

Watch & Clock

BULLETIN

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We are committed to being the world leader, educator, and advocate for horology and for everyone who is interested in timepieces and horological issues.

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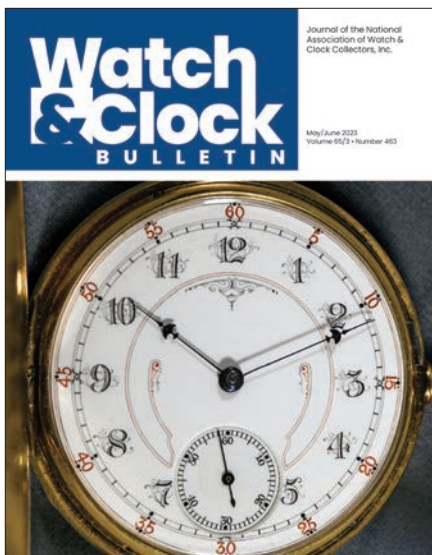
Letter from the Editor

An enthusiastic high school English teacher of mine used to announce, with forefinger lifted high and a slightly maniacal look in her eyes, "Literature lives!" We can also think of the *Bulletin* as a living entity that reflects members' interests and evolves to reflect changes in the NAWCC. Columns in this journal have come and gone, usually ending when the column editor moves on to other interests or runs out of article submissions. Do you remember "Railroaders' Corner" and "The First One...or...I Collect ___ Because..."? New columns have recently appeared, such as "Horological History: Fact or Fiction?" and "Keeping Time with the School of Horology," the first article of which appears in this issue. Is there a defunct column you'd like to

reinvigorate and edit? Is there a new one you'd like to introduce and prepare in a few issues each year? I'd be happy to hear from you at editor@nawcc.org.

The countdown is on for when we will meet and greet one another at the National Convention and the Symposium! I'm looking forward to seeing you at the open house in Columbia, PA, on July 13, and at the Lancaster County Convention Center on July 14–16. And then it's on to the Symposium in Lancaster on the afternoon of July 16 through July 17. For the latest news on Convention and Symposium events, visit natcon.nawcc.org.

Laura Taylor
Managing Editor
editor@nawcc.org



About the Front Cover

In Part 1 of their article on the E. Howard & Co. Model 1862N, on page 172, Alan Myers and Clint Geller explore the historical context for the watch's development and the possible involvement of Daniel Bucklin Fitts in the design. The front cover features a unique dial of Model 1862N movement No. 11,498 that exhibits embellishments typical of the celebrated dial painter Josiah Moorhouse (see page 172).



About the Back Cover

Charles Vander Woerd was a talented designer of horological machines and pocket watch movements, working at the Boston Watch Co., the Nashua Watch Co., and then the American Watch Co. in Waltham. On page 152, Rhett Lucke shares his experience of purchasing a chronometer with Woerd's name on the dial and the subsequent restoration work on the movement and box. The back cover shows the chronometer after the restoration.

Regular Annual Meeting of the NAWCC

Saturday, July 15, 2023

8:00 – 9:00 a.m.

Lancaster Convention Center
25 S. Queen Street
Lancaster, PA

Errata

In the March/April 2023 *Bulletin*, midway down the Equation Explanation on page 111, the line beginning "π is much greater" should begin "P is much greater." The correction has been made in the online PDF.

Message from the Board Chair

I recently had the privilege of attending a couple of Zoom meetings held by NAWCC Chapters 35 and 140 that were titled “Wednesday Coffee and Horology.” These meetings began during the Covid shutdown and now supplement in-person Chapter meetings. Hosted by Frank Webster, the Zoom meetings last precisely 30 minutes with a set agenda and a main topic. For those interested in learning more, details are posted in the “Chapter News and Views” area of the NAWCC Forums (<https://mb.nawcc.org>).

The topic for one of these meetings was mentorship and its role in the future of the NAWCC and our Chapters. This topic really hit home with me. I truly believe my nearly 40 years of continuous membership is largely due to the mentorship I received from the time I attended my first Chapter meeting to today, as my horological interests grow and evolve. I believe we can all look back and identify those who helped cultivate and shape our interest in horology.



Mentorship is simply guidance provided by an experienced individual and is something everyone can offer. When new or prospective members walk into a Chapter meeting, a Regional, or a retail shop, or post on an internet forum, we as experienced members can positively impact their interest in both horology and the NAWCC by simply sharing our knowledge and friendship. It all starts with making newcomers feel welcome, understanding their interests and needs,

and then being a resource for those needs. This is really the core of what the NAWCC is about. As with many members, some of my longest and most valued friendships have come from those I have helped mentor or who have mentored me.

The lifeblood of the NAWCC is our members, and the Association is strongest when members are actively engaged in helping to promote the organization. Mentorship is a vital element of this engagement.

Rhett Lucke

NAWCC Chairman of the Board
rlucke@nawcc.org

Message from the Executive Director

In March, we held our first clock repair mentorship program at the School of Horology for four students. Before the session commenced, all were given clear guidelines regarding the sort of clocks to bring and, importantly, what the condition of those clocks should be. This approach was successful in avoiding students getting bogged down in complex repairs before the basics of servicing were understood. The students worked under the close guidance of our Education Director Ken De Lucca to tackle the servicing of clocks in a thorough and systematic manner.

Since reopening the School last year, we have had many successful weekend courses and this marked the first week-long course. At the end of the week, I sat down with the students and received feedback on their mentorship experience. The response was overwhelmingly positive. All of the students had successfully overhauled at least one clock, performing routine servicing techniques—pivot



dressing, bushing, escapement remediation, and so on. Ken’s academic approach to the sessions was very much appreciated. He applied modern teaching methods in supplying plenty of carefully prepared reading material for the evenings, so that those precious daytime hours at the bench could utilize the learning of the night before, instead of holding up practical progress by classroom lecturing during the day.

Time spent behind the scenes in the Museum and in the Library and Research Center was an important element of the mentorship experience. It gave students the opportunity to study numerous antique clocks close up and explore some different approaches employed by clockmakers around the world. As part of the experience, we looked at both standard and unusual approaches to attaining the 12:1 ratio of motion of the hour and minute hands: firstly, William Strutt’s patented epicycloidal motion work

on a 19th-century skeleton clock and finally, Aaron Dodd Crane's hypocycloidal daisy wheel system. The Library offered substantial opportunity for participants to study the origins and makeup of the clocks that they were working on.

From my perspective, it is critical that we continue to use all of the wonderful resources that have been collected over the years at the NAWCC. We are in a unique position to provide a well-rounded education, and our facilities are being improved continuously. Thanks to the dedication of staff and a small team of volunteers, we are making significant strides in repurposing behind-the-scenes spaces so that they can be used to engage and educate different audiences.

Most recently, two local school groups visited the Museum, which was a really encouraging experience for all concerned. The students divided their time here between a treasure hunt and quiz in the galleries and a study session of diverse objects from our reserve collection. They worked well together to arrange objects by date of manufacture, basing their opinions on stylistic features and the map on an early 20th-century globe clock to roughly determine age. I was particularly pleased to hear from the groups that they were keen to learn more by dismantling and studying the mechanisms.

