

## The Treasure in our Tower: The Repair and Maintenance of Bells and their Fittings

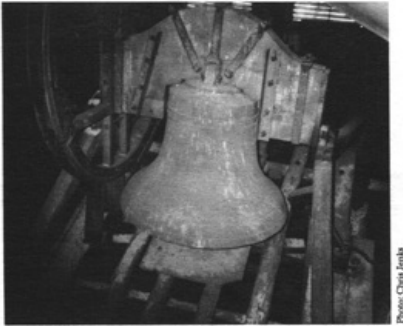


Figure 2: An early 19th century bell hang from an oak headstock by caissons cut into the bell's crown. Note that the supporting frame is also constructed using wood timbers.

The Repair and maintenance of Bells and their Fittings This feature was written by Lawrence Murphy, President of Taylor Bells, Inc. of Wellesley, Massachusetts, which is the American branch of John Taylor Bellfounders, Ltd. Of Loughborough, U.K.

Most churches in the United States have one or more bells to call members to worship and to serve as the church's "voice." People tend to take these bells for granted. The old cliché, "out of sight, out of mind," usually prevails, and so the bells hang in their towers, rung every Sunday, year in and year out, without anyone thinking to inspect them, their fittings, or the towers that they hang in. Unfortunately, when something does go wrong with a bell's hangings the consequences can be catastrophic. Few belfries have floors strong enough to stop 1,000 pounds or more of plummeting bronze, and more than one life has been lost in such a disaster. For these reasons it is vitally important that bells and their fittings be regularly inspected and thoroughly maintained.

### Types of Bell Installations

Bells have been installed in a variety of different ways for different types of ringing. Multiple bell installations usually fall into one of the following configurations: a peal, which comprises between three and eight swinging bells, rung randomly; a ring, which consists of between three and twelve swinging bells, which are rung "mouth up" in mathematical patterns called change ringing (very rare in this country); a chime, which consists of between three and twenty-two fixed bells, which are used to play simple tunes; and finally a carillon, the "queen of musical instruments," which contains at least 23 fixed bells arranged in chromatic series and used to play complex musical compositions.

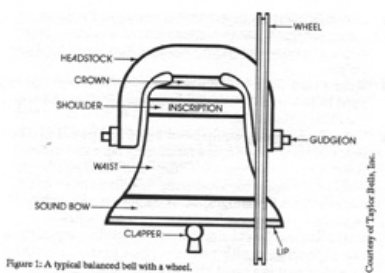


Figure 1: A typical balanced bell with a wheel.

Common types of single bell installations include a stationary bell with trigger-type clapper, a stationary bell with an electrically operated clapper, and a swung bell, rung with a rope and lever. However, this article will focus on the single swinging bell rung with a rope and wheel, which is the most common type of bell installation found in the United States. Nevertheless, many of these same general principals can be applied to other types of bell installations.

### Inspecting the Tower

Anybody working in bell towers has to be wary, especially, as is often the case, if no one has been in the tower for years. When climbing into unfamiliar towers, the following guidelines should be observed:

Never climb towers alone.

All tower inspections should be done by at least two people.

Wear old clothes or coveralls and be prepared to get dirty.

Each person should carry a good flashlight or wear a spelunker's helmet with a lamp.

On your way into the tower, check each rung or step loft that will be holding your weight before trusting it to hold you.

Make sure that ladders are bolted securely to the wall before attempting to climb them.

Check floors from below with a flashlight for water damage, sagging, or any other signs of weakness. Never step on flooring unless you are sure that it will hold your weight. Wear a backpack to carry necessary equipment. You will need both hands free to climb, especially if one hand is clutching a flashlight.

Take the following equipment: a pad and pencil to take notes or make drawings; a measuring tape and folding ruler to take measurements (the "stiff" folding ruler is especially helpful for measuring bell diameters); and a camera to take photographs. A camera is especially important. Ten or twelve photos of a tower bell installation will yield a multitude of details—especially if one photo is shot with a ruler in place to show the scale. In addition, it is a good idea to have photos on hand when discussing the project with a bell hanger or steeplejack. A small, battery-operated tape recorder to record observations can also be helpful.

### The Bell Chamber

Assuming that the way to the tower is clear, what should you expect to find in the bell chamber? In the best case scenario, you will find the tower "broom clean," with windows that are louvered and screened. If, however, the openings have not been screened in any way, you probably will find the bell chamber piled knee-deep in bird and/or bat droppings.

The first place to begin rehabilitation of the bell tower (assuming it is otherwise structurally sound) is with the louver openings in the bell chamber. It is imperative that these openings be screened to keep out pigeons and bats. Good quality galvanized wire mesh (tightly woven with small holes) is usually adequate. If the bell chamber is entered through a hatch, check to see that it fits snugly and securely and is watertight.

Once the openings are secured, the bell chamber itself must be rigorously cleaned of all debris. Take care. Guano is both toxic and dangerous. Before attempting to clean the tower, the droppings should be tested to insure that they are disease-free.

### The Bells

When the bell chamber is clean and secure, it will be time to tend to the bells themselves.

