an early set of organ chimes or similarly shaken chimes - though whether it was the work of J.C. Deagan is anyone's guess.

Meanwhile, none of the surviving Deagan literature makes reference to angklung or any other precedent. Instead, it leaves the impression that the inventor developed the idea for the instrument entirely on his own. Nowadays there are plenty of books, recordings, films and museum collections making knowledge of exotic instruments reasonably accessible and commonplace in the west. A hundred years ago this was not the case. If J.C. Deagan had some knowledge of Indonesian instruments, he could easily at that time have borrowed their forms, even patented them as his own, without acknowledgment their origins, without much concern that his sources would be recognized. FOOTNOTE 1

WELLS BROTHERS AND SMITH



They have just finnished one of there most successful seasons, artistically and financially, in their career, having played 32 weeks and toured the country from coast to coast without receiving one adverse criticism. They are now duplicating that record in the summer parks. The act is a high-classed one, appealing to all music lovers, and is a positive feature on any bill.



FIGURE 4: Magazine clippings from the collection of Fred Dahlinger. Both of These appeared in Billboard, dated 1905 and 1906.

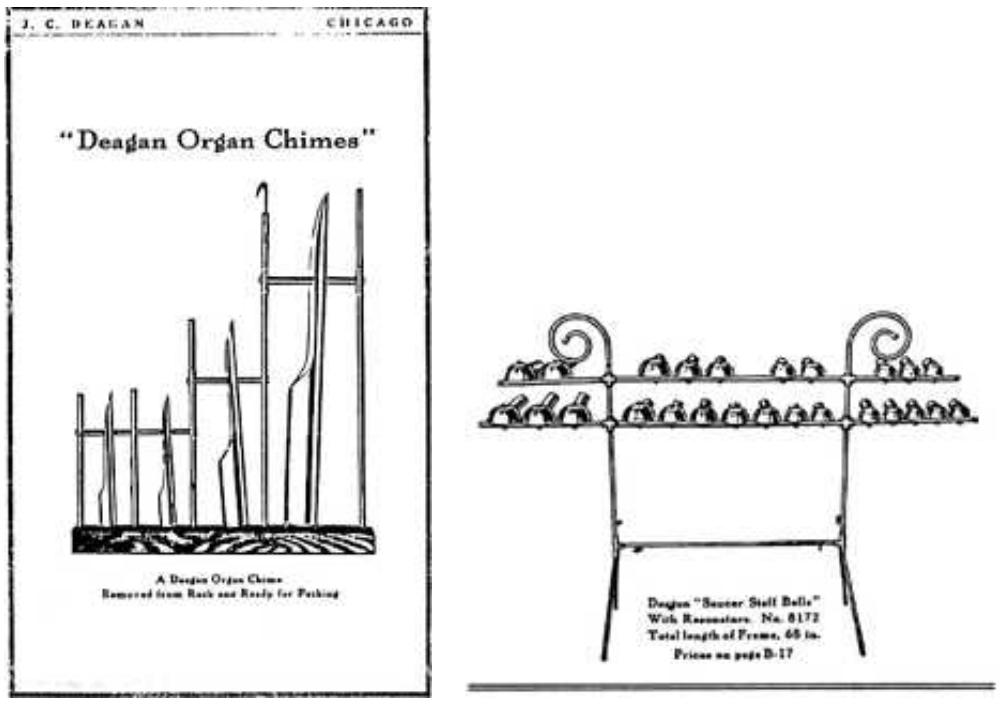
It doesn't appear that a great many sets of organ chimes were manufactured and sold. Despite the undeniable appeal of their sound, they were a big, expensive instrument, and it likely would have been difficult to get many people to part with that much money for an exotic unknown. Where Deagan's marimbas gradually succeeded in creating a market niche for themselves, the organ chimes, along with most of the other innovative Deagan instruments, did not. For comparison: Of Deagan's *Nabimba*, an exotic mirliton marimba, only about fifty were ever made. FOOTNOTE 2 Statistics for the comparably priced organ chime have not come down to us, and so it's hard to say whether the numbers were very much larger.