Like many of us, I share the same entry point into the fascinating world of horology by having had the opportunity to take apart and study a clock or watch. Hearing high school students express interest in the hands-on study of clocks and watches was heartening! In attending numerous NAWCC events over the past year, conversations have frequently turned to how we encourage younger folk to get involved. Using our educational

resources to introduce people to the subject is definitely the way forward.

As I have written in previous *Bulletin* messages, we all learned a great deal about how to communicate digitally during the pandemic, and we understand that not everyone can travel to Columbia to visit the Museum or attend classes at the School. Please rest assured that we are taking positive steps toward putting more educational content online. The good news is that we are now able to complete conservation work on clocks and watches on-site. This is a huge shift from where we were at this time last year and as we develop our working spaces, we are incorporating options to accommodate filming for broadcast on our YouTube channel (@NAWCCMuseum).

We are also developing staff expertise to generate better images for the online visibility of our collections. This is an area that is long overdue for an overhaul, as much of what is available on our website is outdated and poorly represented. There are some basic IT issues that need to be finessed before we can connect our local records to those available on the website, and once this is completed, we can begin to update images and descriptions. As we have around 12,000 online records to work with, there will be a great opportunity for you to help get our records in better shape.

We are keen to involve you in developing our ability to communicate our educational messages more effectively. Please watch our newsletter and website for opportunities to work with the NAWCC's fabulous collections and help us to share them with the world more effectively.

Rory McEvoy

NAWCC Executive Director
rmcevoy@nawcc.org

2023 CLASSES AT THE SCHOOL OF HOROLOGY

Columbia, PA



May 6: American Shelf Clock Tablets with Stenciled Borders

June 2-4: American-Style Time/Strike Movement

June 24-25: Using a Micro-Mill for the Beginner

July 14: Introduction to Antique Clocks

September 9-10: Wheel & Pinion Cutting on the Micro-Mil

Visit nawcc.org/education to register!

Questions? Contact Ken De Lucca, Education Director, at education@nawcc.org or 717-684-8261 ext. 237.

NAWCC's Most Exciting National Ever!



NAWCC's 2023 National Convention, 80th birthday celebration, and the Ward Francillon Time Symposium come together, July 13-17. A single plane ticket lets you attend all your favorite events, including the Museum Open House, the Mart, the Auction, and historical sites in and around Lancaster. (Come even earlier, and attend the World Wide Traders watch show.)

Thursday Special Exhibits:

- Carriage Clocks
- McLemore Clocks (inspired by *S-Town* podcast from *Serial & This American Life*)
- Vintage Wristwatches
- Skeleton Clocks
- Public Time Gallery
- Engine Turning Demonstrations

Friday Talks:

- Pat Holloway: Artists' Role in Horological Advertising
- Russ Oechsle: Christopher Brown's Wooden Works Shelf Clocks
- Philip Poniz: Moinet's Compteur de Tierces
- Seth Kennedy: Engine Turners in London

Saturday Talks:

- Leigh Extence: Drocourt Carriage Clocks
- Frank Webster: Seth Thomas #4 Restoration
- Fred Mandelbaum: Breitling Heritage
- Wristwatch Panel: Balancing Brand Heritage with Modern Design
- Mark Frank: The Astronomical Skeleton Clock
- Philip Morris: The Artistry of John B. McLemore
- Brittany Cox: History & Applications of Guilloche
- Keith Scobie-Youngs: Restoration of the Westminster Great Clock

Sunday Talks:

- Jay Dutton: Electrical Horology
- Patrick Loftus: Campbell's Clock Shop & 400-Day Clock History

In addition, vote for your favorite original work or restoration in the Crafts Competition. The annual members-only auction will be Friday evening, and on Saturday and Sunday, workshops will be presented by the Horological Society of New York, the American Watchmakers-Clockmakers Institute, and NAWCC. And, for the first time in years, the public will be admitted to the Mart room on Saturday afternoon.

The 2023 NAWCC National Convention ends Sunday, July 16 at noon, and the Ward Francillon Time Symposium begins at 1 pm on Sunday and ends on Monday, July 17 at 3 pm.

Register for the Convention and Symposium, select Mart tables, and explore hotel options at natcon.nawcc.org

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Mail with payment to:
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514 Poplar Street, Columbia, PA
17512-2130

Questions? Email convention@nawcc.org

NAWCC OPEN HOUSE: National Watch & Clock Museum,
514 Poplar St., Columbia, PA
CONVENTION: Lancaster County Convention Center
25 South Queen Street, Lancaster, PA

*Name:	<input type="text"/>	*NAWCC #:	<input type="text"/>
Spouse/Partner:	<input type="text"/>	NAWCC #:	<input type="text"/>
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Child Name/Age:	<input type="text"/>		
Children Under 18 No Charge			
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Registration

<u>Early Registration Discount</u>	<input type="checkbox"/>	@ \$70.00 per person	<input type="text"/>
<u>After June 1st Registration</u>	<input type="checkbox"/>	@ \$80.00 per person	<input type="text"/>
Friday Early-Bird Mart Entrance	<input type="checkbox"/>	@ \$50.00 per person	<input type="text"/>
Saturday 80th Celebration Banquet	<input type="checkbox"/>	@ \$55.00 per person	<input type="text"/>
Old Timers & Fellows Luncheon	<input type="checkbox"/>	@ \$35.00 per person	<input type="text"/>
Special Access Needs or Dietary Restrictions?	<input type="text"/>		

Museum and School Open House

- * Thursday, July 13th Starting at 10:00 am (Mart Load-in is on Friday)
- * Demonstrations
- * Tours & Talks
- * Special exhibitions
- * Food & Beverage Vendors

Table Holders

Mart Tables (6 foot)	<input type="checkbox"/>	@ \$70.00 per table	<input type="text"/>
Electric Outlet Hook-up	<input type="checkbox"/>	@ \$65.00	<input type="text"/>

Note: Table Holders wanting to be next to each other must submit their registrations together. All Table registrations include Early Bird admittance.

I'm staying for the entire show:

I may leave before the show ends:



(Illustrative Only)

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<input type="checkbox"/> VISA <input type="checkbox"/> MasterCard	Card Number: <input type="text"/>
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	CVC: <input type="text"/>
	**Donation - Thank You! <input type="text"/>
	Total Amount: <input type="text"/>

Register by June 1st to Receive Early Registration Discount. All Registrations Nonrefundable After June 1st.

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Watch & Clock BULLETIN

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Vox Temporis

Luman Watson Hollow Column Clocks

Buckeye Chapter 23 has undertaken research to obtain photographs of all Luman Watson hollow column clocks and identify them by number (Figure 1). The Luman Watson hollow column clock is the symbol of the Chapter and appears on its literature and website (<https://new.nawcc.org/index.php/chapter-23-buckeye-23>).

Luman Watson was a famous wooden movement clockmaker in Cincinnati, OH. In 1829–30 he produced a hollow column clock patterned after French portico clocks. The wooden movement is unique to this clock.

