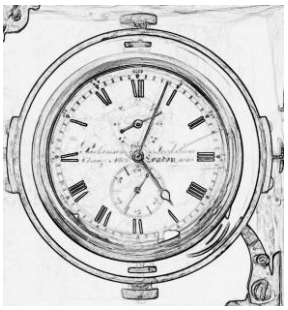


SHIP'S CLOCKS, WATCHCLOCKS, AND A SWISS WATCH AT THE WEST COAST CLOCK AND WATCH MUSEUM

Ed Pasahow

Parkinson & Frondsham Chronometer Edges

This is a story of two clocks and a watch from the WCCWM collection. It is also a story about two brilliant inventors—one whose work led to a life of stress and poverty and the other who enjoyed the wealth and fame of his innovations. This story involves shipwrecks, government boondoggles, and protection of valuable property. A look at a fine Swiss watch finished in exquisite detail concludes the story.

The Key to Navigation at Sea

One night in 1707, a squadron of British men-of-war ran up on the rocks of the Isles Scilly resulting in the deaths of 1,300 sailors and the loss of four ships. This was yet another in a continuing saga of shipwrecks caused by inaccurate navigation. As I will explain below, navigators could easily determine the latitude of their location, but at that time, the only methods for finding longitude were difficult to apply and inaccurate. This latest tragedy caused Parliament to establish the Board of Longitude to develop an accurate and simple method for finding this essential measurement. The board offered a reward of £20,000 (equivalent to about $4.3 million today) to the inventor of a device that could determine longitude within an error less than 30 miles.

Latitude determination in the Northern Hemisphere simply requires a navigator to measure the altitude of the star Polaris above the horizon. This angle equals the latitude at that location. This is usually done using a sextant, but before its invention, navigators used cross-staffs, astrolabes, or quadrants to measure the angle. In either hemisphere, latitude can also be found by measuring the angle of the sun when it reaches its highest point about noon. The sun's highest point is known as Local Apparent Noon in navigator's parlance. (Local Apparent Noon usually does not occur at 12:00 for reasons explained in the October—November 2017 *Ignitor*.) This measurement is combined with an arithmetic correction for the date to find the latitude.

Theoretically, there were at least three feasible approaches to finding longitude. The lunar distance method, which was then available, requires measuring the distance between several bright stars and the moon. Then a complex calculation must be carried out. This method was inaccurate because of observational errors and insufficient knowledge of the moon's motion. The positions of Jupiter's satellites is another possibility, however, shipboard motion made this scheme unusable.

The most promising approach requires looking up the positions of celestial bodies in an almanac and then measuring those same bodies from the ship at a *precise time*. The navigator applies a simple mathematical process to these measurements to find the ship's position. The British government built the Royal Observatory at Greenwich in 1620 that was responsible for publishing celestial positions that could be used in navigation. While astronomical measurements in those days were crude compared to modern results, they were adequate for the third method for finding longitude.

The problem, however, was the requirement for precise time. The terrestrial clocks of the period, powered by the constant gravitational force of falling weights and regulated by an oscillating pendulum, could be extremely

accurate. Such clocks would not functions aboard a pitching and rolling ship though. The goal was to come up with a clock that could run with great accuracy in a shipboard environment.

The government's offer for a reward induced John Harrison, of Foulby, England to devote his lifetime to the development of an accurate, portable clock for use at sea. Harrison's background was as a carpenter, but he became a self-taught clockmaker. With such a slim resume and no money, he had difficulty in getting someone to believe in his ideas for a novel clock. He was finally introduced to the famous English clockmaker, George Graham. Graham had enough confidence in Harrison's plans that he lent him enough money to begin construction.

Harrison worked for six years to produce the timepiece, known as H1. H1 was a monster spanning 2 feet in width and depth and 1 ½ feet in height and weighing 70 pounds. Even though the clock performed well in its tests at sea and Harrison received a certificate from the ship's master stating so, the government bean counters said that he had not met the requirements and rejected the clock. The board, however, did advance him £500 with which to begin construction of an improved chronometer.

Dealing with the board's bureaucrats consumed the rest of Harrison's life, during which time he invented four chronometers—each smaller and lighter than the previous ones. Despite superlative performance of H4, which met all of the test criteria, the board only awarded Harrison £10,000 and imposed additional conditions before he could receive the remaining £10,000. The government's delaying tactics continued for forty years as Harrison labored in near poverty. This situation did not stop the government from sharing Harrison's secret technology with his competitors, giving birth to an entirely new chronometer industry in England. The strategic advantage of accurate positioning of its navy helped make Britain the dominant power on the waves, which provided the leverage to maintain a worldwide empire throughout the following century.

Frustration overwhelmed Harrison, and his son finally appealed directly to King George III for justice. The king took a personal interest in Harrison's plight and presented his case to Parliament. Consequently, Harrison finally received the money long overdue him and he became wealthy, but he died soon afterward at the age of 83.