Yet the instrument does seem to have found a place with at least a generous handful of novelty musicians and groups, and in some circuses.

The organ chimes remained available from Deagan at least until the early twenties. Percussive Notes, the magazine of the Percussive Arts Society, recently reprinted a set of Deagan catalogs from that period. FOOTNOTE 3 Catalog "H" from that set, titled Deagan Musical Novelties contains seven pages devoted to organ chimes and the related aluminum chimes, including pictures, descriptions and price information. (Pages from the catalog are reproduced in figure 6.) The language, of course, is glowingly praiseful, as in "All the various musical instruments listed in this catalog were invented by J.C. Deagan, who is universally recognized as the world's greatest accoustician." As for the organ chimes, they are "universally conceded as being the greatest novelty instrument ever invented." The catalog gives information on twenty-eight available models of organ chimes and aluminum chimes, with Deagan model numbers between 5400 and 5530. Prices range from $95 (in 1920s dollars) for a set of 15 aluminum chimes in the upper range, to $650 for the big 4-octave set of organ chimes on two floor racks.

I have not been able to ascertain when Deagan Company stopped making organ chimes. The entire line of "novelty instruments", among which the organ chimes were prominent, surely had long been out of production when Deagan Company became a division of Slingerland Drum Company in 1977. In 1986 - to bring the story up to date - the Deagan name and all that went with it was sold again, to Yamaha. Yamaha has continued to sell some Deagan chimes and orchestral bells, but the remainder of the Deagan line has been discontinued.

Figure 6: A page from an early Deagan catalog. Below, a picture from the same catalog of another Deagan instrument used in the Tinker Orchestra, the Saucer Bells.



FOOTNOTES, ORIGIN AND HISTORY OF THE ORGAN CHIMES

1. Deagan did, in a sense, acknowledge some of his antecedents with his bar instruments, by calling them by names reflecting their origins (e.g., marimba and nabimba), but he doesn't seem to have divulged their origins further. The nabimba, for instance, was a marimba-like instrument with mirliton membranes attached to the resonator tubes to increase the volume and add a distinctive tone quality. This was an idea taken directly from both African and Guatamalan marimbas, but Deagan actually patented it for himself and presented the idea in his catalogs as a great innovation.
2. This figure comes from Frank M. McCallum's Book of the Marimba (Carlton Press, 1969).
3. Percussive Notes Research Edition, March/Sept 1986. This is a fascinating set of documents, highly recommended – write the Percussive Arts Society for information on availability at PO Box 25, Lawton, OK 73502-0025

Back to Table of Contents

SURVIVING INSTRUMENTS

In the process of researching this article, I have gotten word of about a dozen surviving sets of organ chimes in various locations across the U.S. How many more there may be, I cannot say. Here are some notes on a few of the remaining sets.

The Frank M. Tinker Singing and Dancing Orchestra, also known as Tinker's Singing Orchestra, flourished from 1904 through 1938 in Massachusetts and neighboring states. Frank Tinker was the orchestra's drummer; his wife Frances E. Tinker played saxophone, and at the organ chimes (at least during the time period around 1930) was one Wilfred F. Oldale. Mr. Tinker purchased the Organ Chimes set shown in Figures 2 and 7 sometime around 1915, and they quickly became a featured instrument in the orchestra. Surviving photographs show a group of ten players, with instruments including banjo, piano, saxophones, trumpet and trombone, string bass, and drums. The group also played at least two other unusual Deagan instruments: The saucer bells (Figure 6, below) was a tuned bell set mounted on a floor rack. Fancier versions had small tubular air resonators attached directly to the side of each bell. The Unaphone or Una-fon reportedly was a keyboard-operated electromechanical metal-bar xylophone with resonators.

After the orchestra disbanded, the Organ Chimes set remained in the Tinker family. For many years they were packed away in storage. In 1990 two of Frank Tinker's daughters, Mrs. Floris Dinda and Mrs. Geraldine Kelly, arranged to send the chimes to Art Sanders' Musical Museum in upstate New York, and from there, as described earlier, they found their way to EMI.