These clocks are rare. It is believed only 30 or so were produced. Fortunately, the clocks were consecutively numbered at the factory. The number was marked with a broad pencil in the middle of the back of the top front rail (Figures 2–3). The number is right side up.

Do you have a photo of this clock you could share with Chapter 23? Owners who provide information on these clocks would remain anonymous if they desire.

—Russell Hill (OH)
barnfool47@aol.com



Figure 1. Luman Watson hollow column clock. PHOTO BY RUSSELL HILL.



Figure 2. Pointing to the location of the number. PHOTO BY RUSSELL HILL.



Figure 3. The number is written in pencil under the lid. PHOTO BY RUSSELL HILL.

Charles Vander Woerd's Chronometer

BY RHETT LUCKE (NE)

The Acquisition

One evening in late 2018, while searching the internet for American-market marine chronometers, I stumbled across an antique estate auction that included a single chronometer, listed with a condition note, "This Movement is Not in Working Order." A note like this is usually a red flag to move on, but I noticed in the pictures that the dial was marked for Charles Vander Woerd. As a collector of American pocket

watches, this piqued my interest as I had not seen or heard of another chronometer under his name. Over the next few weeks, I spent numerous hours searching for details or pictures of another example, without any success.

By the time of the auction, I had convinced myself that even though the movement likely had some significant repair needs, it was worth going after. After a few short hours of waiting for the lot to hammer, the chronometer was mine (Figure 1).



Figure 1. Charles Vander Woerd chronometer after restoration. AUTHOR'S PHOTO.

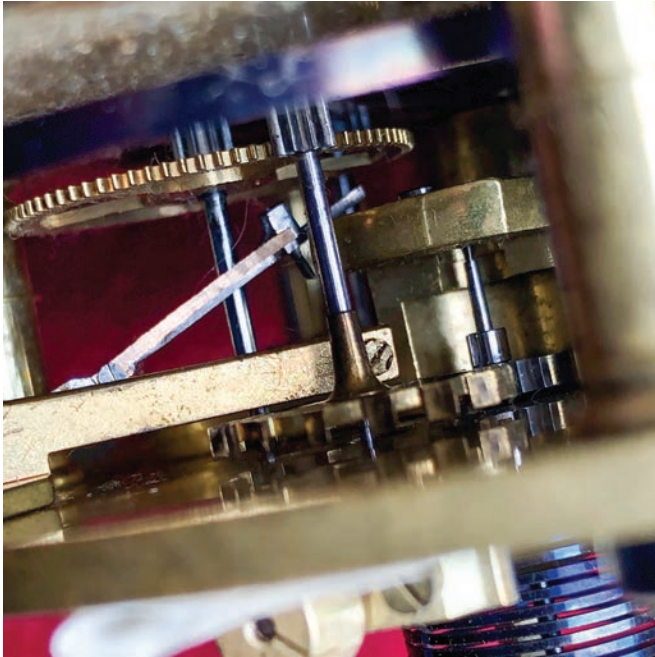


Figure 2. Unattached detent. AUTHOR'S PHOTO.

Upon receipt and initial inspection, it was clear that the chronometer was going to need a fair amount of work. The box was pretty much intact but needed some general refreshing to both the wood and brass. The dial was in good shape but missing the indicator hand. The movement, however, was dirty, and the detent showed signs of a poor repair and was not attached (Figures 2 and 3).

Charles Vander Woerd

Charles Vander Woerd (Figure 4) was born in Leyden, the Netherlands, on October 6, 1821, the son of a precision optics maker. After years of training and an apprenticeship under his father, specializing in microscope and telescope making, he decided to migrate, along with his wife and two daughters, to America in 1846. Upon arriving, Woerd settled in South Boston, MA, working as a machinist in a sugar refinery owned by Seth Adams. He remained with Adams until 1853, when he went to work for a well-known telescope maker in Cambridge. In 1857 he took a job with Charles Moseley at the Boston Watch Co. in Waltham and subsequently followed Moseley to B. D. Bingham's Nashua

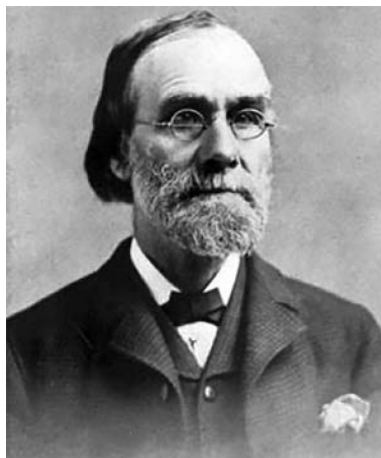


Figure 4. Portrait of Charles Vander Woerd, from Craig Risch's article in the December 2002 *NAWCC Bulletin*.

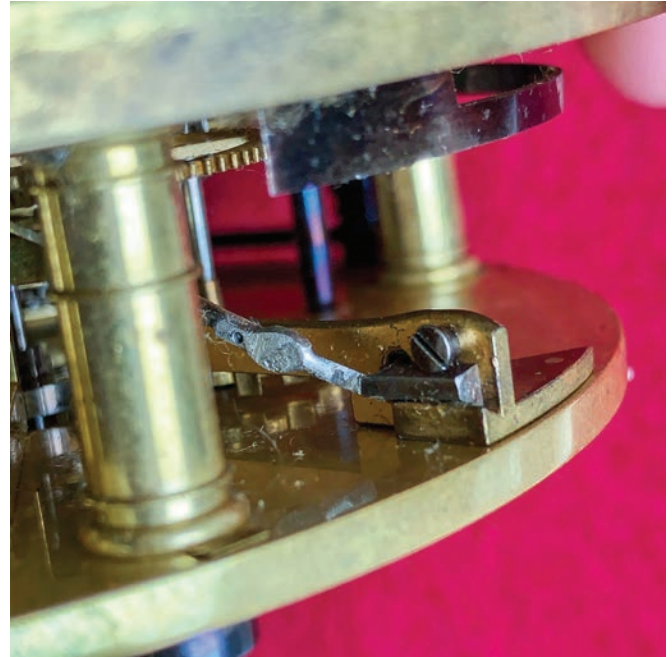


Figure 3. Previous detent repair. AUTHOR'S PHOTO.

Watch Co. venture in 1859. At Nashua, Woerd quickly rose from being a machinist to overseeing the train department. It was while working in the train department that Woerd started developing machines, the first being a grinding apparatus used for cutting teeth in wheels and pinions.

In 1862, Woerd and Moseley were back at what was now the American Watch Co. in Waltham where Woerd found himself in the Nashua Department. While there, Woerd continued to show his skills by developing a machine for jewel making before being promoted to mechanical superintendent. It

was around this time that Woerd became involved in movement design and acquired several patents, one of which was for his winding and setting mechanism that can be found in the Model 1868 watches. He was then made responsible for the overall design of the Model 1870 Crescent Street, which included several unique elements. He was also involved in the highly celebrated Model 1872. A few of the 1872 watches also included a unique temperature compensation design, featuring a sawtooth-style balance.

