



# TRURO MEETING HOUSE REVERE BELL RESTORATION BY THE VERDIN COMPANY BUILDERS OF FINE BELLS & CLOCKS SINCE 1842 *Friends of the Truro Meeting House – June 22, 2017*

## Background

On June 22, 2017, the newly restored Revere Bell was reinstalled at the Truro Meeting House. The Revere Bell restoration was necessary due to a previously failed repair attempt on the crown portion of the bell. Historical castings are very difficult to weld when the exact alloy is not known. As a result, welds often fail and the cracks continued to grow. This risk meant that our bell could break apart if rung again. Project Architect Mark Almeda recommended that the Friends of the Truro Meeting House and the First Congregational Parish of Truro contact the Verdin Company, one of the very few companies with a foundry that is qualified to do the bell repair work. Verdin inspected the bell on site and developed a plan to repair, protect, and preserve it for the future. Funding was requested and received from the Truro Community Preservation Act program for the work.

The first step was to remove the bell from the tower and ship it to the Verdin factory in Cincinnati so that it could be thoroughly examined and evaluated.



*Photos of bell removal and arrival at Verdin Co.*

## Bell Examination and Evaluation

At its foundry, Verdin first removed all of the bell hardware and then bead blasted the bell to remove the paint, corrosion and other contaminants to return the surface down to bare bronze. This was necessary for Verdin to conduct its testing. A visual inspection of the top of the bell clearly revealed the cracks resulting from the previous faulty repair. Further testing was required to evaluate the full extent of those cracks.



Besides the visual examination, there were three different tests done on the top of the bell:

1. **X-ray:** X-rays were taken of the top of the bell and crown. The only crack that could be seen on the X- rays was the original one that could be visually seen.
2. **Radiographic Inspection:** Radiographic Inspection is the process of using short X-rays and gamma rays to look below the surface for something hidden. No cracks were found within the casting.
3. **Dye Penetrant:** Dye penetrant testing is a process that sprays reactive chemicals on the surface of a piece, which brightly highlights any flaws or cracks. No cracks were found except the one that could be visually seem.

The news from this testing was good; there were no hidden cracks protruding down onto the shoulder of the bell. Based on their evaluation, Verdin recommended that the repair as originally proposed could move forward.

## Bell Restoration

The next step in the repair process was to remove enough of the old crown of the bell to include all portions that contained cracks in the casting. Had even the smallest cracks remained, they would have continued to grow when the bell was rung. To remove the crown, the bell was clamped to a vertical lathe and rotated against a tool, which cut all the way through the casting. Once the crown was off, the same tool was used to chamfer the edges of the cut, first on the outside, and then on the inside once





the bell had been flipped upside down. Chamfering the edges would later enable the new crown to be welded to the bell.

The old crown was ground back into its original shape to become a pattern for the new crown. From that, a wax crown was created so that a “lost-wax” ceramic mold could be formed for casting the new crown. An alloy, which is very close to the original bell alloy, was poured into the mold to reproduce a crown identical to the original.



*From upper left: mold for new crown; crown being placed on bell; bell and crown being heated for welding; and new clapper being fabricated.*

Once the new crown was cast and ready, heating elements and blankets were used to slowly heat the entire bell up to a specific temperature. Because of the thickness of the casting, it was necessary to heat the entire bell so that the weldment would cool very slowly over time. If the weldment cools too quickly, it has the possibility to become brittle. When the welding was complete, the bell was cooled down over a period of several days until it reached ambient temperature. The last step of the repair process was grinding and smoothing the weldment to make it look like it was never there. At this point, a patina was applied to the bell so it looks like the originally cast bell, but with the new integral crown. Next, the clapper shank was completed and a bronze ball cast. After it was removed from the mold it was transferred to the machining department for completion. Shown on the next page are photos of the repaired bell being adjusted in the Verdin factory and readied for shipment.





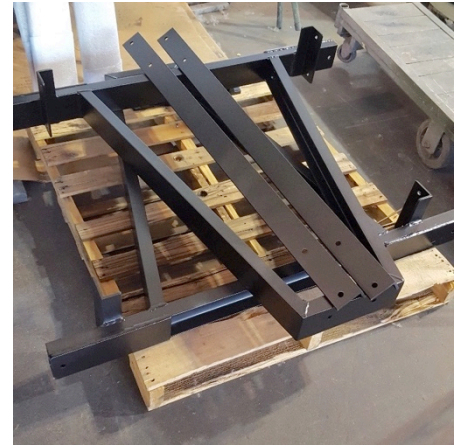
*Restoration of the Truro Meeting House Revere Bell being completed at the Verdin Factory, Cincinnati, Ohio.*



## Bell Support Structure

To construct the new support structure, Verdin cut and milled from oak the wooden support yoke modeled after our original yoke. From the wood shop, the yoke was transferred to the machine department to be fitted with the hardware to hold the bell inside it. At the same time the stainless steel gudgeons for the yoke as well as the stainless material for the support shafts, bolts and collars that hold the shafts in place were fabricated.

The material for the A-stands was cut and machined, holes drilled, and angle cuts made for the fit-up, welding and painting of those parts. Similarly the material for the wheel was fabricated for the fit-up, welding, and painting.



*The photos show machining during the fabrication process; completed A-stands; and the completed wheel.*

## Bell Shipped to Truro

Delivered from Cincinnati on a Verdin truck, the bell arrived in Truro with the new wooden yoke attached and the new fabricated steel headpiece and springs installed. The A-stands were in four pieces: two A-stands ends and two spreaders. The wheel was in two halves. The clapper, pillow block bearings, and rope were boxed.



*The photo at left shows the bell arriving with yoke and clapper attached. Both needed to be taken off the bell for it to fit into the tower. Photos at right show the new yoke and clapper.*



## Bell Installation

Verdin and the Augustus Construction Company performed the Truro installation. First off the Verdin truck were the A-stands, which along with the spreaders and two halves of the wheel were hoisted into the tower by the Winkler Crane Company. The A-stands were located on the wooden platform that had been re-enforced by Augustus. Once these 2 pieces were in place, the A-stand spreaders were bolted to them and the pillow block bearings were loosely fitted to the stainless steel yoke gudgeons. The bell, the yoke and the clapper were hoisted up to the tower and assembled on top of the A-stands. The pillow block bearings were adjusted and tightly bolted. The two halves of the bell wheel were assembled onto the new wooden yoke. With the wheel in place, the rope was attached and the clapper installed. Parish bell ringer, Carlotta Dyer Zilliax reported "I rang the bell this afternoon with Verdin and [Augustus's] Scott Romer instructing. It has a very easy movement and a wonderful sound, quite different and better." Town Manager, Rae Ann Palmer chimed in "And the inhabitants of Town Hall were treated to its joyful ringing this afternoon. It was amazing. Congratulations!"