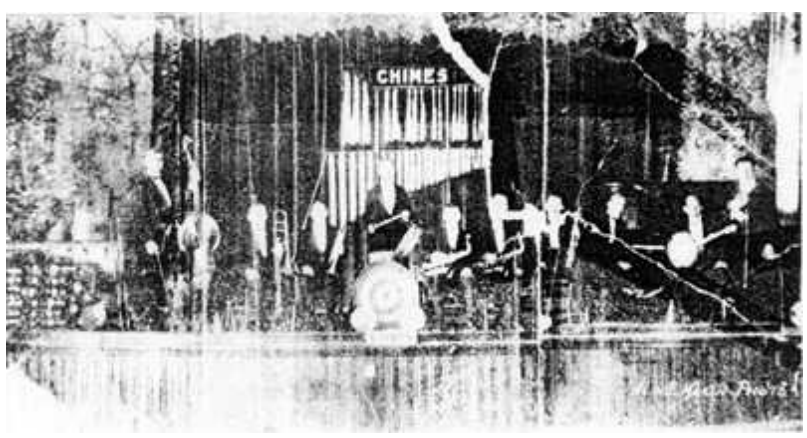


FIGURE 7: Billboards for "Tinker's Famous Singing Orchestra"

Marion B. Cox, in Bountiful, Utah, has maintained a set of Organ Chimes in good condition, and plays them with extraordinary clarity, precision and virtuosity. He has performed on them intermittently since they came into the Cox family in 1934, when he was 12 years old. Mr.

Cox continues to provide the musical sound of Deagan Organ Chimes on special public occasions and for friends and family in his home.

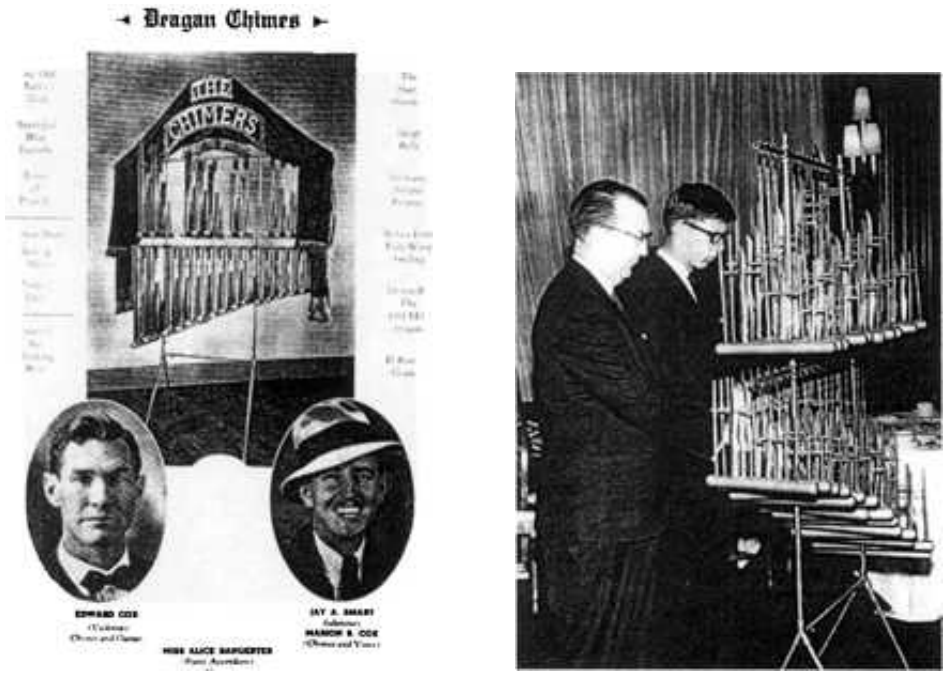


FIGURE 8: Above left: an early poster for "The Chimers."
Above right: the same chimes set played by Marion B. Cox and son Paul in 1967.