Even with all these accomplishments, Woerd is

probably best known as a machine designer. His most notable design is his automatic screw machine, introduced in 1871. Woerd, working under Royal Robbins, continued to climb the ladder at American Watch Co., being promoted to mechanical superintendent of the entire factory in 1874 and then general superintendent in 1876. Woerd continued in this position until 1883 when Robbins, recognizing that changes needed to be made in factory management, brought in Ezra Fitch as general manager. This signaled the end of Woerd's long and innovative run at Waltham, and in June 1883, he resigned.

After leaving Waltham, Woerd went into business with Granville Nutting and Dennison Wright of the Waltham Tool Co. Woerd helped them expand into a larger facility to make automatic machines. In 1886 he convinced these business partners to establish a new watch company in Waltham, which became the United States Watch Co. at Waltham. In this new company, Woerd was given the roles of general manager and factory superintendent. He proceeded to design a three-quarter-plate movement that was slightly larger than a standard 16-size. These watches did not fit a standard 16-size case and proved to be unpopular. They were discontinued in 1887, at which time Woerd left the company. From all accounts, this was Woerd's final foray into the watch industry, and he then relocated to California. He died of a sudden heart attack on December 28, 1888.¹

The Charles Vander Woerd Chronometer

After acquiring the chronometer, I left it untouched until early 2020 when I decided to contact Dave Cooper about the possibility of having the movement restored (Figures 5 and 6). After an initial inspection, Dave agreed to take on the restoration. He noted that the chronometer was of high quality and in the English style of design, but it had no apparent numbering anywhere on the movement or under the dial. The design of the detent was of the Earnshaw style but with a unique foot design. The Earnshaw design had been a longtime standard but was largely abandoned by the time this chronometer was made.

During the initial inspection and subsequent restoration, it was determined that the Earnshaw-style detent and several other parts were not of English origin and were most certainly made in the United States. As can be seen in Figure 7, having a triangular foot the same width as the detent spring greatly reduces the time to make the foot and makes it far easier to adjust. With a standard-footed detent, a much larger piece of steel stock must be used, requiring a significant amount of metal removal prior to making the actual detent itself. It was also noted that the foot was not a perfect triangle, and the locking screw is at a different angle than the potence, again a deviation from what one would expect in a chronometer of English origin.



Figure 5. Charles Vander Woerd dial. AUTHOR'S PHOTO.



Figure 6. Woerd movement. AUTHOR'S PHOTO.



Figure 7. Original detent foot (top) and new detent foot (bottom). PHOTO BY DAVE COOPER.

The balance design is also unique to this chronometer and features a “dog foot” style of balance spoke along with a unique middle temperature compensating balance. The balance spoke closely resembles the design used on the Nashua and early Waltham American grade models that Woerd would have been very familiar with (Figure 8). The compensating balance, which is clearly referenced on the dial, must certainly be of Woerd’s design. To date, however, a corresponding patent has yet to be located. A patent is known for what was likely a later bimetallic compensating balance design of Woerd’s, known to have been used on a small number of Waltham Model 1872 American grade watches.



Figure 8. Waltham American-grade balance spoke. AUTHOR’S PHOTO.

Adding to the determination that the detent was made in the United States is the fact that the section of the detent that contains the passing spring, which was partially missing, is by English standards quite heavy. The standard for detents was to be as light as possible, but in this instance the extra thickness of the horn section allowed the original section to be attached to the new spring and foot by means of the passing spring screw. It was also noted that with this extra weight the chronometer is able to keep perfect time (Figure 9).

The major restoration issue was with the detent itself, which had been damaged and crudely resoldered and required a complete rebuild of the foot half of the detent, sizing, and fitment of



Figure 9. Completed detent assembly. PHOTO BY DAVE COOPER.



Figure 10. Purpose-made machining fixture. PHOTO BY DAVE COOPER.

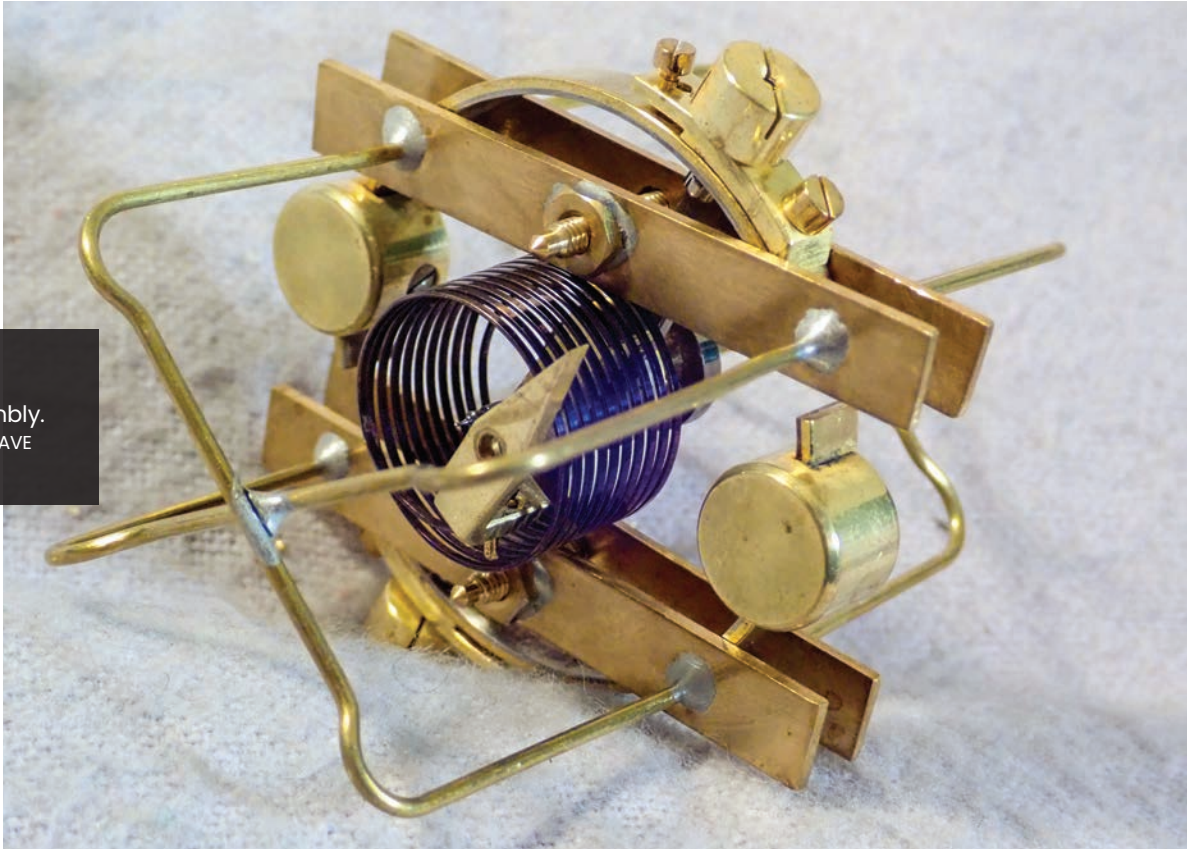


Figure 11.
Balance
subassembly.
PHOTO BY DAVE
COOPER.

