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Church Steeples and Fog Signals

by Thomas Tag

Acknowledgment

This story is partially the result of the extensive research and writings of Dr. Max F. Homfeld who developed the article *Clockwork Fog Signals* that was printed in the National Association of Watch and Clock Collectors (NAWCC) *Bulletin* of October 1986. Dr. Homfeld was mainly interested in clockworks and the specific clock designs used in tower clocks and in their offshoot, the fog bell striker. The U. S. Lighthouse Society received permission to use Dr. Homfeld's research and writings and we have expanded the scope of his research to include a much greater emphasis on the various types of fog signals, and especially fog bells.

Introduction

What do church steeples and fog signals have in common? Well in many cases, a strange "Rube Goldberg" looking machine filled with gears, cables, fan-blades and a giant sledge hammer. We are talking about the tower clockwork in the case of a church and a fog-bell striker in the case of a fog signal.

Many types of fog signals were invented, including cannons, bells, whistles, sirens, steam trumpets, reed horns, etc. For a complete description of the history of fog signals see Wayne Wheeler's excellent article in *The Keeper's Log*; Volume VI, No. 4 and Volume VII, No. 1. This story will concentrate on the uses of bells and bell strikers as aids to navigation.

History of Fog Bells

One of the earliest fog bells was established in 1766 at Nidingen in the Baltic. Drawings show a bell in a wooden tower next to the lighthouse. Another early bell was regularly sounded during fog from the south turret at Bamburgh Castle on the northeastern coast of England starting in 1777.

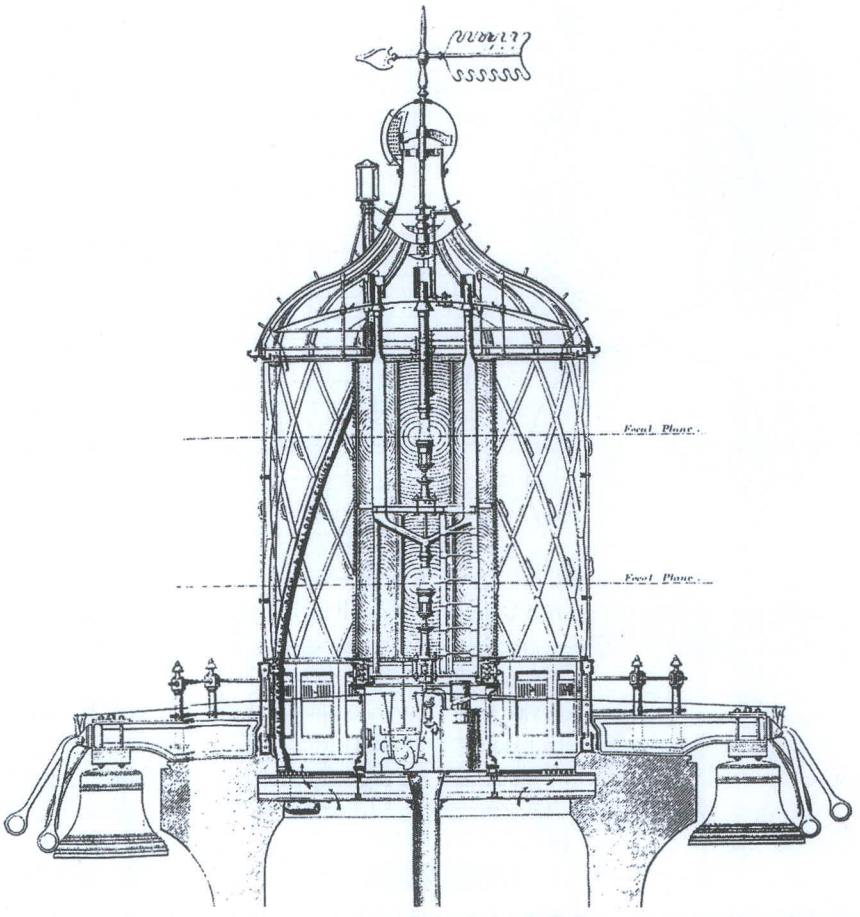
On February 1, 1811, after the completion of the Bell Rock Lighthouse, the Commissioners of Northern Lighthouses in Scotland issued a *Notice to Mariners* stating: during continuance of foggy weather and showers of snow, a bell will be tolled by machinery, night and day, at intervals of half a minute. A similar bell was placed in the Skerryvore Lighthouse off the Scottish coast in 1844.

By 1820, several other bells had been installed at European lighthouses. In 1838, the pile lighthouse on the Maplin Sands was fitted with a bell. From 1841 onward the installation of bells was approved by Trinity House for lighthouses under its administration.

In 1837, the United States Lighthouse Service experimented with a metal triangle at the West Quoddy Head Light Station. It was constructed of a metal bar 2-1/8" by 14-1/2 feet, bent into shape, and rung by hand... it was not a success. At this time fog bells were mostly still rung by hand.

Several countries experimented with bells for use as fog signals in the mid 19th century, and there were problems. Mr. Cunningham, of the Northern Lighthouse Board, in Scotland stated that the 2-1/4 ton bell at Howth, Ireland, which was struck four times a minute by a 60-pound hammer, could be heard only one mile to windward against a light breeze during fog. He also reflected that he doubted if the bells at the Bell Rock and Skerryvore lighthouses were ever responsible for saving any vessel from wreck during fog and said he did not recall a single instance of a vessel reporting that she was warned and put about in fog or ascertained her position because of either bell signal.

The American experience was similar; General Duane, U. S. Army, said "a bell... cannot be considered an efficient fog signal



Fog bell installation on the Eddystone Lighthouse in England. Drawing from the author's collection.

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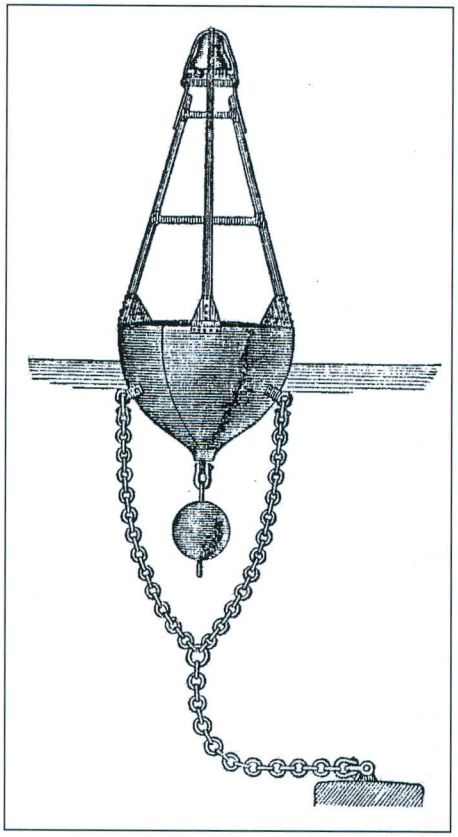
on the sea coast. In calm weather it cannot be heard half the time at a distance greater than one mile, while in rough water the noise of the surf will drown its sound to seaward altogether."

During 1863 and 1864 Trinity House made a series of fog bell trials that were similar to earlier trials undertaken by the French lighthouse authority. Observations were made about the effectiveness of the different sizes of bells and experiments were made to see if different sizes of hammers produced any improvement in the loudness of a bell. They also experimented to determine whether the use of hemispherical reflectors improved the signal. In addition, the prevailing wind speed and direction was logged during the trials. The results proved that increasing the number of strokes per minute was related to the distances at which a bell signal could by heard: 15, 25 and 60 strokes a minute were in ratio to 1, 1.14 and 1.29 miles. The experiments also showed the audible range of bells could by improved by using a reflector to help concentrate the sound. The trials confirmed the observations made by the French who had placed a reflector behind bell signals in an effort to increase the distance at which they could be heard. It was also found that striking the bell with a hammer was more efficient than swinging the bell and the maximum range of a 1000 pound bell was a little over a mile.

Bell Construction

The official specifications for one type of fog bell were as follows: "The bell is to be composed of tin and copper mixed in the proportion of 22 pounds of pure tin to 78 pounds of pure copper. It is to weigh about 2000 pounds, and be of the design shown in the accompanying drawing. Old metal is not to be used in casting. The bell is to be properly finished and free from defects."

Bells weighed up to 5,000 pounds, although in general, bell weight was between 700 and 2000 pounds. The sound of a bell is not composed of a single note, instead it has a range of distinctive harmonics. The bell is designed and cast to produce one specific note, which dominates when the bell is first struck. This note subsides and is replaced with a ringing hum made from the natural harmonics of the original note. Bells were tuned by removing rings of metal from the inside after casting. The bell tuner struck the bell, using his trained ear and tuning forks to determine the precise amounts of metal to remove to produce a ring with the greatest number of harmonic notes and to produce the precise main note designed for the bell.