During the years 1935-1946, the Cox chimes were the star attraction of a touring musical group formed by Mr. Cox's father, Edward Cox, then of Salt Lake City, Utah. "The Chimers" performed at hundreds of schools and other facilities in Utah, Idaho, Oregon, Washington, Nevada, Arizona and California, and in Utah and Idaho in 1952- 1962. During the earliest years, the chimes were played by Mr. Cox's sister, Bernice Cox (Sly), who also gave humorous readings, and a cousin, Eva Cox, widely acclaimed as a world-class yodeler as well. By age 17, Mr. Cox had gradually developed a repertoire of solo music on the chimes that included three and four-part harmony, then toured with the group as chimes and vocal soloist in 1938.

The elder Cox was an accomplished musician, music teacher, and composer. He acquired the Deagan Organ Chimes from George Barzee, a Salt Lake City piano tuner. Mr. Barzee received them in partial payment of tuning services for Ringling Brothers and Barnum & Bailey Circus while it was in Salt Lake City in 1933. Based on writing stamped on a C chime pipe, "J. C. DEAGAN, CHICAGO, MAR 16-1900," it is thought this instrument was made as early as 1900.

Mr. Cox has personally seen one other set of Deagan Organ Chimes. He was living in Hemet, California, in 1949, when he and his wife, Joyce, were startled to see Deagan Organ Chimes standing on a downtown city sidewalk. An itinerant minister was using the chimes to help promote a revival meeting. Mr. Cox then age 28, excitedly told the minister he owned a similar set of chimes. The minister was skeptical and did not share Mr. Cox's enthusiasm, but invited him to play. A large group of Saturday afternoon shoppers gathered to hear "The bells of St. Mary's," and the minister had a captive audience to invite to his revival meeting.

Mr. Cox taught most of his children to play duets with him on the Deagan Organ Chimes during their teen years. His sons Paul, Gary, Dale, Dwight, and daughter Jana, participated in public. Mr. Cox has given hundreds of public performances, including a memorable series in the rotunda of the Utah State Capitol Building - bringing a new dimension to the sound of Deagan Organ Chimes music as it reverberated for several seconds from the marble walls and hard-surface floors throughout the cavernous building.

*The author received an update on the Cox family and their Deagan Organ Chimes in an email from July, 2002.

Dear Bart,
Marty Cox, my Grandfather, asked me to write to you and ask you to put a small update in the article about his Deagan Organ chimes, where it refers to his children playing duets with him. Could you please add his granddaughter Chalae Cox, who subsequently played duets with him. These included a unique "two-deagan-chimes-sets" performance with Ellen Schultz, of Sacramento, who had acquired the chimes set formerly owned by Reverend Alley. Thus making four generations of Coxes who have played duets on this set of Deagan Organ Chimes. His wife Joyce, has also, reluctantly, begun to play duets with him. Thank you! He thoroughly enjoyed seeing the chimes recognized on the internet. Thanks for doing such a wonderful thing.
Sincerely,
Chalae Cox

Circus World Museum (426 Water St., Baraboo, WI 53913) has three sets of organ chimes. The largest of them, a 27-note set, is demonstrated in performance by a museum docent three times a day. It was previously used by novelty performer Larry Benner of Miamisburg, Ohio. One of the smaller set has been used in a wagon for parades.

Among additional surviving sets not privately held are one in excellent condition at the Shrine To Music Museum at the University of North Dakota (414 East Clark St., Verniiffion, SD 57069- 2390) (this is the beautifully preserved set shown in Figure 1); one at The House on the Rock (Highway 23, Spring Green WI, 53588; phone (608) 935-3639); and one at Purdue University.

Special thanks for assistance with this article to Mrs. Floris Dinda, Mrs. Geraldine Kelly, John G. Tinker,Art Sanders, M.B. Cox, Margaret Downey Banks of the Shrine to Music Museum, the Percussive Arts Society, Fred Dahlinger Jr. of Circus World Museum, and Greg Filardo.

Anyone interested in seeing and hearing the Tinker Family Organ Chimes should contact Bart Hopkin at EMI.

Back to Table of Contents

-

-

-

-

AIR RESONANCE TUNING FOR CHIMES

[Since 1993 when this was originally written, the author Bart Hopkin has learned more about air resonance tuning in chimes. For updated information, you can contact him at emi@windworld.com]

As part of my research for writing this article, I spent a few hours in the shop experimenting with air resonance tuning for chimes. What follows is certainly not the last word on the subject, but here are some notes on what I learned.