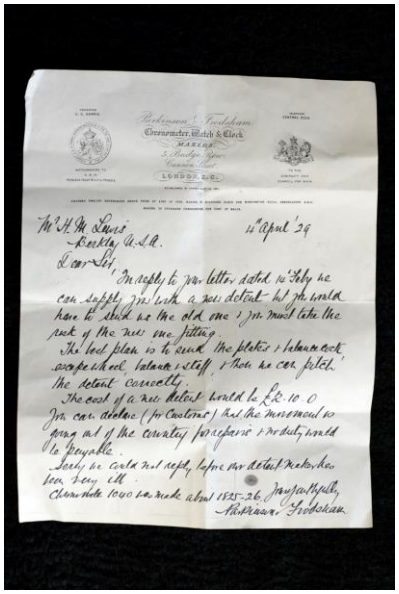
The government indignities did not end there. In the 1760s, the clocks were removed from Harrison's home without his permission and stored in a Greenwich Observatory cellar, collecting dust and deteriorating until Commander Rupert Gould removed and repaired them in 1920. The clocks are now displayed at the National Maritime Museum.

Parkinson & Frondsham chronometer

Parkinson & Frondsham chronometer rear view

Over the ensuing years, British clockmakers built on the foundation established by Harrison, which brings us to the point of the story-- a Parkinson & Frondsham marine chronometer with a precision running train, balance, and escapement on loan to the museum from Jim Bove. Two interesting documents that I will cover later accompany this clock.

The dial is signed "Parkinson & Frondsham, Change Alley, London, 1040" (the numerals are the serial number, not an IRS form). This chronometer has a 12 hour dial and runs for two days after being fully wound. Roman numerals mark the hours, and on a railroad track minute chapter ring, Arabic numerals denote the five-minute marks. A 48-hour up-down counter at 12:00 reports the power reserve. Seconds are shown on the subdial at 6:00. All hands are blued steel. The chronometer is encased in brass and has a winding hole behind a circular aperture on the back. The winding key is stored in the upper left corner of the case. The gimbals and wooden case of this example are not original.



Parkinson & Frondsham letter

Documents accompanying the Parkinson & Frondsham chronometer provide some insight into its history. A letter from Parkinson & Frondsham states that the timepiece was made about 1825-1826. What seagoing service it experienced until 1928 is unknown, but on New Year's Eve of that year, H.M. Lewis purchased the chronometer from the Louis Weule Co. for $10. Evidently, the clock was defective because Lewis contacted Parkinson & Frondsham regarding a replacement part. Their reply recommended that some components of the clock be sent back to them so that they could properly size the needed part.

Jim Bove purchased the chronometer from Lewis's estate and he learned from the family that Lewis had been a shipboard radio operator during WWI. After returning to civilian life, Lewis set up a shop and displayed the chronometer in his window with a sign saying, "Over 100 years old and still going." Lewis was probably also the builder of the present case and gimbals.

William James Frondsham and William Parkinson established Parkinson & Frondsham in 1801. Specializing in chronometers, their address was 4 Change Alley from 1801 until 1890. Master mariners, merchants and ship's captains frequented Change Alley to drink at the local coffee shops and conduct business, so this was an ideal site for selling marine timepieces. Through the years, the firm moved to other locations and continued doing business until 1947.

A Parkinson & Frondsham instrument, similar to the one in the museum, was the first chronometer purchased by the US navy in 1831 for $420. The chronometer was used aboard the *S. Adams* between 1831 and 1834. By 1835, the navy owned 54 marine chronometers. The first American-made chronometer was purchased from Dominic Eggert in 1838 for $300. Records indicate, however, that Eggert actually made very few instruments and that the majority of the nearly 250 chronometers he sold were actually Parkinson & Frondsham chronometers with his name on the dial.

Experience with the first navy-purchased chronometer actually made by Eggert was disappointing. The chronometer was issued to the *Brandywine*, and six months later, the ship's master reported it had, "…become useless from irregularity of performance." This problem may have been exacerbated by allowing a watchmaker in Lisbon, Portugal to work on it after it failed rather than returning it to Eggert's company.

The navy's use of chronometers did not end there. At the start of WWII, the government issued requests for chronometers to all major allied clock and watch manufacturers. Only the Hamilton Watch Co. and Elgin National Watch Co. responded. The 23 instruments produced by Elgin all failed to meet navy timing and compensating tolerances. On the other hand, Hamilton's products proved to be excellent.

The US Naval Observatory, established in 1834, publishes the *Nautical Almanac* tabulating navigational positions of the sun, moon, planets, and 57 bright stars for navigational use. As a footnote, Number One Observatory Circle, on the observatory grounds, is the home of the US veep. The house was built in 1893 to house the observatory superintendent. In 1974 (always willing to cut spending not involving their own salaries), Congress authorized transforming the home into the "official temporary residence of the Vice President of the United States." Temporary it remains today.

WWII Shipboard chronometers required special care and feeding. Before issuing them to ships, the US Observatory tested, regulated, and observed each new or refurbished clock for five weeks. The devices were hand-carried to the ship and securely fastened down in an environmentally protected area. The gimbal mounts of the devices tended to isolate the chronometers from pitching and rolling along with the shock of firing the ship's guns and battle damage. The clocks were never allowed to run down and were wound at the same time daily. By the end of WWII, Hamilton had constructed 13,087 chronometers—more than existed worldwide since Harrison's invention. Hamilton received several "E" awards in recognition of the excellence of their production.