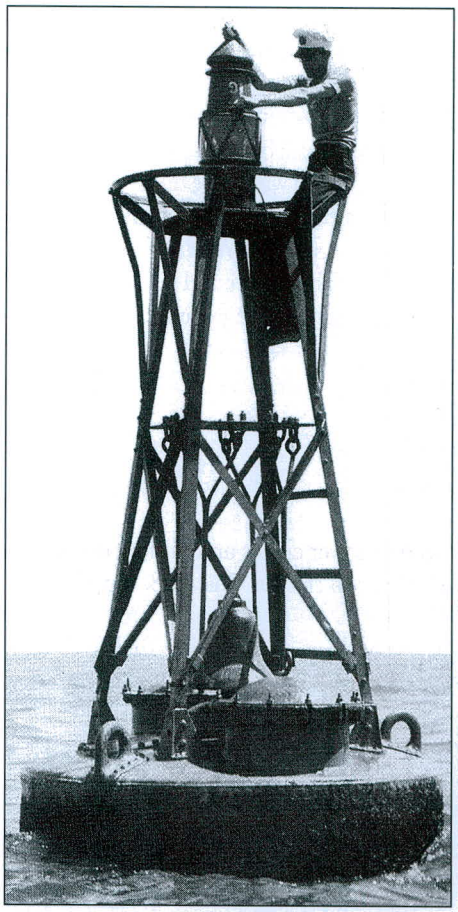


Brown's bell buoy. The bell is located at the top of the buoy. U. S. Lighthouse Society drawing.

Wave Actuated Bell Buoys

A Congressional Act approved on August 25, 1841 authorized the modification of a small light vessel to be equipped "with a bell only... to be fixed as to be rung by the motion of the sea." However, these bell boats were not very successful because they often capsized. Joseph Henry, scientific advisor to the Lighthouse Board stated: "These consisted of a bell supported on a water-tight vessel and rung by the oscillation of the waves. All contrivances of this kind have been found to be untrustworthy; the sound that they emit is of comparatively feeble character, can be heard at but a small distance, and is frequently inefficient during a fog that occurs in calm weather."

The first true bell buoy was invented in 1852 by Lieutenant Brown, an officer assigned to the Lighthouse Service. His design incorporated a 300 lb. bell under which a cannon ball rolled around on a grooved plate. As the buoy was moved by the swells of the sea, the cannon ball struck the sides of the bell. Today's bell buoys have a fixed bell (usually 85 lbs. in weight) and clappers mounted on each side of the bell in a cage arrangement.



Bell buoy circa 1930. Bell is struck by one of the four clapper arms mounted around the bell. U. S. Lighthouse Society photo.

Clockwork Driven Bell Striker Design

Mechanical clockwork driven bell strikers (about the size of a pedestal sewing machine) were powered by a descending weight with their speed usually regulated by a governor. When a cam dictated, a heavy spring released a sledge hammer that struck the bell.

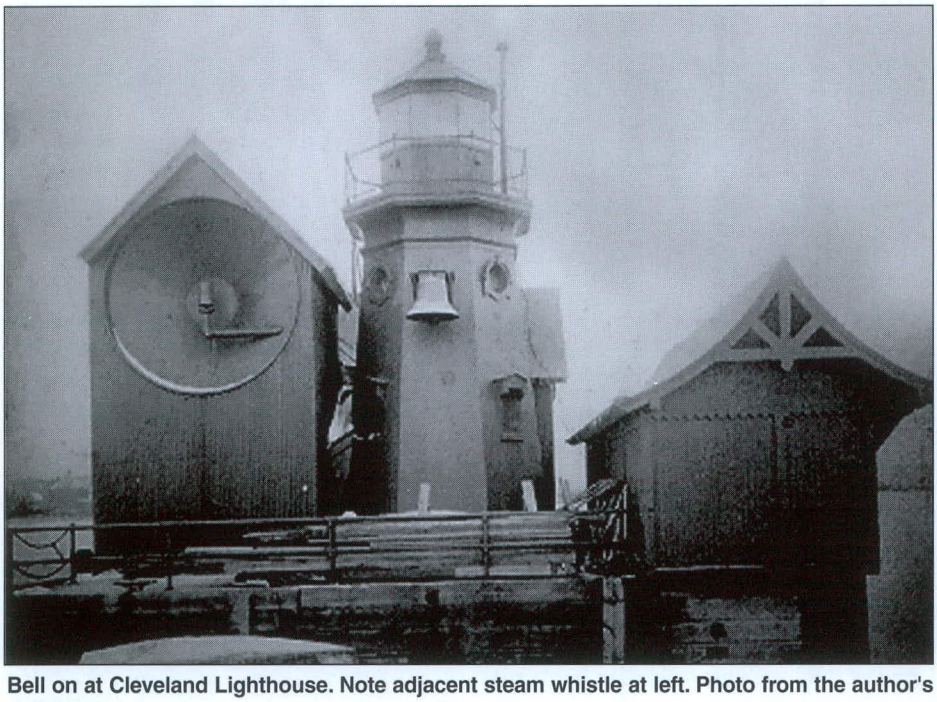
Sometimes the automatic striking machinery was incorporated into the tower of the lighthouse and more often in a separate bell house. At first, some of the bell houses were constructed to jut out over a cliff, allowing the weight to descend beneath the structure. However, this placed the weight and attendant wire rope in proximity to salt spray, which rapidly deteriorated the wire rope causing it to part, dropping the weights into the water. The Lighthouse Service remedied this by

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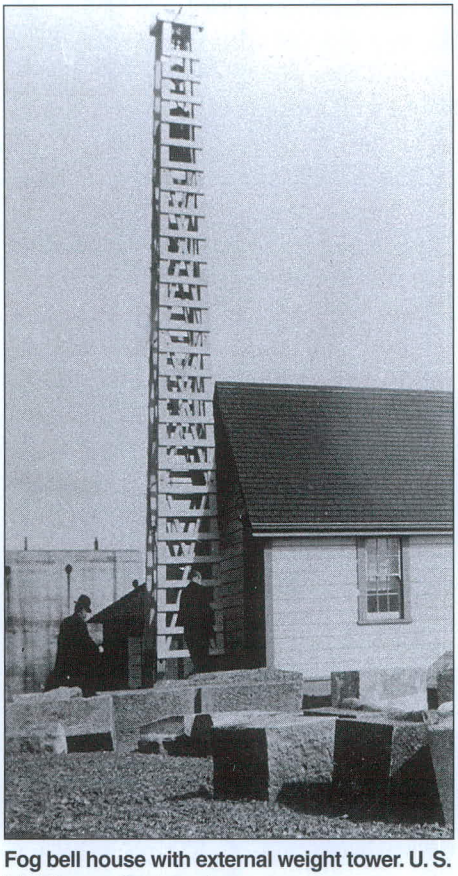
building a tall weight tower behind the bell house or constructing a pyramidal tower that was tall enough for a sufficient weight drop. The striking machinery was located inside the bell house. Some bell houses had a panel in the wall through which the hammer passed to strike the surface of the bell located outside. In other bell houses, the striker operated a linkage to an external hammer and bell.

The weights were wound by hand. The frequency of winding depended on the characteristic of the signal established for that station; one winding a day for a characteristic of two blows every 15 seconds or every four days at a station that had a one blow every 30 second signal. Some of the automatic bell strikers were good for up to 10,000 strikes of the bell on one winding.

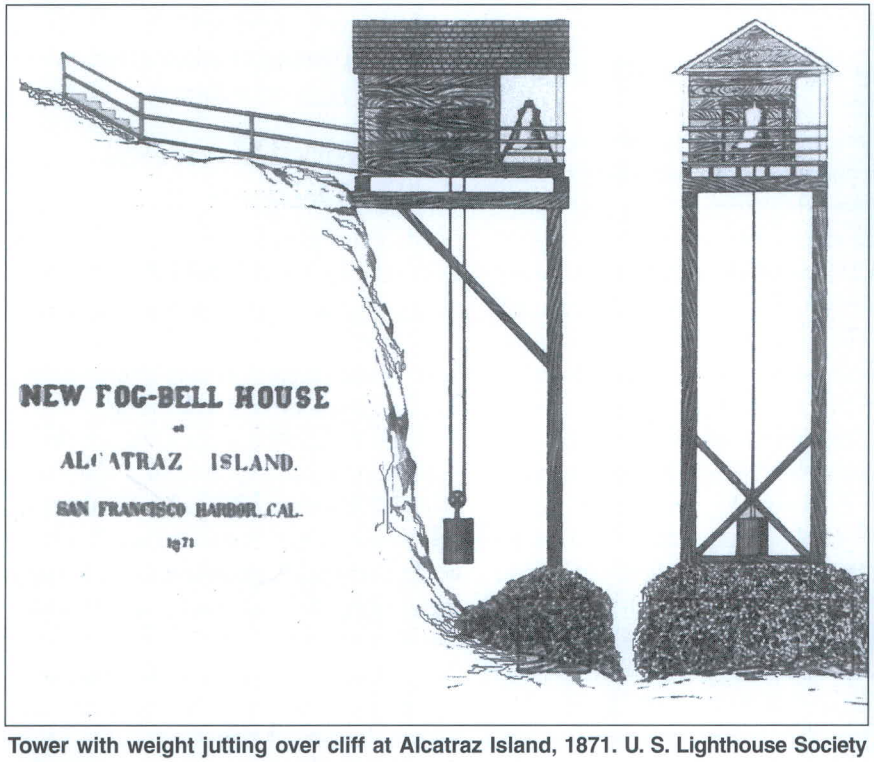
The fog bell clockwork-striking machinery usually was driven by its own separate weight, and it was also possible for the optic-drive machinery to provide a mechanism to sound the bell. The first fog bells installed at Bell Rock in Scotland in 1811 used this optic-drive