First, some background, starting with a discussion of simple cylindrical tubes. (We'll get to the more elaborately shaped organ chimes in a moment.) The air enclosed within a hollow cylindrical tube will have certain natural resonance frequencies. These are the frequencies at which the air is naturally inclined to oscillate, once excited. You can determine what these frequencies are by finding some way to excite the air inside. An easy way to do this is by blowing flute-style over the edge at the end of the tube. As you do so, listen to hear what pitch dominates in the somewhat breathy tone that results. Normally there will be a lower pitch which dominates in the sound. That's the lowest resonance frequency, the fundamental. Some overtones, representing additional resonance frequencies in the air column, are usually present as well, but they tend to be subtle and more difficult to hear.

The metal of the chime itself also has its resonant frequencies - the ones you hear ringing out when you strike it. These likewise consist of a fundamental mixed in with overtones, blending together to form the chime's composite timbre. If one of the air resonance frequencies happens to agree with one of the metal chime frequencies, then the chime tone will excite the air resonance when the chime rings. The two will reinforce each other, and the overall result will be a stronger, richer sound from the chime. The best results usually come about when the fundamental of the chime tone matches the fundamental air resonance, rather than matches between the overtones. That's partly because the fundamental air resonance is usually the strongest, and so gives the richest result. It's also because in most cases (though not all), it is the chime's fundamental that we most want to hear, and so it helps to have the air resonance bring out that tone selectively. With many chimes, especially metal chimes in the lower ranges, the overtones tend to be overly strong relative to the fundamental. Chime overtones are non-harmonic. Their prominence in the tone gives the timbre a clangy quality, and creates ambiguity in the tone's perceived pitch sense. A rich air resonance at the fundamental helps alleviate those problems, as well as increasing volume and lending a special fullness to the sound.

There are actually two possible resonance systems in hollow cylindrical tubes. One is the resonance you get when both ends of the tube are left open. The other is the resonance you get when one end is stopped, by means of some sort of solid end-covering, or perhaps something like a cork. The fundamental for a stopped-end resonance is a little less than an octave lower than the fundamental for the same tube with both ends open.

For cylindrical metal tube chimes of typical dimensions, the fundamental air resonance is well below the fundamental chime tone, for both open and closed tubes. The challenge then is to think of ways to either raise the air resonance or lower the chime tone without at the same time defeating the purpose by causing a parallel change in the other. One way to do this is to try using a very slender tube (the skinnier and less rigid the tube, the lower the chime pitch). For various reasons which I won't enumerate, this approach is impractical and yields poor results anyway. Another way is to give the tube an end stopper in the form of a cork, and then slide the cork the right distance up into the tube. The idea is to shorten the air column length to the point where the air resonance matches the chime tone. For typical chime dimensions, it turns out that this means sliding the cork to a point where the air column constitutes only a small percentage of the overall tube length. For I don't know what reason, this conveniently simple and seemingly promising approach did not yield enhanced resonance when I tried it. Maybe someone else will have better luck with it.

The third approach - and this is the one that has proven most successful - is to somehow open up or cut away part of the tube, so that the effective air column is substantially shortened while the overall tube length for chiming purposes is less affected. This is how the organ chimes work, as well as the bamboo angklung. In these instruments, one side of the chime tube is sliced away over a large part of the tube length, leaving only a short portion of the original air column intact. Removing all that material also affects the chime tone, but not in a fashion that parallels the rise in the air resonance tone. Removing mass from one end of the chime tends to raise the chime tone, but removing material near the center tends to reduce its rigidity in the region where it needs to flex, which lowers the chime tone. Thus, by the shaping of the cutaway, you can controllably tune the chime tone without affecting the air tone. Meanwhile, you can tune the air tone by continuing the cutaway farther along the tube, thus altering the length of the enclosed air column. Another trick is to use a slideable stopper such as a cork for the end-stopper, and tune the effective air column length by sliding the cork a short distance farther in or out (I found this to work nicely with the organ chime configuration, even though, as mentioned above, it didn't work with the simple tube). On the Deagan organ chimes the cutaway typically extends to about half the tube length for the bigger, lower-pitched chimes, and up to about 60% or more for the smaller ones. The depth of the cut is about 2/3 of chime diameter. Bamboo angklung - those that I've been able to check anyway - show similar lengths of cut, but depths of only about 1/2 of tube diameter.