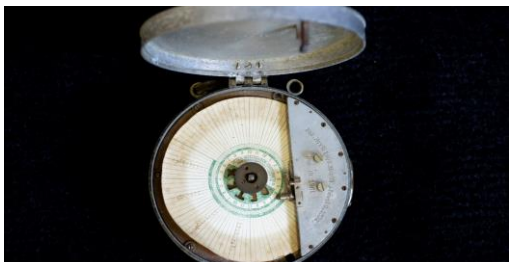
Quartz chronometers later replaced mechanical chronometers then GPS replaced the quartz timepieces. Even so, savvy navigators continue to practice celestial navigation and sextant skills against the day when some unexpected event might disable GPS signal reception.

Newman Watchclock

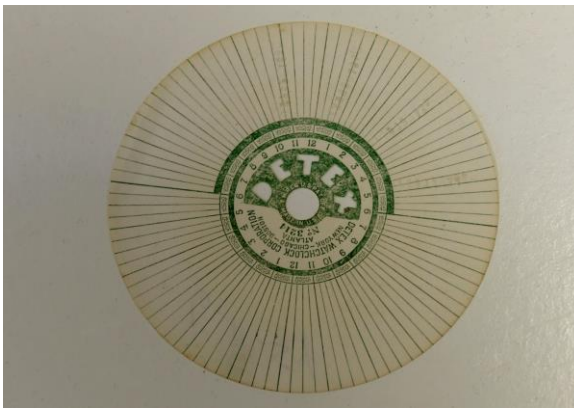
Newman watchclock dial

The name for this next clock seems oxymoronic. How could it be both a clock and a watch? In fact, the name is a contraction of "watchman's clock." Patrolling guards carried these mechanical clocks in order to check in at various points along their route. At each checkpoint, a uniquely numbered key impresses its identification on a rotating paper disk that is printed with the corresponding time.

Albert A. Newman established his company in 1878. He originally sold only on the East Coast but later moved into the Mid-West. In the 1890s, he began importing portable watchclocks manufactured in Germany—the rationale for the "Factory Germany" on the dial of the clock. In addition to managing production and sales, Newman earned more than thirty US patents on improved products.



Newman watchclock with disk installed



Detex recording disk

Detex file system

In 1901, he patented the station key and internal clock die which embosses the station number at the appropriate position on a paper disk. This new American clock, with Newman's patented features and complete dial and hands to show the time, revolutionized the industry and obsoleted models from competitors. Insurance companies were also enthusiastic about the clock and endorsed its functions and adoption by policyholders.

Guards carried the 5-pound clock in a leather pouch on a shoulder strap. At the end of each shift, a supervisor would unlock the case, remove the disk, and install a new one. Each time the clock cover is opened, the disk is punctured to indicate the time. Should the disk have more than two perforations, an unauthorized person has probably opened the clock. The company provided not only the clocks and disk but also a primitive database in the form of a stand with a spindle to hold the disks and index tabs denoting each month.

Newman sold the company to Charles Renshaw in 1909 and retired to enjoy his wealth. Renshaw continued to build the organization through acquisitions and mergers, eventually changing the name to the Detex Corporation (denoting its capability of detecting patrol officers' actions.) Detex sold similar mechanical clocks through 2011. Now located in New Braunfels, TX, the company occupies 39,000 square feet of manufacturing space and 13,000 square feet of administrative space.

Jacot & Son Watch

Jacot & Son watch in holder

Jacot & Son watch

Jacot & Son watch movement

This English silver cased Jacot & Son watch resides on its original watch holder in the museum. Birds perching on entwined vines and leaves ornament the gilt holder. A mother-of-pearl shell provides a small shelf for jewelry, such as cuff links. Guilloche (engine turning) and hand engraving decorate the silver dial. (Smudges in the photos are the result of tarnish that has built up.) The dial is marked with Roman numerals on all hours except 6:00, which is partially obscured by the seconds subdial. Embossed dots subdivide the minutes. The spade hour hand, elaborate minute hand, and small seconds hand are blued steel. The owner opens the back and inserts a separate key to wind this watch. This action predates watches that are wound using the crown.

Opening the back reveals an undecorated series of bar bridges and cocks that retain the wheels. (Bridges are held in place by two or more screws and cocks by only one.) In view of the impressively worked dial, the lack of any type of engraving or machine decorations on the back is unexpected and disappointing. The 18K gold Swiss movement, signed Jacot & Son, Locle (Switzerland) was made around 1850 and features 9 jewels. The escapement uses a Swiss lever escapement with a "club foot" escape wheel which impulses a lever staff that causes the balance wheel to rotate back and forth. This type of escapement is commonly used in modern mechanical watches because of its accuracy and reliability.

A visit to the WCCWM is not only an opportunity to view noteworthy clocks and watches but also a moment to learn some of the fascinating stories behind them. Be sure to ask the museum docents to share an anecdote or two with you.

I wish to thank WCCWM curator Ernie Lopez for his knowledgeable assistance in preparing this article.