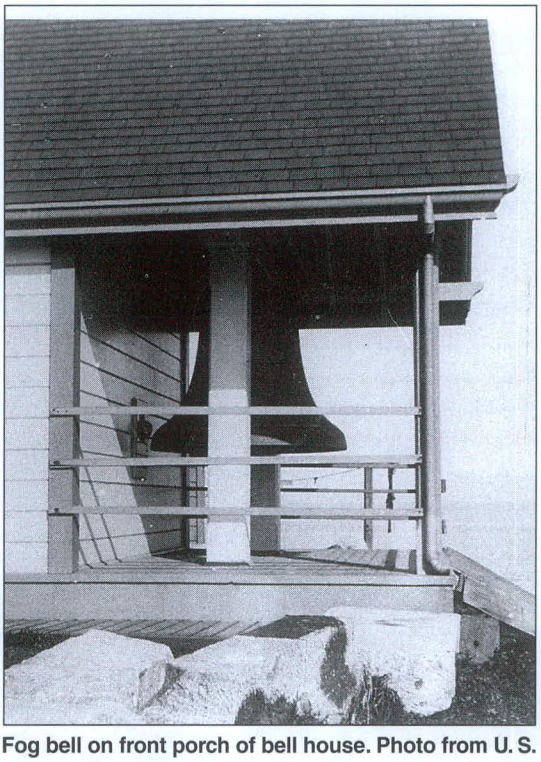
Bell on at Cleveland Lighthouse. Note adjacent steam whistle at left. Photo from the author's collection.



Fog bell house with external weight tower. U. S. Lighthouse Society photo.



Tower with weight jutting over cliff at Alcatraz Island, 1871. U. S. Lighthouse Society drawing.



Fog bell on front porch of bell house. Photo from U. S. Lighthouse Society.

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bell-striker system. After 1900, in England and elsewhere, some clockwork-operated fog bells were converted to gas operation to function automatically. Carbon dioxide gas bottles were installed and connected to a striker mechanism below the bell via a controlling flasher mechanism similar to those used in acetylene lanterns on buoys. The flasher regulated the gas supply to release the striker, and a piston was fired by the expanding carbon dioxide against the inside of the bell once every fifteen seconds. A similar system, using carbon dioxide gas for actuation, was used on bell buoys during the 1930s and 1940s.

Another method of actuation where electric motors turned the striking mechanism to wind a chain taut and then trip it to release the hammer was used in the harbor lighthouses at Avonmouth, England and Fishguard, Wales, when they had bells installed in 1907 by Chance Brothers.

The Morse Perpetual Fog Bell Striker

The earliest known mechanically operated fog bell in America was a design developed by Andrew Morse, Jr. who named it "the perpetual fog bell" and installed it at the Whitehead Lighthouse at the entrance to Penobscot Bay, ME in 1839. This was an elaborate device consisting of a "boom" floating in the surf, which rose and fell on the swells causing weights of 2,000 pounds to be wound. The descending weights drove both the regulating and striking apparatus. The striking and regulating part of the device worked fairly well, but the "boom" was often torn apart by the sea and the signal was discontinued after about three years. Although this clockwork device was unsuccessful, it was the predecessor of the eventual clockwork mechanism powered by a descending weight that was introduced a few years later.

The Lowell Fog Bell Striker

One of the early clockwork-driven fog-bell strikers was a design by the Lowell Machine Shop installed in 1851 that was described as follows:

US Revenue Cutter Morris,
Harbor of New York
June 3, 1851

Sir: In obedience to instructions from the Honorable W. L. Hodge, the acting Secretary of the Treasury, in a communication addressed to me on the 3rd ultimo, directing me to proceed to Boston and report to the collector, for the purpose of making an examination of the fog-bell lately erected at the outer light in that harbor, on my arrival in the city, on the 12th, and in the absence of Mr. Greely, I reported myself to Mr. Wellman, the deputy collector of the port. Finding the United States revenue cutter *Hamilton* had been hauled up for repairs, I hired a small steamer, and in the company of Mr. Wellman, proceeded to the lighthouse to perform the duty assigned me. In order to test the utility of the bell, and the distance at which it could be heard at sea, we went several miles outside of the lighthouse while the bell was being rung, with a south wind blowing across our wake and ahead, and while the steamer was under full headway, with the noise of her machinery and the water made by her wheels, and at the bow we heard the bell distinctly at a distance of five miles.

The weight of the bell is 1,375 pounds, and it was cast by Messrs. H. N. Hooper & Co., of Boston; it is rung by machinery that runs six hours, striking every forty-seven seconds, with one winding up, which is readily done by one person. The machinery was manufactured by the Lowell machine shop, at Lowell, Massachusetts, and is made in a handsome and workmanlike manner, and does not appear to be liable to get out of order. The structure in which the bell and machinery are enclosed is built of good timber and painted and secured by guys, and I conclude the whole work has been done in a workmanlike manner, very creditable to the contractor. The plan of this bell is much better adapted for a fog signal than any that I have examined.

I forward, herewith, an account of my travelling and other expenses.

With high respect, I have the honor to be, sir, your obedient servant,

Green Walden, Captain,
United States Revenue Service

The Lowell Machine Shop was originally established to build lock machinery and textile machinery for the growing water-powered cotton mills of Lowell, Massachusetts and was organized as a corporation in 1845. At one time it was the largest machine shop in the United States. No other drawings or description of the Lowell bell striker have been found.

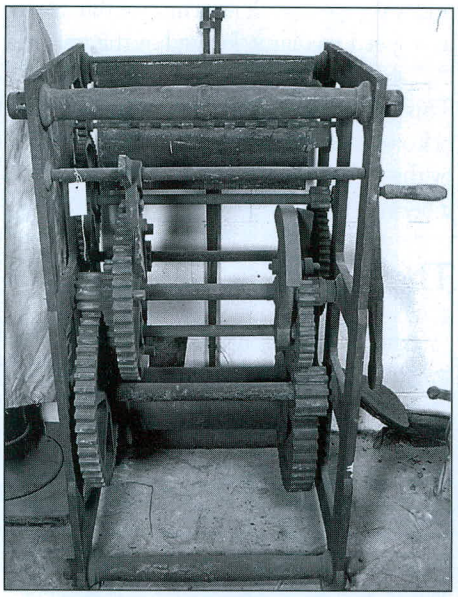
The Custer Fog Bell Striker

One of the oldest bell machines still in existence was built by Jacob D. Custer of Norristown, Pennsylvania who began constructing these devices in 1850. The surviving Custer machine is at the Mariner's Museum, Newport News, Virginia. The sides are 51" high 25" wide at the top, and spaced 25" apart. Unlike the striking train of a clock, it contains differential gearing for winding (known as its "maintaining power" design) so that the machine can continue to strike the bell while being wound. Custer tried to patent his design several times and was unsuccessful. Later, he obtained patent number 21656 on October 5, 1858 for only his "maintaining power" winding mechanism.

In the Patent Office files is an 1858 letter from Custer in which he states that he is a clockmaker and already has built 22 fog-bell machines. The serial number on the existing machine is 43, indicating that he built at least that many.

Most lists of clockmakers show Custer only as a maker of tower clocks. He had his own iron foundry at the corner of today's Main and Green Streets in Norristown, Pennsylvania. Several shelf clocks, tall clocks, and one watch made by Custer are known. George Eckhardt's book on Pennsylvania clockmakers has this information on Custer:

Custer, Jacob D.
Norristown Montgomery Co.
Born 1805, died 1872



Custer fog bell clockwork circa 1858. Photo from U. S. Lighthouse Society.