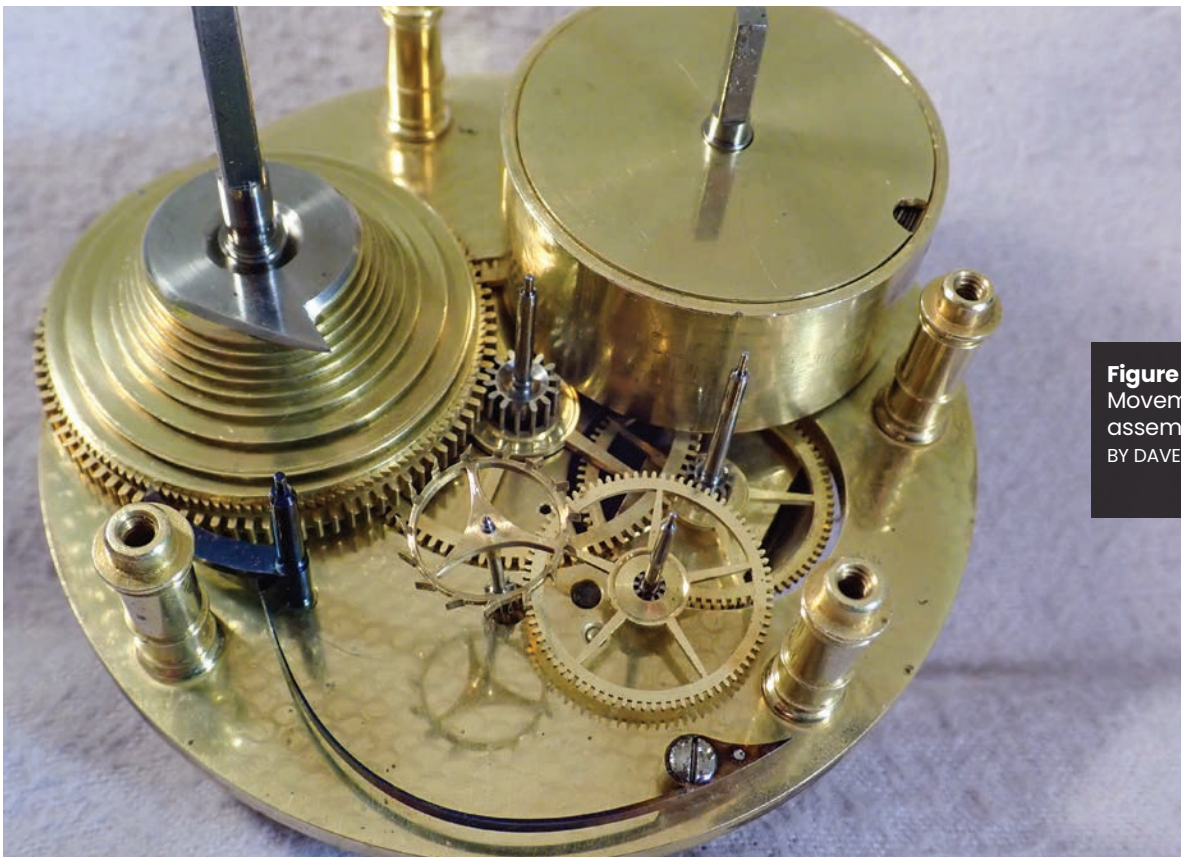


Figure 12.
Movement
assembly. PHOTO
BY DAVE COOPER.

a new spring. The generous amount of solder used, however, saved the detent parts from being lost. Reconstructing the foot proved to be a real challenge, due to having two different angles of 12 and 30 degrees as observed on an optical comparator. The setup for making the new spring involved a Sherline dividing head mounted inline and driving a purpose-made Webster Whitcomb-style lathe fixture bolted to the mill bed set up for working between centers on delicate and long parts (Figure 10). To preserve as much originality as possible, the detent was done in two pieces, the foot and spring attached to the horn. Once the detent was complete, a few other minor issues were addressed and the movement was cleaned, assembled, and adjusted to time (Figures 11 and 12).

During the movement's restoration, a few other interesting things were found. First, the detent and escape wheel, as well as the 48 threads-per-inch plate screws, appear to have been made in America. As mentioned previously, the movement bears no markings or numbering and there is no serial number on the dial. It was noted, however, that the following was hand-scratched on the movement, under the dial: "Frank L. Scofield, 71 N Main St Albans VT, W H S, Mar 26, 1901" (Figure 13).

A little research indicates that Frank L. Scofield was born on March 22, 1876, in St. Albans, VT. He was the son of Jeremiah Scofield, who owned and operated a local mercantile business. Frank left the family business in 1876 to learn the jeweler's trade. From the "W H S" scratchings on the chronometer, it seems clear that Frank's training apparently included some time at the Waltham Horological School. Having completed his training, he then worked for jewelers in St. Albans and Montpelier, VT, from 1902–3, before opening his own jewelry business in St. Albans in 1904. From this timeline, the assumption is that Woerd's chronometer had at some point found its way into the school.

While the movement was being restored, it was also a good time to address a few issues with the box, a project that Paul Regan agreed to take on. Upon receipt, Paul and I agreed that the box should have only minimal repairing and refreshing. A small piece of missing wood on the base was replaced, and minor cleanup and restoration work of the original finish was completed. After some debate, it was also decided to retain the Max Low tag, which was obviously added later but felt to be part of the chronometer's history. Max Low was well known for servicing and repurposing used chronometers during World War II (Figure 14).



Figure 13. Hand-scratched markings on the movement under the dial. PHOTO BY DAVE COOPER.



Figure 14. Charles Vander Woerd box. PHOTO BY PAUL REGAN.

Paul noticed several interesting items while working on the box. The box appeared to have never been taken apart and had only been worked on once before with the application of a lacquer coat over the original finish. The box was made from a very plain mahogany. Construction was noted to be nontypical, starting with the base, which was simply applied rather than rabbited out as is standard (Figure 15). There was also much attention paid to hiding the method of joinery, with a $\frac{1}{16}$ " veneer being placed as a cover over each leading edge. Typically, the joinery is left visible as a matter of pride. The method of holding the glass in is also unusual. Instead of a rabbit and spline, the maker attached a double spline with pins (Figure 16). Much of the

brass work is also not typical. The stop hinges are very unusual, more like a modern hinge except that they are made of heavy brass. The center hinge is also more robust than what one would normally see (Figure 17). The handles are very heavy and attached through holes in the mounting brackets, rather than the typical blind mounting (Figure 18). There are also no casting marks on the reverse of the handles. The gimbal lock works in reverse of most others: counterclockwise for the tab and the gimbal is very light (Figure 19). The gimbal is a rather primitive form of what we are typically accustomed to seeing. The gimbal also has no straps mounted to it that would allow the user to balance the chronometer perfectly horizontal. Normally, there is a tub-to-gimbal mounting strap that allows adjustment of the tub within the gimbal. A second strap, 90 degrees from the previous strap, is then typically used to adjust the gimbal within the box. The Woerd chronometer has neither of these features, indicating that it was never intended for use at sea and was most likely used in a static position.

