The Woods Hole Time Ball

Townsend Hornor

Nautical oddities like time balls have always fascinated me. There used to be a time ball in New York on the Titanic Memorial Light and Time Ball Tower of the Seaman's Church Institute, which is now located at the entrance to the South Street Seaport Museum. I've also seen time balls at the National Maritime Museum in Greenwich, England, and at Mystic Seaport. But I became especially intrigued with these devices when I learned that one once sat atop the water tower of the U.S. Fish Commission Building in Woods Hole many years ago.

When we think of time balls, most of us picture New York's Times Square and the apple-shaped object dropping from the top of a long pole signifying, at the very end of its fall, the start of a new year. It turns out that this is not an ordinary time ball because most time balls indicate the exact time the moment at which the ball is released from the top of its pole.

We need to go back a little to understand what all this time ball business is about. Geographical locations on land and sea have been defined since the time of Ptolemy in terms of latitude and longitude. Latitude is found by measuring the sun's altitude at noon or by measuring the height of the Pole Star above the horizon. The Portuguese navigators under the leadership of Prince Henry "the Navigator" (1394-1460) developed practical methods and instruments to accomplish this at sea. But longitude is harder. The hard part is determining the time at a known longitude by means of an accurate clock. The difference in times determines the difference in longitude between the known point and the place where the ship's observation was made.

The early navigators used estimates of time to calculate longitude, occasionally confirmed by local solar and lunar eclipses whose exact time could be predicted worldwide. But eclipses were not conveniently frequent, and these navigators usually had no real idea of their longitude. In the 1770s, William Harrison constructed the first ships' chronometers. Slightly later, Pierre LeRoy and Thomas Earnshaw came up with similar devices at more reasonable cost.[1]

These timepieces, just like your watch, kept fairly good, but not perfect, time. They had to be compared regularly with a time standard to determine their rate of error. This was the mariner's problem: where could one find a source of correct time aboard ship? In the 1820s, various visual means – flags, gun smoke, searchlights, rockets – were tried in different ports to delineate some preselected moment in time, but it was not until late in 1829 that an experimental time ball, hoisted to the top of a mast and dropped at a precise time, was tried at Portsmouth, England, and found satisfactory. Time balls were subsequently installed in Liverpool and Greenwich, England; Mauritius; St. Helena; Cape of Good Hope; Jakarta; Valparaiso; Madras; and Bombay among others, generally between 1833 and 1845.

The first American time ball, at the U.S. Naval Observatory in Washington, DC, was not installed until 1845, although our government had known about time balls since as early as 1830. The Washington time ball was used only to coordinate time for the various government departments and the locals. After this modest beginning, time balls were erected in New York (1877), Boston (1879), and then at an

impressive list of ports including, on the East Coast: Newport, Philadelphia, Baltimore, Hampton Roads, Newport News, Norfolk, Savannah, Key West, and Woods Hole.

The Woods Hole time ball was placed on the water tower of the U.S. Fish Commission building located where the NOAA National Marine Fisheries Service is now on Water Street. It was used from 1885 to 1902/3. The time ball was round, 3.5 feet in diameter, and raised on a mast whose top was 75 feet above sea level. The ball dropped 25 feet at noon, and was lowered a little later to the base of the pole where it was kept until its next use.

The installation seems to have been typical for time balls. The shape was usually a segmented metal framework covered with black canvas, weighing perhaps 120 pounds. The ball was hoisted on a rope halyard, then dropped manually or, in later years, automatically by an electromagnetic release activated by a telegraphed impulse. Time balls cost between $400 and $1,100 plus installation and maintenance. There was an elaborate protocol for their use, with a preliminary signal, an "arming" step, the time signal itself, an error signal in case of failure, and so forth. In Boston, the ball was to be at half-mast at 11:55 a.m., at the top at 11:58 a.m., dropped at 12 h, 0 m, 0 s noon. If there was a drop failure, the ball was next dropped at 12:05 p.m., etc. There were lists of failure reports ranging from battery failures, ratchet-wheel mix-ups, halyard failures, icing, and a broken key so that the ball's cover could not be unlocked.