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Self-taught, having had only 6 weeks' schooling. In his 19th year he set up as a clock and watchmaker between Shannonville and Jeffersonville in Montgomery County. Moved to Norristown in 1832 and soon began to make steeple clocks. In 1834, he made a clock for the court-house. He made town clocks for Uniontown, Danville, Gettysburg, and Phoenixville, N. J., as well as towns in South Carolina and Alabama. His best period was between 1840 and 1845. He made "fog bells" of his own invention for the government in 1850. He began the manufacture of tall case clocks in about 1831, and in 1842 commenced the manufacture of "clocks" to propel the lights of lighthouses for the government. (Ed: No other information has been found relating to his building clocks to revolve reflectors or lenses.)

The 1850 date above indicates that Custer was working on his bell striker machine while the Lowell machine was being built. Incidentally, the bell machine patent also covered the application of his maintaining power to a device for recording telegraph messages that he also claimed to make.

The Daboll Fog Bell Striker

Celadon Daboll conducted many fog signal experiments for the U. S. Lighthouse Board in the 1850s. In 1851, Daboll invented the reed-trumpet fog signal, and at this time, he also developed a mechanical fog-bell striker that was used in several lighthouses.

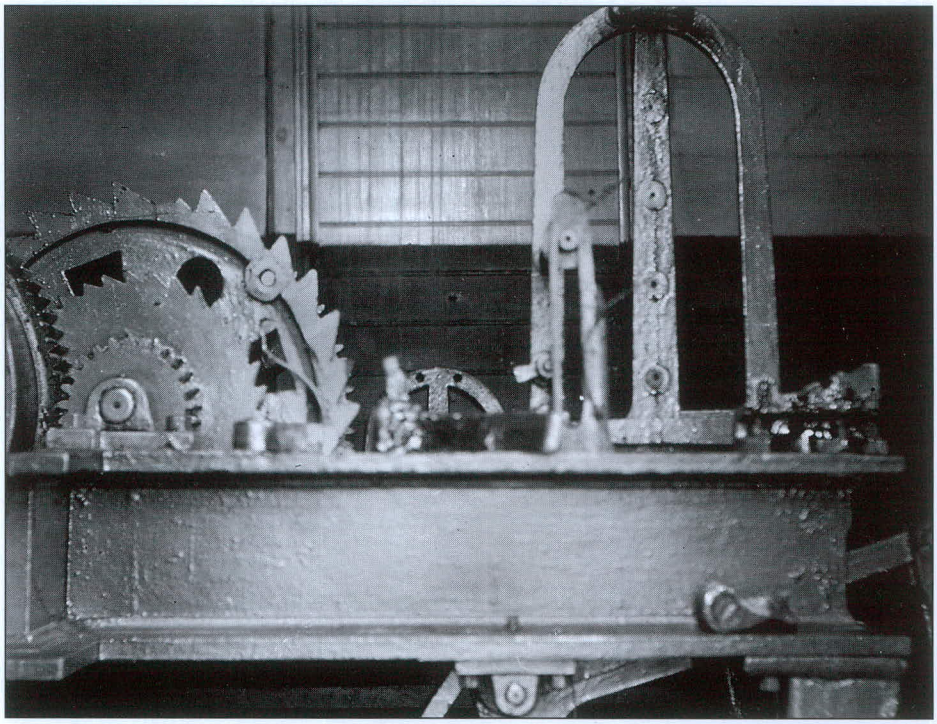
The Daboll bell striker was produced for only a short time (approximately 1852-1869) and was expensive. It used multiple fan blades as a speed regulator, located in the inverted "U" shaped tower on the right in the photo. This design used the old style design elements of Lowell and Custer and was quickly replaced by the early Type "A" design of Stevens when it became available in 1869.

The Jones Fog Bell Striker

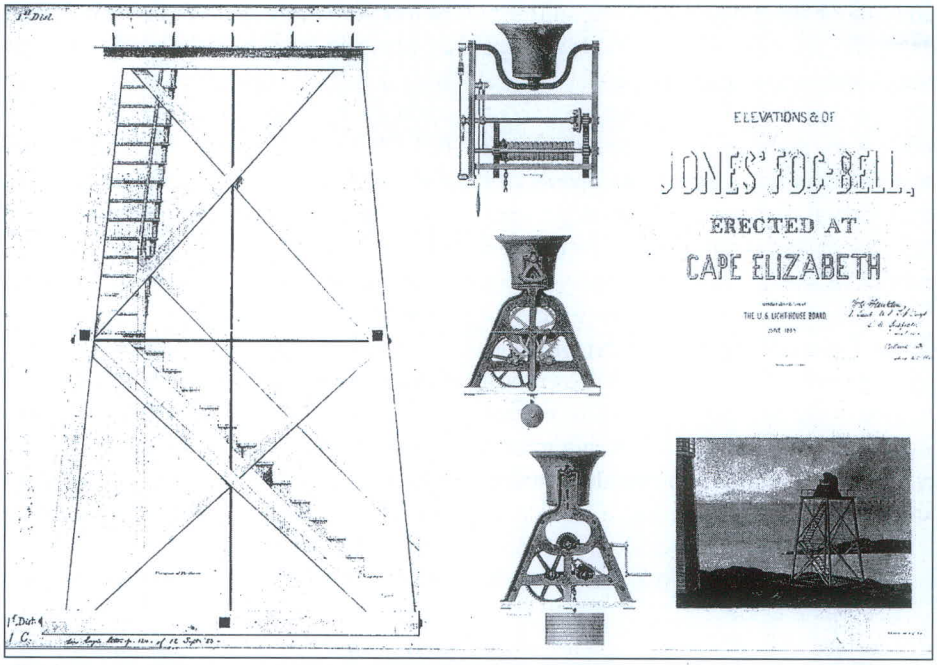
Another early fog-bell machinery maker was the Jones Fog Bell Company. Jones designed a machine that oscillated an ordinary bell through approximately 140 degrees using a clockwork mechanism mounted on the top of a wooden tower. The clockwork operated a large pendulum and the bell was connected by gearing to the top of the pendulum arm above its swing point. As the pendulum moved back and forth the bell moved in the opposite direction driven by the gearing. The Jones Fog Bell mechanism was used at the Cape Elizabeth Lighthouse in June 1854. It was also in use at Whitehead Lighthouse in 1853 and Bald Head Lighthouse in 1854.

The Stevens Fog Bell Striker

George M. Stevens and Co. was a maker of tower clocks in Boston, in business from 1864 to about 1915. Four distinct styles of Stevens bell strikers have been identified, which we will call types "A" through "D". All types were generally alike in their design. Type "A" was the first Stevens bell striker designed in 1869. It was less efficient because it expended part of its energy with a fan-blade regulator as in the Custer and Daboll machines. In the later Stevens designs a pendulum regulator was used allowing most of the energy from the falling weight to be applied directly to the bell hammer.