Conclusion

Both the movement and the box have enough unique and unusual features to indicate they are original to one another. The movement could possibly have been imported from England as an ébauche and fitted with the unique detent and other parts in America, but it is unusual in that it

has no numbers or marks identifying the maker. The box also has many unique build features that would indicate that it was purposely built for the movement and may have been specifically made in the way it was to accentuate the chronometer itself.

The purpose of the chronometer is unknown. Did Charles Vander Woerd build it as some type of prototype exercise, to show off his skills, as a personal piece, or for some other reason? When was it built? Given the tooling and equipment that would have been required to make the unique parts, Woerd likely made the chronometer during his time at the Boston, Nashua, or Waltham Watch Companies. I am very interested to hear what other readers might have to offer about this chronometer and its history or purpose. My email address is rrstd@yahoo.com.

Acknowledgments

I would like to thank NAWCC members Dave Cooper and Paul Regan, both masters at their craft, for their expertise and help in bringing the movement and box of this chronometer back to life. Their encouragement and technical input in putting



Figure 15. Box base construction. AUTHOR'S PHOTO.



Figure 16. Double spline/pin glass mounting. PHOTO BY PAUL REGAN.

together this article is also much appreciated. Thanks also to Laura Taylor and the editorial staff at NAWCC headquarters in Columbia for their help in the editing and layout of the manuscript.

Note

1. For an in-depth account of Charles Vander Woerd’s life and work, see Craig Risch, “Charles Vander Woerd’s Unique 1872 Model Waltham, Part 1,” *NAWCC Bulletin* 44, no. 341 (December 2002): 721–35.

About the Author

Rhett Lucke has been a member of the NAWCC since 1984 and currently serves as Chairman of the NAWCC Board of Directors. He has contributed to and written numerous *Bulletin* articles as well as participated in the NAWCC Time Symposium on railroad timekeeping. He led an NAWCC project to raise funding for and to coordinate scanning of the Hamilton factory ledgers, available online for NAWCC members at nawcc.org/research/company-records/hamilton-serial-number-search. Rhett is a graduate of the University of Nebraska,

with a BS in engineering. In his 35-year career, he has held a variety of engineering and management positions prior to his current role of managing new product launches for a large manufacturer of off-road equipment. His horological interests include American watches and chronometers intended for the American market.



Figure 18. Handles on the Woerd box. AUTHOR'S PHOTO.



Figure 17. Hinges on the Woerd box. PHOTO BY PAUL REGAN.



Figure 19. Gimbal ring (middle ring). PHOTO BY PAUL REGAN.

The Atlantic Clock Works of Birmingham, England, Revealed

Part 3: "Square Nut" Movements

BY PETER GOSNELL (UK)

An Overview

The collected and examined details of clock and movement examples strongly suggest that "Square Nut" movements were produced soon after the "Early Production No. 3" ("E.P.3") movement (investigated in Part 2!), with production possibly beginning circa 1870. The arbitrarily assigned name "Square Nut" originated from the threaded brass square nuts that now hold movement plates together. Both 8-day "Square Nut" striking ("S.N.s.") and 8-day "Square Nut" timepiece ("S.N.t.") movements were manufactured (Figures 1A and 2), suggesting that these could possibly be the movements in production during the visit of the *Jeweller and Metalworker* correspondent to the Atlantic Clock Works in December 1875 (key point 4 in Part 1²), but more on this later. Except for the new square nuts, "S.N.s." movements use the same components as the previous "E.P.3" movement and can have either a 5-, 4-, or 6-spoke escape wheel. "S.N.t." movements use the same time train and motion work components as "S.N.s." movements, but the design of their plates and the planting of arbors differ from any known American timepiece movement and is believed to be purely British in origin. "S.N.t." movements have been found with either a 5- or 4-spoke escape wheel. All "S.N.s." and "S.N.t." movements additionally have decorative rings around their front great wheel arbor bushes (Figures 1A, 1B, and 2).

The discussion that follows presents these "Square Nut" movements in groups according to their believed chronology, functions, and characteristics. Attempts will be made to connect observations to the key points in Part 1 that describe the Cartwright factory's operations from the primary sources.