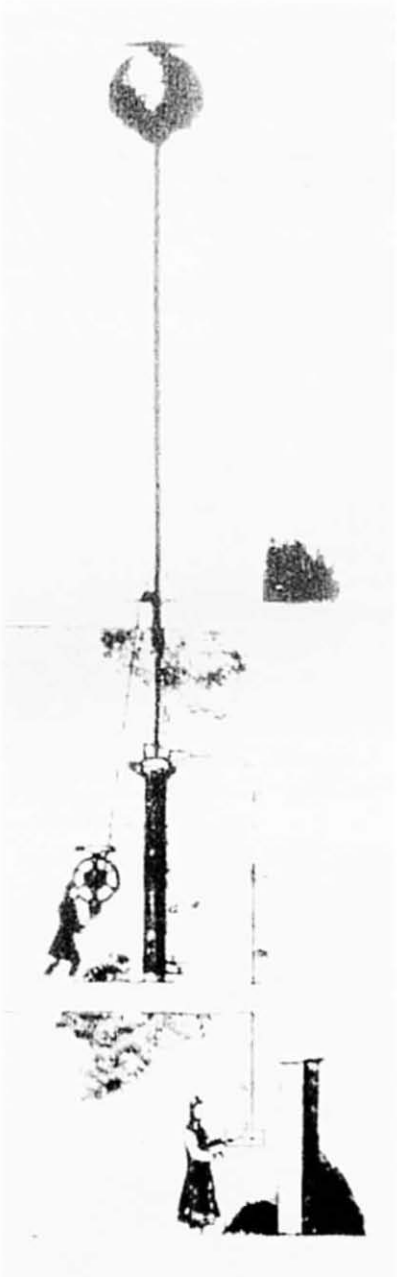

Diagram of an early time ball installation from *Illustrated London Almanack for 1845*, page 28. Courtesy Townsend Hornor.

It is interesting to note that in England the balls were dropped at 1 p.m. because the persons in charge were generally so busy at noon calculating the exact time that they preferred to drop the ball at the next hour. In this country they were almost always dropped at noon, with the time being transmitted from the Naval Observatory to the local stations by Western Union Telegraph. (The telegraph had come into commercial use in 1846.) Initially, noon meant local apparent noon, which varied with the location's longitude: up to 3.5 hours from coast to coast. Each major city had its own local time. When the railroads came, the need for a common time standard became much more obvious. In Pittsburgh, for example, there were six different time standards for train arrivals and departures. A traveler from Maine to California would change his watch some twenty times along the way. So in 1883, after years of debate, a standard time scheme was adopted with the zones as they exist today.

U.S. Fish Commission buildings in Woods Hole, 1890. Fisheries laboratory on the left, administration and residence building with its adjacent flag pole on the right. The time ball is on top of the shingled water tower in the middle. Photo by Baldwin Coolidge, No. 5147. Courtesy WHHC.

Standard time could now be distributed to time balls via the telegraph, a small adjustment being made in each location for the different transmission times along the wire.

Why did such a small port as Woods Hole warrant a time ball, putting it in the same category as Boston, Newport, and New York? There were many more vessels using Vineyard Haven, New Bedford, and Hyannis. Why not place it in one of those ports instead?

It seems most likely that the work of the Fisheries Commission required highly accurate calculations of positions at sea and that, together with its Federal Government connection, justified the Woods Hole time ball. What accounts for its early termination in 1902/3 is more of a mystery. Most of the other time balls existed until the 1920s. In 1904 the Naval Observatory began transmitting time signals daily at noon. The availability of radio time signals to navigators, which greatly accelerated during World War I, spelled the end of the need for time balls.

Once a mariner could receive time by radio, the need for visual checks in port became unnecessary. But none of that explains the early demise of our Woods Hole ball. Perhaps a storm took it down or maybe the water tower was demolished. Does anyone know? It seems strange that so prominent a landmark could disappear into such obscurity.

In November 1980, the Vineyard Gazette published a brief letter from Ian Bartky of the National Bureau of Standards providing some information about a time ball in Woods Hole and requesting additional information. When I saw it, I tried to reach Mr. Bartky by letter, but we never connected. I filed the one-inch clipping away, not to read it again until this spring. Thinking that it might make an interesting story, I asked around Woods Hole and learned absolutely nothing. No one had ever heard of a Woods Hole time ball! So I turned to the Internet. After prowling around I found the U.S. Naval Observatory site. To my amazement I discovered that they had a time ball page.

Time ball hoisted to the top of its mast. Formerly displayed at Mystic Seaport, Mystic, CT. Photo courtesy Mystic Seaport.

I then struck up an email correspondence with Dr. Steven J. Dick of the Observatory, to whom I am deeply indebted. He sent me a copy of the article published in 1983 that Ian Bartky had been researching when he wrote the letter to the *Gazette* in 1980, along with reprints of other articles that he had co-authored with Bartky. The 1983 article contained a chart showing the time span for U.S. time balls, including Woods Hole. Through the kindness of Jennifer Gaines at WHHC, I received a copy of a photograph showing what I now realize was the unknown time ball! In a little bit of over-kill, I also corresponded by email with Cambridge University in England, which is the repository of the archives of the Observatory in Greenwich, England. I have since been invited to visit them and view the papers of the 7th and 8th Astronomers Royal (1835-1910) who worked during the period when time balls were first used in Britain. I look forward to accepting this invitation as I continue my quest to learn more about time balls.

Townsend Hornor has lived in the same house on the water in Osterville since he was born, first just in the summers and weekends, and for the last twenty years, permanently. He has been interested in maritime history since majoring in it at Harvard. He is a retired trustee of the Woods Hole Oceanographic Institution, a retired chairman of Sea Education Association and the Osterville Historical Society, a trustee of the Herreshoff Marine Museum, and an overseer of Plimoth Plantation and the National Maritime Historical Society.

Notes

1. For more on longitude, see *Longitude* by Dava Sobel, published in 1998 and now available in paperback.