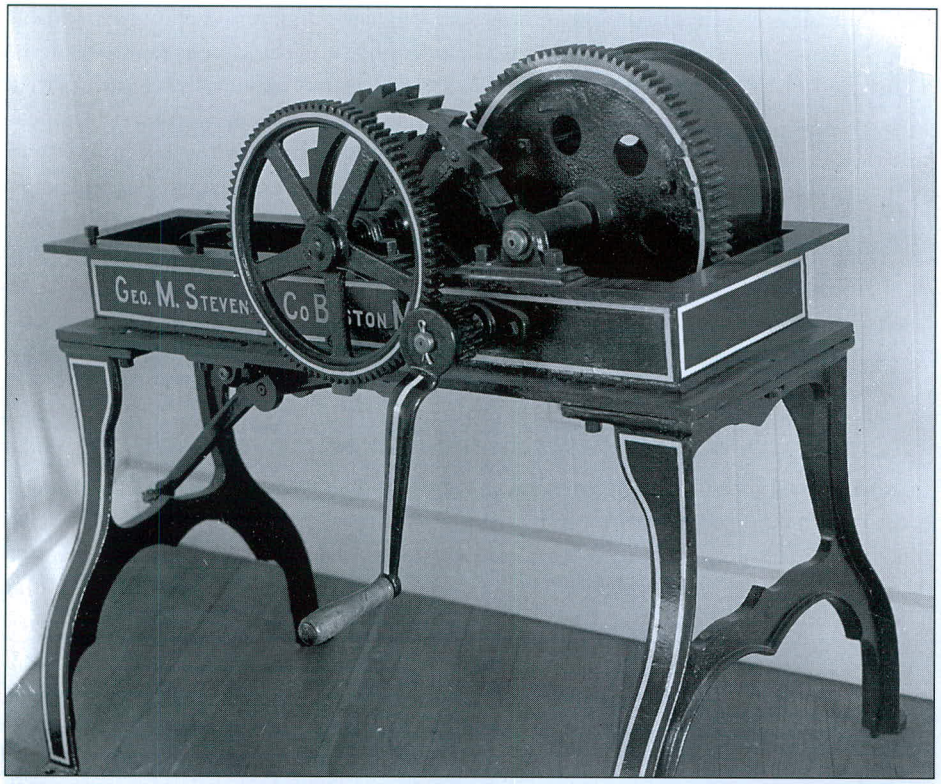


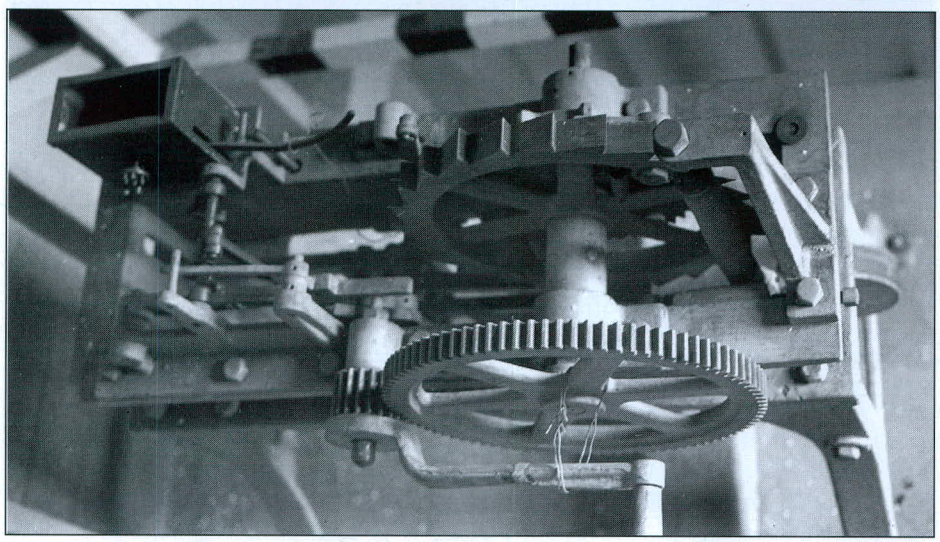
The Daboll fog bell striker at Trinidad Head Lighthouse in 1892. Photo from U. S. Lighthouse Society.

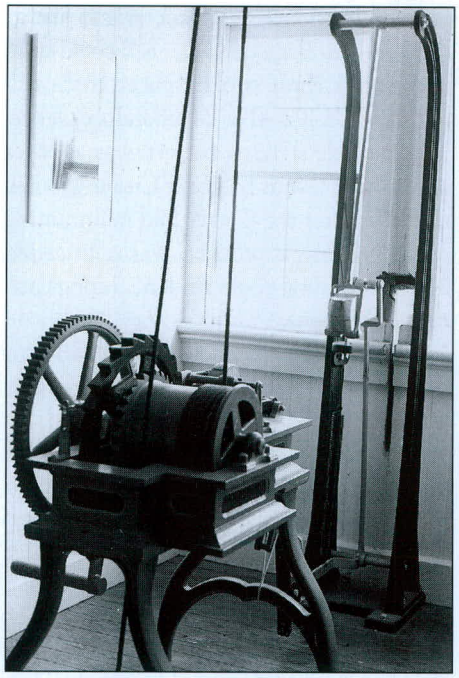


The Jones fog bell installed at Cape Elizabeth in 1854. Drawing from the author's collection.

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**Above – A Stevens Type "A" striker hammer at Hooper Straights Lighthouse.
Top Left – Stevens Type "A" bell striker.
Lower Left – Stevens Type "C" bell striker (seen from above) shown in the Point Lookout bell tower at the Chesapeake Maritime Museum.
All photos from U. S. Lighthouse Society.**

The Stevens machines that were originally in the Hooper Straits and Drum Point lighthouses appear to be of the early Type "A". In the photo the timer mechanism is missing. The original machine used a timer with a fan-blade regulator. A fan-blade regulator is something like a small fan operated by centrifugal weights that controls the speed of the mechanism. The gear train for the regulator rotated a cam that determined the striking pattern, so various striking patterns were possible. In an assembly drawing of this timer, the blades of the regulator are shown as being adjustable. However, it was difficult to maintain the correct timing when using a fan-blade regulator.

Design Type "A" had gears between the cable drum and escape wheel. It also had a bell hammer that was supported from both above and below by linkage. The Type "A" hammer still in place in the Hooper Straits Lighthouse is currently linked to a Gamewell bell machine (discussed later).

Stevens' second and much improved design was the Type "B." The operation of a Type "B" striker is as follows: In the drawing there are two similar arms (known as pallets). The left ends of these pallets are pivoted on each end of a rocking arm that moves the bell hammer via a linkage. The lower pallet is attached to the lower end of the rocker arm and the upper pallet is attached to the upper end of the rocker arm. Pressed into the side of each pallet is a pin that can contact the cam surface.

In action, the lower pallet arm is driven to the left by the escape wheel that pushes the bottom end of the rocker arm to the left operating the linkage to the hammer and ringing the bell. As it moves, the rocker arm is pushing the upper pallet arm, which is currently disengaged, to the right. The upper pallet arm is raised at its right end, guided by the cam, to meet another tooth of the escapement wheel. When the upper pallet arm is engaged by the escapement tooth the lower pallet arm drops away from the escapement wheel at its right end. The upper pallet arm now moves to the left returning the rocker arm and the linkage to the hammer back to its original position and moving the lower pallet arm to the right. The lower pallet arm is now down against the cam where it will be raised into position and the process repeated. The action is rather like a stiff-legged person going down a stair.

Timing of the strokes is done by a pendulum clock that is part of the machine and is powered by a small weight that is raised by each stroke of the bell hammer. The timer has a cam that is shaped to release the bell hammer on a schedule unique to that particular lighthouse. This gave the bell-fog signal

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the ability to have a characteristic just as the lens had. For example, a bell could have been struck three strokes spaced three seconds apart, followed by 24 seconds of silence. The variable striking pattern was another advantage Stevens had over Custer. No bell machine after the Custer had maintaining power gearing; it probably was not needed as some winding could be done during each period of silence.

A Stevens bell machine in the Point Lookout Bell Tower at the Chesapeake Bay Maritime Museum is shown on the previous page. It is marked Type "C" so it probably is their third design. It differs from Type "B" in several ways. It has a timing clock that employs a foliot regulator rather than a pendulum. It would not be as accurate as a pendulum. But it is compact, self-starting, and sufficiently accurate for the purpose. Type "C" has its weight on a chain rather than a cable. The hammer spring is on the bell machine rather than the hammer. This places it out of the weather and more accessible for adjustment.

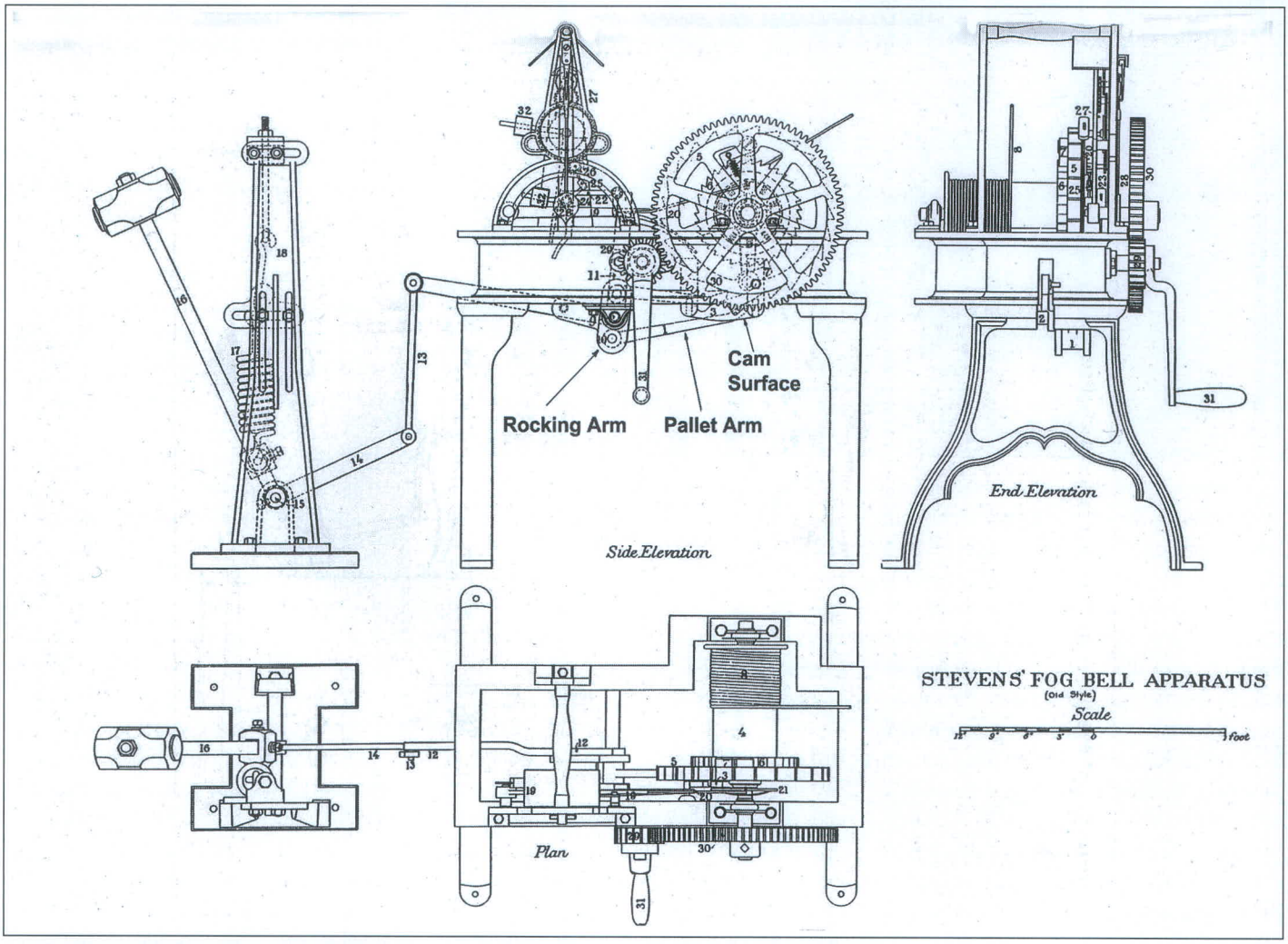
The bible of a lighthouse keeper was *Instructions to Light-Keepers* published by the United States Lighthouse Establishment. The 1871 edition mentions only the Custer and Stevens striker machines. The 1881 edition has instructions for the Stevens bell striker machine, although it has no mention of the Lowell, Daboll or Custer machines. By 1881, the Stevens machine had made the other three obsolete.