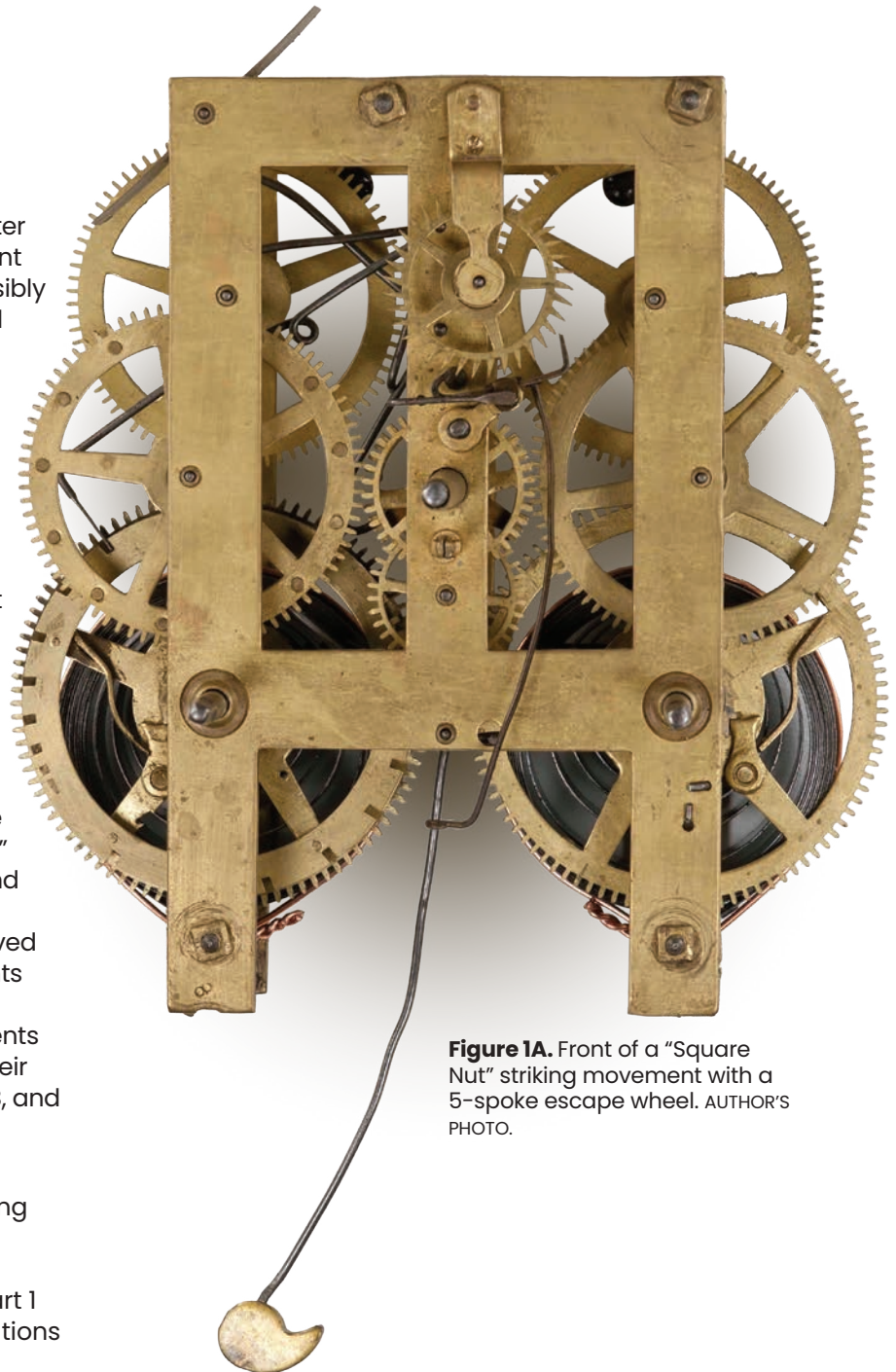


Figure 1A. Front of a "Square Nut" striking movement with a 5-spoke escape wheel. AUTHOR'S PHOTO.



Figure 1B. (top left) Front left plate leg belonging to the "Square Nut" movement in Figure 1A. AUTHOR'S PHOTO. **Figure 1C.** (top right) Anglo-American-styled drop-dial case containing a "Square Nut" striking movement with a 5-spoke escape wheel in Figure 1A. AUTHOR'S PHOTO. **Figure 2.** (bottom) Front of a "Square Nut" timepiece movement with a 5-spoke escape wheel. AUTHOR'S PHOTO.

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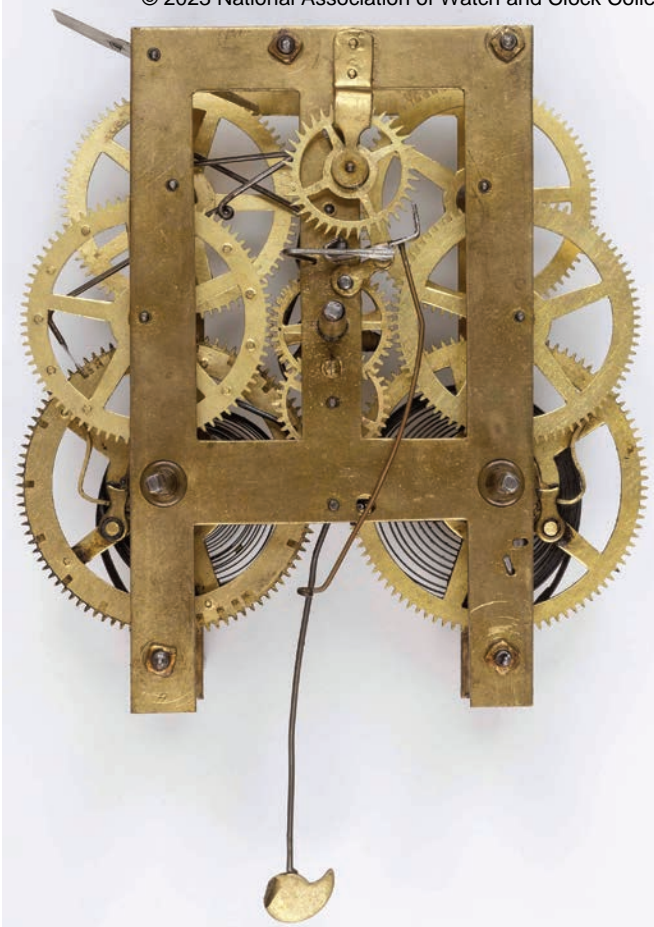


Figure 3A. Front of a "Square Nut" striking movement with a 4-spoke escape wheel. AUTHOR'S PHOTO.



Figure 3C. Front left plate leg of the "Square Nut" movement in Figure 3A. AUTHOR'S PHOTO.



Figure 3B. Left-rear view of the movement in Figure 3A. AUTHOR'S PHOTO.



Figure 3D. Escape wheel of the "Square Nut" movement in Figure 3A with "8" punched on the spoke at the 2 o'clock position. AUTHOR'S PHOTO.

“Square Nut” Striking Movements with a 5-Spoke Escape Wheel

Only two identical “S.N.s.” movements with a 5-spoke escape wheel (now “S.N.s.5”) have been found so far, with Figure 1A showing one example. Six views of the same movement were published previously in the *Bulletin*.³ “S.N.s.5” movements have their plates held together with what have been called “Small Square Nuts” that have an approximate outside diameter of 0.134” x 36 threads per inch (Figures 1A and 1B). Both “S.N.s.5” movement examples also have a small punched “8” at the very foot of the front left plate leg (Figure 1B); its purpose is unknown at present.

Figure 1C shows the Anglo-American-styled drop-dial case⁴ that the “S.N.s.5” movement seen in Figure 1A was found within. The main body of this case was made from oak and pine, with the front veneered in rosewood with mother-of-pearl and pewter inlay. The case seen in Figure 1C has a small, front glazed door for easier pendulum access and has its dial surround pegged to the case (not shown).

“Square Nut” Timepiece Movements with a 5-Spoke Escape Wheel

Figure 2 shows the only known “S.N.t.” movement with a 5-spoke escape wheel (called “S.N.t.5”); it

is now just a loose movement, and once again six views of it have appeared previously in the *Bulletin*.⁵ The “S.N.t.5” movement also has its plates held together with “Small Square Nuts,” but notice in Figure 2 how four of the five pillars now have modern replacement hexagon nuts due to the original square nuts probably having stripped out. Unlike the “S.N.s.5” movement above, this “S.N.t.5” movement example has no mark at the foot of the left plate leg.

“Square Nut” Striking Movements with a 4-Spoke Escape Wheel

It now appears that the 5-spoke escape wheel on “Square Nut” movements was discontinued, for no obvious reason, and the old 4-spoke escape wheel previously used on the “E.P.3” movement was employed again. Since the same punch and die set was now being used to create the 4-spokes on both the escape and cannon wheels, it seems possible that this simplification could have provided savings in materials and cost. An “S.N.s.” movement example with a 4-spoke escape wheel (now “S.N.s.4”) can be seen in Figures 3A and 3B. Out of a total of nine “S.N.s.4” movements investigated, seven have what will now be called “Large Square Nuts.” Two had a mixture of both “Large Square



Figure 3E. A 12” drop-dial case containing the “Square Nut” striking movement in Figure 3A. The dial is now a replacement. AUTHOR’S PHOTO.



Figure 3F. Rear of the case in Figure 3E with a nailed-in bent wire hanger visible. AUTHOR’S PHOTO.