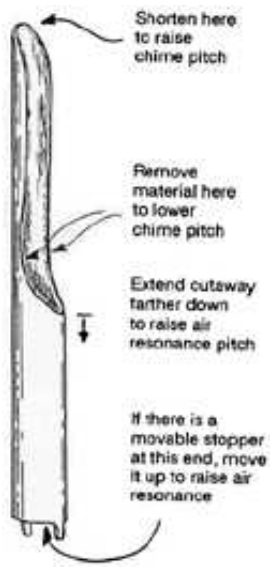
When I made a few Deagan-style metal chimes, I found that alter- ing the original tube shape by making the cutaway seriously undermined the Extend cutaway clarity of the chime tone. Tuning the air resonance to raise air resonance pitch then brought back some of the tone, but I remain en- vious of both the angklung makers and the organ chime makers for having somehow retained excellent clarity in the chime tone even with the cutaway shape.

Altering the tube shape by making the cutaway means that the tube is no longer symmetrical all around. As a result, the chime manifests different modes of vibration depending upon the angle of the strike. It produces multiple fundamentals - struck from the side it sounds one tone; struck from front or back it produces another. Angklung and organ chimes are mounted in their shakers in such a way that the percussive impact always comes from the right direction to excite the desired mode and minimize the audible effect of the other tones.

While I was trying out the principles of organ chime and angklung tuning, I also explored several other ways to alter the form of a tube chime so as to bring up the air resonance. Some approaches yielded so-so results, and some proved quite satisfactory. Let me describe the most successful and conveniently do-able of the techniques tried.

It occurred to me that you can treat a cylindrical metal tube chime like a flute: drill toneholes along the side to raise the air resonance pitch. Typically, when you've drilled a row of holes over about 60 or 70% of the overall tube length, you can achieve a match between the open-tube resonance pitch and the chime fundamental, and the tone will ring out with noticeably increased fullness and volume. You can verify the effect, once you've got the match, by striking the chime and then gently blocking and unblocking the first tonehole with a finger:

you'll get a wah-wah effect, much like the vibrato of a vibraphone, as the resonance match is alternately un-done and then restored.



A few notes on the process: Don't bother trying to shortcut the situation by drilling a single tonehole far up the tube. There are acoustic reasons why you need the row of open toneholes, just as on a flute. But the sizing and spacing of most of the toneholes is immaterial; I suggest making them about 1/2 of tube diameter and an inch or an inch and a half apart for a typical-sized chime. Start the series near one end of the tube, and proceed from there, checking the air resonance against the chime tone after drilling each new hole. The last hole you drill - the one closest to the hole-less end - is the one that will matter most in determining the air resonance tone. The closer to the hole-less end it is (the shorter the air column in the hole-less part of the tube) the higher the air resonance will be. Also, the larger that hole is, the higher the resonance. So: when you find you are drawing close to matching the two resonances, drill the next hole at what seems like a reasonable location, but make it small. This should yield an air resonance still a bit low. Then gradually enlarge it until you get the match. The strongest tone will usually come about not as expected at a perfect match, but rather when the air resonance tone is very slightly below the chime tone.

Adding the holes will make the tube slightly less rigid, and so lower the chime pitch slightly. If you place the holes in a straight line, it also makes the tube weaker along one axis than another. The result, once again, is to give the tube two fundamentals depending on the angle of the strike, making it henceforth necessary always to strike from the right direction. You can try spiraling the holes or otherwise altering their location around the cylinder, so that the weakening doesn't happen predominantly along one axis; this may alleviate the dual fundamental problem.

The toneholes trick seems to work best with chimes whose length-to-diameter ratios allow them to have a good tone in the first place. It is only marginally effective in improving the sound of a chime that is too long and thin, making it weak in the fundamental.

Back to Table of Contents Back to Main Deagan Organ Chimes Page

Home