There is an interesting variation of Type "C", designed in 1921, located at the Maine Lighthouse Museum in Rockland, ME. This machine has a large drum for a weight cable, together with additional gearing on a cast iron base to which the legs of the bell machine are bolted. The large drum and extra gearing would increase the running time between windings. The normal Type "C" chain sprocket is not used. This device is described in the April 1921 issue of the Lighthouse Service Bulletin as follows:

"In the installation of a weight-operated fog-bell striker, it is desirable to arrange for as long a running period on one winding as is possible, and the same is especially desirable at the small stations where no quarters are provided for keepers. In most instances the length of the weight well is limited, and where it is not, the building of a structure to support a long weight well is expensive, and the structures are unsightly.

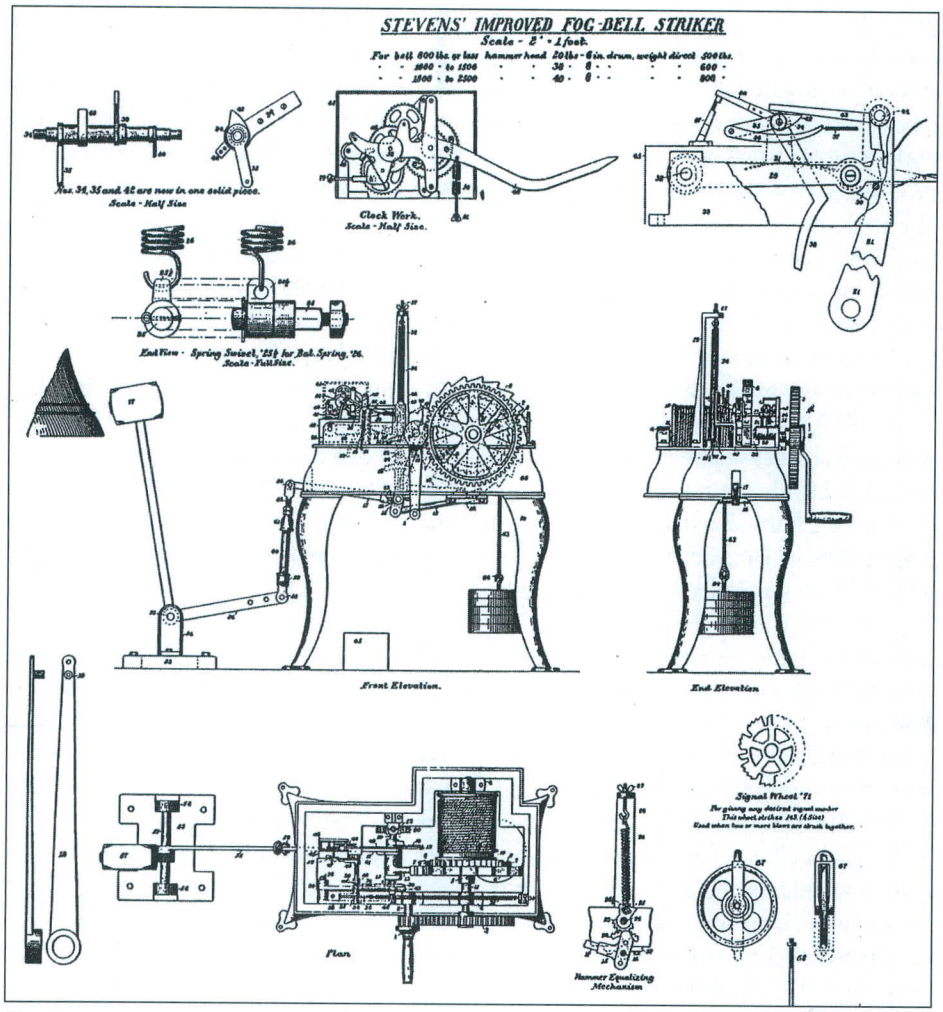
"Recently some progress has been made in lengthening the running time and reducing length of weight wells by increasing the number of weight-fall parts. In so doing it was found that the sheave friction rapidly reduced the power and that where more than a four-part fall was used, the sheave friction consumed practically all the power, which is probably due to the fact that there is such a slight movement of weights and sheaves for each blow of the hammer, and that at the commencement of each blow the weights, etc., are at repose.

"In order to obtain a long running time with a short weight well, a reducing motion has been designed. It consists of a drum for a wire cable that is connected by a chain of gears to a gear

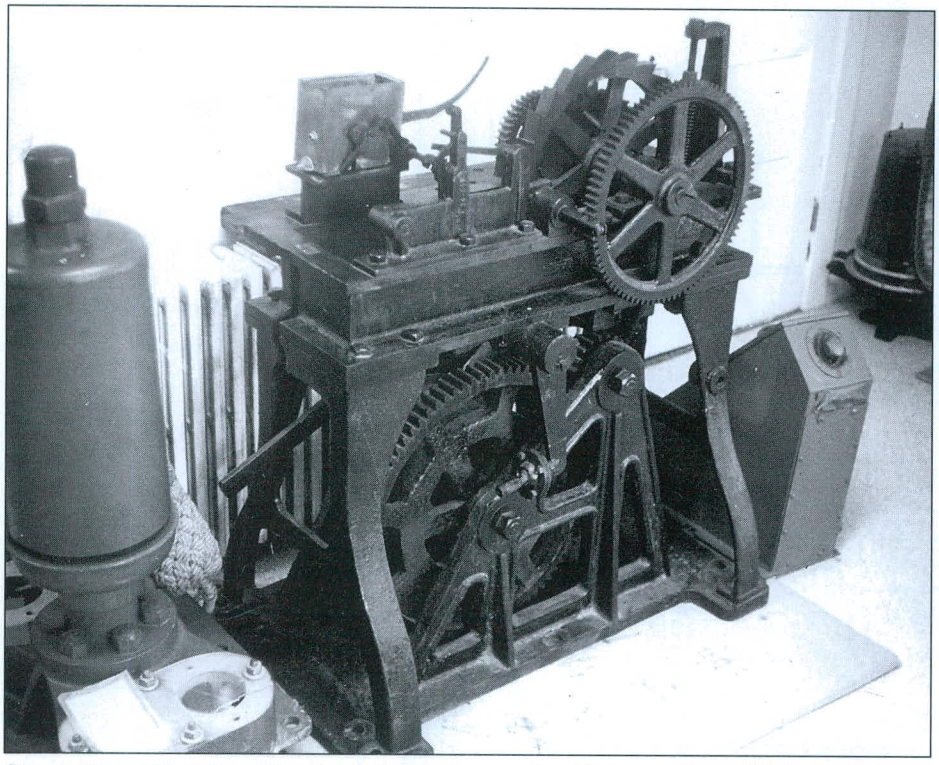


Drawing of the Stevens Type "B" bell striker circa 1873. Drawing courtesy U. S.Lighthouse Society.