Almost all bells are cast from bronze—a material that requires minimal maintenance. However, the fittings from which a bell is hung can be made from a variety of materials, depending upon the age of the bell and the hanging techniques used by a particular bell hanger. Swinging bells are typically attached to headstocks, of either wood or metal, that rotate on pins, called gudgeons, which are set into pockets or bearings in the bell's supporting structure. In older bell installations these bearings are either completely open or shielded by a hinged clasp, which allows access to the gudgeons for oiling. In more recent bell installations the gudgeons are usually set in closed ball bearings, which are packed with grease and sealed. Bells of the 18th and early 19th centuries are usually hung from the headstock by canons—loops that are cast into the bell's crown—and attached to the headstock by heavy-duty iron straps that are woven through the canons (Figure 2). In bell installations of the last one hundred years or so the canons are usually dispensed with and the bell is bolted directly to the headstock.

If the bell is hung from the headstock by canons, check to see that the iron straps are free of corrosion and canons as well to make sure that they are free of cracks the securely strapped to the headstock. Carefully check the canons as well to make sure that they are free of cracks or breaks. Bells of this vintage are usually placed in a wooden frame of heavy timbers and hung from wooden headstocks. Make sure the headstock is in good shape and free of rot or insect damage. Check any other wooden supporting elements to ensure that they are not rotting or otherwise deteriorating. If the bell is bolted to the headstock, check the bolts that secure the bell. This is especially important since many bells are hung with only one center bolt, which holds the clapper as well. If this bolt is rusted out or is loose, the bell is in imminent danger of failing. If the headstock is cast iron or steel, check to see that it is free of corrosion.

Once you have ascertained that the bell is secure in its headstock, check to see that the clapper assembly is secure in the bell. The clapper should strike the bell just above its lip at its thickest point called the sound bow. A loose clapper striking the wrong part of the bell can crack it, and if a loose clapper falls out while the bell is swinging, it can cause serious damage, possibly cracking the bell, damaging the bell's supporting framework and causing structural damage in the tower.

Occasionally bells are "clocked", that is, a rope is tied to the end of the clapper and the bell is rung by hitting the clapper against the sound bow. Because "clocking" holds the clapper against the bell, the bell cannot vibrate freely and is therefore likely to crack. This is what caused the famous crack in the Liberty Bell in Philadelphia.

Once you have ascertained that the bell is properly hung and the clapper assembly is tight in the bell, check the bearings to be sure they are secure in their framework, and check to see that the bell moves smoothly in its bearings and swings parallel to its framework. A balanced bell should move back and forth in its frame with the clapper moving parallel to the line of swing and striking the sound bow at its thickest point. If the bell does not move smoothly or rhythmically in its frame, check the wheel to see if it runs true. You can discern this by seeing if the rim of the wheel moves from side to side while the bell is being swung.

Another place to check is the gudgeons. If the gudgeons do not pivot smoothly in the bearings, they probably need lubrication. Lack of lubrication will cause the bell mechanism to seize up. It is also possible that the bearings may have become packed with a mixture of grease and dirt, which will also cause the mechanism to seize up. A far more serious problem is a broken gudgeon, which will usually manifest itself by giving the bell a slightly lopsided look, i.e. the bell will not hang level in its frame from bearing to bearing. This is a dangerous situation that could result in the bell dropping through or into the frame. If you have any doubt whether the gudgeon is broken or not, call a Professional bell hanger immediately. He or she will be able to diagnose the problem and propose a solution.

Last but not least, check the rope for flaws and snags. Also check its path from the bell to the place from which the bell is rung to see if there is any place where the rope can become hung up. Typical trouble spots include pulleys, rope chutes, and the holes in the floors or decks through which the rope passes.

If you are considering having work done on a bell in the tower. Also make note of the name of the foundry and the date of casting, which usually appears on the bell. Any other inscriptions on the bell will also be of interest to church members.

#### Routine Maintenance

Bells will ring indefinitely if the hangings are maintained adequately. Routine maintenance can be taken care of by the sexton or an agile member of the property committee. Another option is to appoint an interested member of the Congregation to be "steeple keeper" and regularly maintain the bells and their fittings. The following check list is suggested:

1. Make sure all the nuts and bolts on the bell and the frame are kept tight. All the metal parts of the frame should be regularly cleaned and painted to prevent the formation of rust. If rust has formed, it should be cleaned with a wire brush and primed with a rust inhibitor before repainting. Metal headstocks need the same kind of care as metal frames. The bell itself, however, should never be painted.
2. All wooden components, such as wooden frames, headstocks, and other supporting structures, should be regularly checked for water damage, rot, or other signs of deterioration.
3. If the gudgeons are open, lightly oil them on a regular basis using a light machine oil. Open gudgeons should not be greased. Grease tends to gather dirt, which can harden and score the gudgeons and grind into the bearing surfaces. Grease will also seize up in cold weather and under other adverse tower conditions. If the gudgeons are set into closed ball bearings, they may need to be cleaned and re-greased. This can only be done by an experienced bell hanger.
4. Clappers, which are typically made from iron or steel, need periodic scraping and painting. Depending on how often the bell is used, the area on the clapper that strikes the bell will become flattened over time, producing a mushy sound rather than a sharp tone when the bell is struck. It may be necessary to call in a bell hanger to re-shape the clapper, or have a new clapper made.
5. Wheel bolts should be tightened periodically; the metal work on the wheel needs periodic painting. Make sure that the wheel runs "true."
6. Check the rope where it passes through the rim of the wheel and where it goes through a boss on the floor.

The rope should move smoothly and directly through the floor boss. Any place the direction of the rope is changed, such as pulleys, chutes, etc., is a potential trouble spot and requires regular inspection.

Bells are important to the life of a church. They are its voice. Care and maintenance will keep that voice loud and clear for many years to come.