Five Tube Copper Chime Set by Gareth Thomas, England

In the Autumn (Fall!) of 2015 I discovered Lee Hite's fabulous website, luckily before I set about my first windchime construction. In that case, I had accumulated assorted random lengths of scrap copper pipes over the years, of three different diameters, and wanted to know how to go about making a chime where they could all harmonise into a recognisable chord.

With 9 tubes in all, It worked perfectly to produce a C# major 9th chord (with 7th). Lee kindly added my account to his list of visitors' projects on this site.

This time was different – I had acquired, years ago, a 102" length of 1" type M gas mains copper pipe which was old but unused.

I used Lee's excellent calculator to work out exactly what measurements I should need to make five tubes in a 9th chord configuration that wasted no copper. The chart worked perfectly to produce a set of tubes in E*b* 9th, with less than a half inch of pipe wasted overall.

The notes turned out to be: E*b* (longest), G B*b* D & F (shortest), with only minimal grinding needed to create the perfect pitches.

As before, I used end caps to suspend the pipes, which lower the pitch by about 1.5 tones, but this was a common factor to all the pipes.

I can thoroughly recommend this method of suspension, as I had used previously, and fixed the caps with original (hard type) Araldite, taking care to get complete adhesion all around the pipe. This avoids burning the cord when soldering, if you have placed the cords first.

A note here: Last time I used 1 mm braided nylon cord, which I felt was a bit thin, (but is still holding well in fact). So this time I sought out some 1.5mm braided stainless steel wire for a proper job.

Imagine my dismay when I found, when tuning the pipes, that this fine wire *completely kills* the sustain time down to 5 seconds. With fine nylon in place, sustain can reach nearly 50 seconds with this bell-like construction technique. Perhaps this is a problem only for end-cap suspension.

So this time I opted for a slightly stronger nylon cord. Made from 12 strands of thin mono (as 3x4) and twisted into a thin rope. (1.5 mm o/d). I believe it started life as a builder's level cord, used on building sites, and dark yellow in colour. (Fig1)

The top support disc was another treasure from the past: a bulk milk tank inspection port cover cap, 4 ⅝ inches dia., Stainless steel, and just waiting for another life. It did need some mods: firstly the handle on top had to be drilled right through to take the 2 mm braided stainless main suspension cord that I had purchased for that job. I found to do that, my

drill in a pillar press with a 2.4 mm cobalt drill bit and continuous lubrication with fine oil, saw the 2-inch long channel drilled accurately. (Fig2) S/S is a pig to drill otherwise. The S/S cord was fed through then looped and an ally crimp applied.

I used the same drill, with some larger following, to drill the five stations on the rim for the S/S pop rivets I had planned to use as conduits for the nylon cords. (Fig3)

That worked fine too. (I had a number of lovely 5mm shank, 15mm flanged S/S pop rivets surplus from a job and I used them on a number of locations on this chime, to prevent chafing.)

Inserting them into the 5 location holes, I used the rivet gun to pull the captive pin into the rivet end, just enough to create a small swelling in the shaft, to firm its location in the hole, and also to create a small 'bell' on the inside end to accept the very small pop rivet shells that I would use in reverse to trap the knotted nylon cord ends. The pins were not pulled in hard enough to make them bind, and were then removed from the inside ends. (fig4)

I wanted the clapper nylon cord (2mm braided) to join in-line with the 2mm braided steel cord coming through the disc centre, so I used a stainless electrical connector from an ex-storage heater to join them up with no 'dog-leg'. Another pop rivet used there to avoid fraying at the cord exit. (Fig5a + Fig5)

The clapper was fashioned from an old circular wooden candlestick, (badly burned in a previous life), mated snugly into the top of a redundant hard plastic (polypropylene?) peanut bird-feeder, and topped with a brass plumber's blanking disc for extra weight. (fig6)

The ubiquitous S/S pop rivets were again employed top and bottom of course, and the clapper was located on the cord by an adjustable brass screw-trap that started life in an old electric plug. (fig7)

This time, I was going for bottom-aligned pipes for a change, and the desirable sweet spot is very close to the bottom tube-ends. The screw clapper-stop makes fine adjustment so easy. (Fig8)

Two features of this design mean that balance of the tubes relating to their weight is absolutely critical to maintain the perfect stable bottom alignment. These are: the centrally located suspending cord – much more difficult to balance than a 3 or 4 string suspension, and also the hanging order around the circle. Both of these are crucial factors in maintaining a horizontal support disc in the first place.

The suggested order for a 5-pipe chime would be: 1-3-5-2-4, where 1 is shortest and 5 is longest. However, this did not result in a level disc in this instance. I experimented with different orders and the one which works perfectly for this set is: 1-4-3-2-5. The top disc is horizontal, the

tube bottoms are all level and they all appear to be struck equally and at random.

I'd had no plan for a wind sail at the outset, but after reviewing many examples and patterns, I hit upon a beautiful Abalone shell which has been on my shelf for 60 years and which, decades ago, I had polished off the rough surface to make it even more attractive. This fitted the bill perfectly. I drilled through one of the sealed-up holes in the shell rim series and screwed in a drilled screw-post to which an S/Steel S-hook and swivel were attached. (Fig9)

Although perhaps heavier than the usual recommended sails, this seems to work very well with the clapper so close to the bottom tube-ends.

The clearance between the clapper and the tubes is ¼ inch, and the shape of the shell really picks up every breath of wind, and as a bonus, the shell is at last on display for the first time!

On the point of finish for the copper tubes – I wanted the 'spun metal' look that I had achieved before. This means spinning some fairly large lengths of piping.

This time, I fashioned a mandrel from a redundant 28mm end-cap, using a threaded bolt as the shaft. This fits neatly over the end of the pipe to be polished, and if a little slack, I used some plumbers' PTFE tape to fill the gap and provide grip. (Fig10)

The trick is to spin slowly in a drill with a good speed control trigger, and cradling the pipe in the other hand which contains a sheet of dry wetanddry paper, move the abrasive up and down slowly until all polished. Then repeat if needed with medium wire wool.

One important point here: use the drill in <u>reverse mode</u>, or you may well undo the mandrel fixing bolt if you use forward gear. (You are gripping the pipe to some degree)

Then remove from the mandrel and turn round to do the other end inch or so that had not been turned.

To preserve the polished finish, I treated immediately with 50:50 liquid paraffin/petroleum jelly mix, worked well into the surface texture. This has been very successful on my two-year old chime which is still polished with no corrosion, the copper having mellowed to a slightly darker tone.

The result has been a great success, and having carefully cleaned right up the whole length inside of the tubes as well, with a wire brush on a Dremel extension shaft, I am getting sustain times of up to 50 secs with this E*b* 9^{th} chord. (Fig 0 fullchime)

One thing I had not calculated before hand was the compatibility of the two chimes I have made, with each other.

Individually they are beautifully harmonious sounds which you can enjoy for a long time – BUT what I failed to realise is that C# is also known as D*b* and E*b* is AKA D#! So now I have two chimes here that are *one tone* apart – D*b* and D#, and that, my friends is a complete no-no! Individually they are glorious sounds, but together they are a perfect discord and completely unbearable!

Ah well, we have a garden on both sides of a very tall wide house, and they can be sufficiently separated not to clash when in action…

It was an interesting and unexpected lesson to learn nevertheless.

Once again, I cannot bestow too high a praise on Lee's website which is such a mine of information which you may not have realised you will need, and I thoroughly recommend anyone to immerse themselves in it for a few or more hours before embarking on the construction of 'THE PERFECT' Windchime!

Gareth B Thomas, Jan 2018, Ludlow, UK.