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The "improved" Stevens bell striker. Drawing courtesy U. S. Lighthouse Society



Stevens Type "C" striker with extended operation gearing. Photo courtesy of Maine Lighthouse Museum.

wheel mounted on the extension of the drum shaft of a Stevens Type "C" fog-bell striker. All shaft bearings of this reducing motion mechanism are ball bearings. The bearings are carried in the side stands that are integral with the bedplate and the bedplate is extended so that the legs of the Type "C" striker can be set on the bedplate, thus making a complete unit of the reducing motion and striker.

"One of these machines has been completed and tested out in the shops at the Tompkinsville Depot. It was found that each blow of the hammer dropped the weight one-eighth inch, and the required rope pull on the drum of the reducing motion mechanism was 2,200 pounds. The required rope pull will be somewhat variable in actual use, depending on the weight of the hammer used and the angle to which it is lifted.

"One of these machines is to be installed in the new steel tower to be erected at Fort Adams, RI, where with a weight drop of 25 feet and striking one blow every 20 seconds the bell will have a running time of 13 hours and 20 minutes on one winding".

The 1902 edition of *Instructions to Lightkeepers* shows Type "B" that it calls "old style" and another that it calls "improved", which we will call Type "D." We do not have a specific date when the "improved" machine was introduced. It can be assumed to have occurred around 1895.

Though the Type "D" differs somewhat in appearance, it has the same timer as Type "C" and the hammer-spring is on the machine. The Type "D" design appears to have a number of small simplifications to specific parts and was the final George M. Stevens and Company bell striker.

By 1905, Stevens was nearly out of the fog-bell striker business having only two known sales that year and no recorded sales after that time.

The Gamewell Fog-Bell Striker

A competitor of George M. Stevens and Co. was the Gamewell Fire Alarm and Telegraph Co. of New York (later moved to Boston).

The 1881 edition of *Instructions to Lightkeepers* shows only Stevens machines. However, insert-pages distributed in 1883 describe the Gamewell machines, which were first offered for sale in that year. These insert-pages describe two Gamewell bell machines, Models

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3 and 4. They are almost identical except that Model 4 is 25 percent smaller than Model 3.

Gamewell bell strikers were built in both chain and cable-driven versions. In principle, they are very much like the Stevens machines, though the workmanship is better. The timer was a compact clock having a very short pendulum. The 1894 drawing shows a single-leaf hammer-spring mounted on the hammer. Later versions had the hammer-spring on the machine, rather like the later Stevens machines.

Gamewell bell strikers can be seen at the following locations:

Model 3, serial no. 40, at the Chesapeake Bay Maritime Museum. Once in Thomas Point Lighthouse. Cable driven.

Model 3, serial no. 13, at Calvert Marine Museum, Solomons, Maryland, in the Drum Point Lighthouse on the Museum grounds. Chain driven.

Model 3, serial no. not known, at Shelburne Museum, Shelburne, Vermont, in the Colchester Reef Lighthouse now on the Museum grounds.

Model 4, serial no. 47, at Mariner's Museum, Newport News, Virginia. Cable driven

Gamewell also built a model 5 machine that could be used for fog bells or for municipal fire bells. In this case, the clock was replaced by an electromagnet so that the bell machine could be started and stopped remotely. When turned "on" it struck the bell with rapid blows. They even offered a version that turned on and off an air valve of a fire whistle. This produced repeated whistle blasts. Later, the electrical solenoids were also incorporated on models 3 and 4 to eliminate the former elaborate clock controls. An interesting side note is that every Gamewell striker was assigned a serial number that was then stamped onto each and every part of the machine.

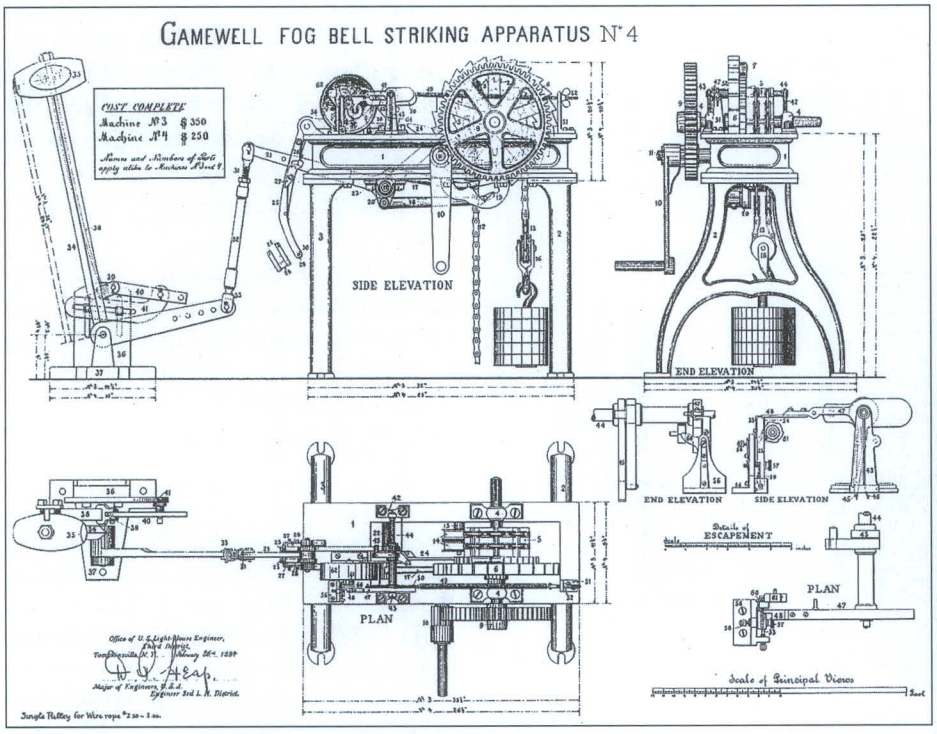
By 1900, sales of the Gamewell fog-bell striking machines dominated the purchases of the US Lighthouse Service.

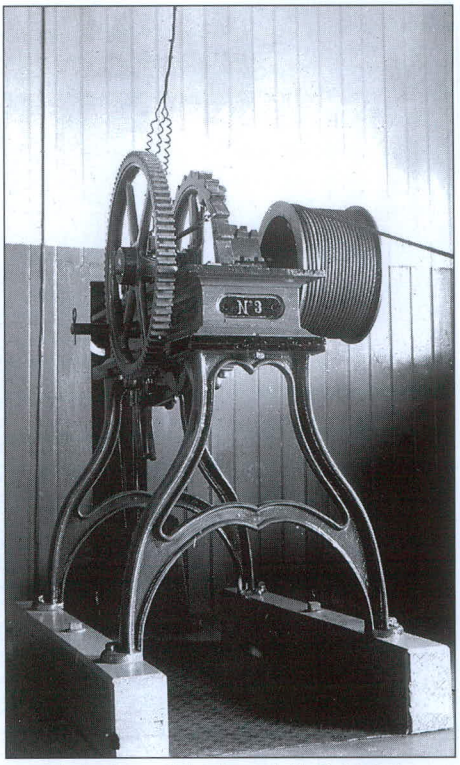
The 1902 *Instructions to Lightkeepers* shows a very different Gamewell bell machine called a Model 10. It is described as a 10,000 stroke machine; that is, 10,000 strokes per winding. Note in the figure that the bell is mounted directly on the machine. This would require that the assembly be mounted in a weather-proof enclosure, such as one with louvered sides. No existing Model 10 has been found.

The 1908 Boston telephone directory listed Gamewell as having offices in the John Hancock building and a factory in Newton Upper Falls. Gamewell is still in business as the Gamewell Corporation in Medford, Massachusetts. They now build electronic fire alarm systems.

Bell strikers proved to be fairly reliable and lasted well into the 20th century. One bell striker that did fail provides an interesting story. Mrs. Juliet Nichols was the Keeper of the Point Knox Lighthouse on Angel Island in San Francisco Bay from 1902 to 1914. She was the widow of CDR Nichols, USN who had been the inspector of the California District (1892 to 1895). He died during the Spanish American War and she was later offered the keeper's position.

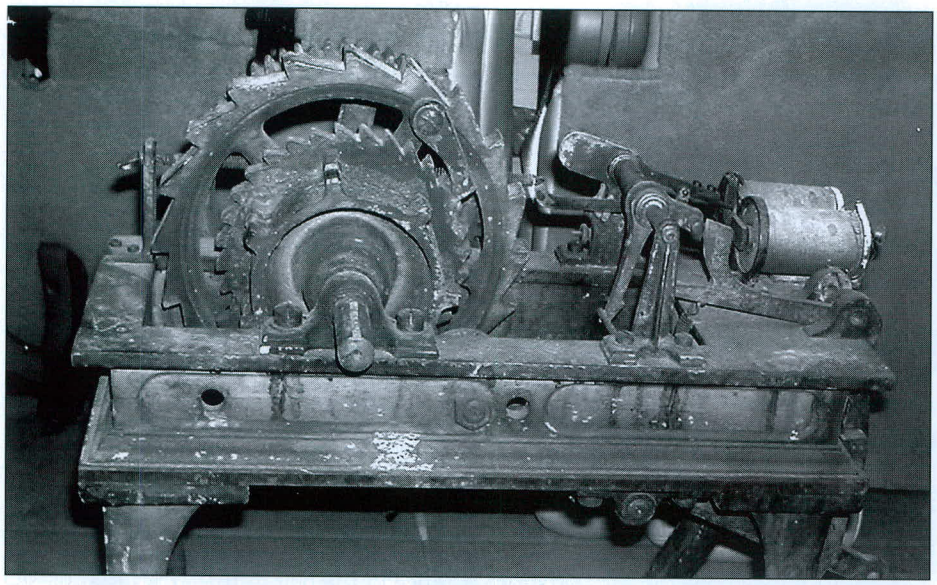
On July 2, 1906 the fog rolled into the Bay and Mrs. Nichols dutifully set the fog-bell striking machinery in motion....and it failed! She was the sole keeper of the station and had no way to contact the District, or anyone, for assistance. She knew the importance of the bell to the ferries that passed Point Knox in route to Sausalito. Being a dedicated keeper, she took an ordinary nail hammer and began ringing the bell by hand. The characteristic was two blows every 15 seconds. The fog stayed and Juliet remained at her post; for 20 hours and 22 minutes she rang the bell by hand. She was presented a service award for her feat and appeared as a heroine in several publications, including the National Geographic Magazine. Although her station has been razed the 4,000 pound bell, with hammer marks clearly visible, remains at the site.



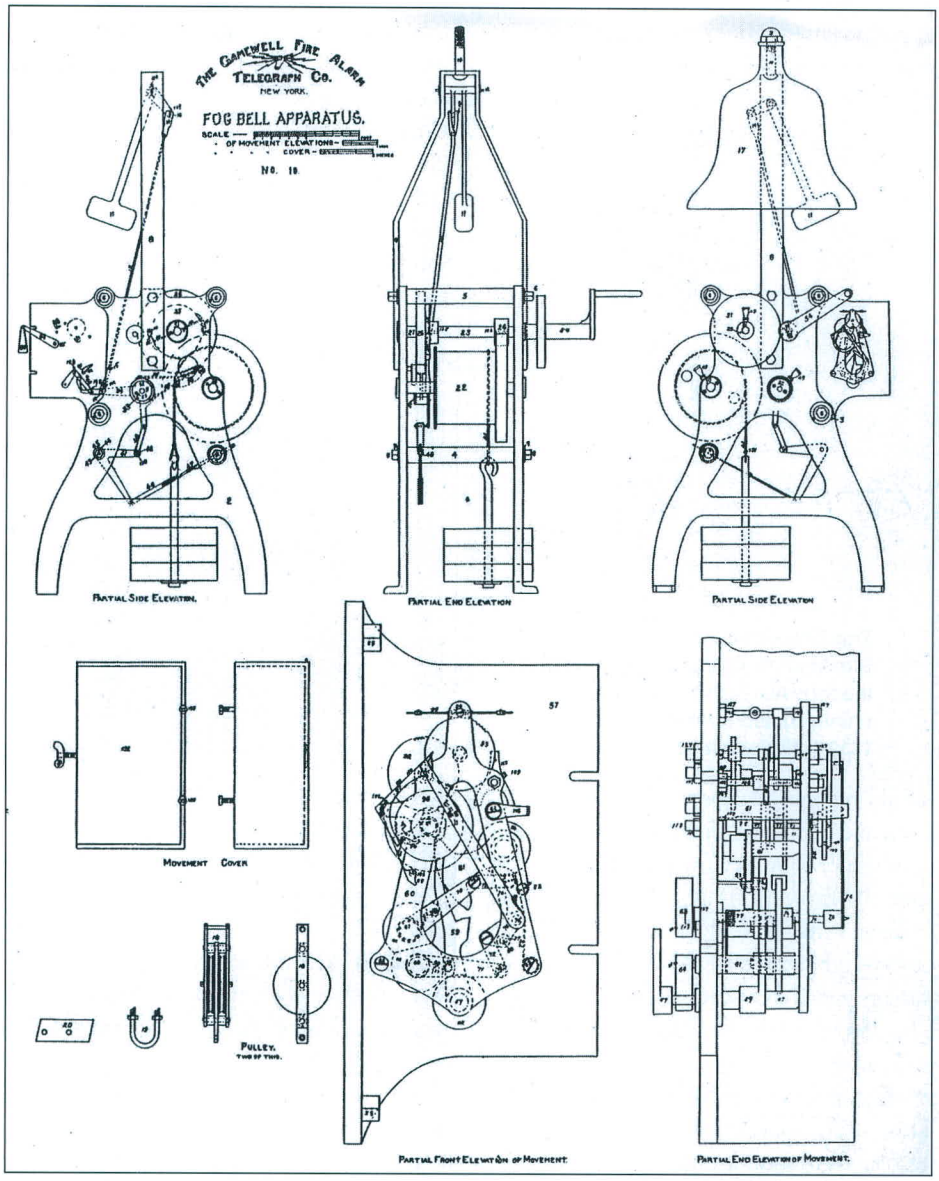


Left – Gamewell Model 4 fog bell striker. Drawing also applies to Model 3 and is from 1894. Right – Gamewell Model 3 at Alcatraz Island 1908. This was actuated electrically, note the three coiled wires at back end. U. S. Lighthouse Society archives.

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Gamewell Model 5 bell striker. Note the electric solenoids at right. Photo from the author's collection.

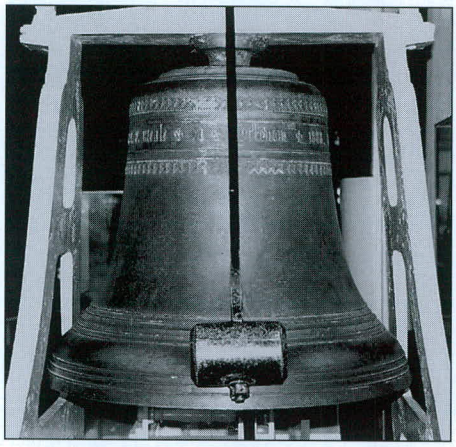


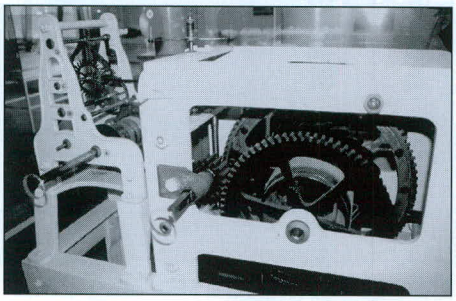
Gamewell Model 10, 10,000 stroke bell striker. Courtesy of U. S. Lighthouse Society.

The 1950 Atlantic Coast Light List includes a listing for the West Point Lighthouse on the Hudson River that states (in addition to information about the light) "Bell, electric, 1 stroke every 20 seconds. Operates automatically only by blast of a ship's whistle." Ken Black, of the Maine Lighthouse Museum, Rockland, ME, informed us of this unusually activated signal. As ships approached West Point they sounded their whistle that automatically activated the bell for a specific duration. From our Light Lists it appears this bell fog signal became operational around 1948 or 1949 and was discontinued in 1965. We have no other information on this signal or if there were others of this type established. The bell striker probably was the electrical solenoid operated Gamewell Model 5.

Bells and their striker mechanisms were removed from service in England around 1905 and in America during the 1960s. A very small number may survive to the present, installed on breakwaters or buoys. However, in Germany and other European countries some fog bell installations still exist although now silenced.

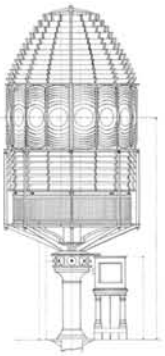
So, the next time you hear a church bell think about how its machinery helped to save lives during fog.





Above – Rotersand bell hammer.
Below – Rotersand fog bell striker clockwork (maker unknown).
Both photos: Kim Fahlen Collection.

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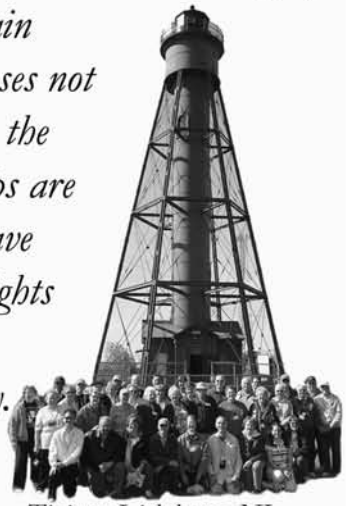
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