Figure 3G. Another view of the case in Figure 3E with the dial and bezel removed to show the dial surround permanently fixed with screws, and the full-width trunk door tied open to show the label. AUTHOR’S PHOTO.



Figure 3H. “Superior No. 1” label from the case in Figures 3E–3G. Notice how the label is now discolored by oil staining. AUTHOR’S PHOTO.

Nuts” and “Small Square Nuts.” One still had just “Small Square Nuts,” probably indicating “Small Square Nuts” were gradually replaced with new “Large Square Nuts” sometime near the beginning of “S.N.s.4” production.

“Large Square Nuts” have a coarser, larger diameter thread of approximately 0.159” x 32 threads per inch., and when compared with “Small Square Nuts” would have been a little less likely to strip out. A direct visual comparison between these two square nut sizes can be made from comparing Figures 1B and 3C. It was also noted that “S.N.s.4” movements with “Large Square Nuts” now have a small “w” rather than an “8” punched on the foot of their front plate left leg (Figure 3C). They also have an additional small number punched onto their escape wheel, with “8”, “2”, and “0” found so far on these “S.N.s.4” movements. Figure 3D shows a punched “8” as an example. These small numbers on escape wheels were used as a factory code to indicate the pendulum length needed for that movement.

To date, 14 wall cases of various designs with “S.N.s.4” movements have been discovered. Five of these known only from photographs were typical Anglo-American–styled drop-dial cases finished with different wood veneers and were similar in overall design to the case shown in Figure 1C. Two more were in English drop-dial cases with papier-mâché fronts, one of which previously appeared in the *Bulletin*.⁶ English papier-mâché-fronted drop-dial cases are more commonly found with either English fusee or imported American movements. The remaining seven cases with “S.N.s.4” movements

have a slightly different design than typical Anglo-American–styled cases and have common details that seem to link them together. The author now tentatively believes these seven cases could mark the beginning of case production at the C. & H. Cartwrights’ Atlantic Clock Works. Their common details will now be called “Significant Details”:

- A. A nailed-in, bent wire hanger is used instead of the usual hanging plate.
- B. If the case has a wooden dial surround, then it is fixed permanently to the case with screws rather than pegs.
- C. If the case design permits the use of a visible label through a full-width trunk door, then this label will have a pseudo-Royal Coat of Arms of the United Kingdom at the top and the word “Superior” below the coat of arms image.⁷



Figure 4A. “Prize-Medal Regulator” case with the dial now repainted and renumbered in pencil. AUTHOR’S PHOTO.

Figure 3E shows a 12" drop-dial wall clock case with the main body made from pine and the front veneered in rosewood with pewter inlay (consistent with key points 15 and 17). This case has Significant Details A, B, and C (see Figures 3F and 3G). The clock's "S.N.s.4" movement has already been pictured in Figures 3A–3D. Figure 3H shows a close-up of the label also seen in Figure 3G. This label has a pseudo-Royal Coat of Arms of the United Kingdom at the top and then reads "Superior / 8 DAY CLOCK. / With Extra Bushed Movement. / Warranted if Well Used / for / HOME & ABROAD." This wording suggests that some of these clocks were being exported, consistent with key point 18.

This label was glued to the inside of the backboard directly in front of the upward-hinged full-width trunk door that is glazed with a tablet (Figures 3E and 3G). Previously, this label had been assigned the name "Colorless Superior Label Version 1A".⁸ For the sake of simplicity and chronological clarity as we proceed, this label's name will now be changed to "Superior No.1" ("S.1") label. The "S.1" label was printed from a single, carved wood block with black ink. As seen in Figure 3H, the "N" in "MOVEMENT" has been printed backwards. It is very rare for a mistake of this kind, made when the wood block was cut, to

have still been used for printing;⁹ perhaps its use lowered supply costs. This "S.N.s.4" movement has a 38-tooth escape wheel punched with an "8" (Figure 3D) and a 10" pendulum. Different images of this clock's case, movement, and label have appeared in the *Bulletin*.¹⁰ There is just one other incomplete but seemingly identical example that was pictured in the 2014 *Bulletin*.¹¹

Figure 4A shows an example of what was previously called a "PRIZE-MEDAL REGULATOR" ("P-M.R.") case design.¹² It is veneered in rosewood with inlay of mother-of-pearl and what is believed to be satinwood. This case has Significant Details A, B, and C, with just C shown in Figure 4B. This label, behind the trunk door that hinges to the right, has a pseudo-Royal Coat of Arms of the United Kingdom followed by the text "Superior / 8 Day / ENGLISH MADE CLOCK. / Warranted if well used. / for / HOME & ABROAD." The important line here is "ENGLISH MADE CLOCK"—the first clear indication of the "Square Nut" movement's place of origin. Previously, this label was called "Colorful Superior Label, Version 3"; it will now be renamed "Superior No. 2" ("S.2"). This "S.2" label appears to have been over-pasted in the past, making some of the text difficult to read. The "S.2" label is 1 ½" narrower than the "S.1" label and



Figure 4B. "Superior No. 2" label from the case in Figure 4A. AUTHOR'S PHOTO.



Figure 5A. "Prize-Medal Regulator" case with the original tablet in the lower door. PHOTO COURTESY OF WOOTTON AUCTION ROOMS LTD.



Figure 5B. "Superior No. 2" label from the case in Figure 5A. PHOTO COURTESY OF WOOTTON AUCTION ROOMS LTD.



Figure 6. Headless wall case now with the dial repainted. AUTHOR'S PHOTO.

has a curved lower edge to fit the "P-M.R." case. The "S.2" label has four different colors, each printed with a separate wood block so it must have been more expensive to produce.¹³ This clock's "S.N.s.4" movement has a 33-tooth escape wheel with a punched "0" and a 13" pendulum. This same clock and label along with its "S.N.s.4" movement have been shown before in the *Bulletin*, but due to its importance in this story is shown again here.¹⁴

Three other less elaborate "P-M.R." cases with "S.N.s.4" movements have now been found; all of them have Significant Details A, B, and C. Figure 5A shows one of these three "P-M.R." cases with what is believed to be the original tablet in the lower door, and Figure 5B features the "S.2" label.

Figure 6 shows a mahogany headless wall clock case with an inlaid round-top door. This case also has a carved fret below the dial, a carved top pediment, and decorative, turned pillars and finials. Also notice in Figure 6 that this case has a mirror-backed pendulum box and imitation mercury pendulum, the same details reportedly used by Cartwright with its so-called Vienna Regulator-styled cases (key point 17). Headless wall clock cases have only Significant Detail A; this style of case permits no other. The "S.N.s.4" movement has a 38-tooth escape wheel punched with an "8" and a 10" pendulum again. Only one other almost identical



Figure 7. A 12" dial clock now with the dial repainted. AUTHOR'S PHOTO.



Figure 8A. Front of a "Square Nut" timepiece movement with a 4-spoke escape wheel and "Small Square Nuts." AUTHOR'S PHOTO.



Figure 8B. Cottage clock case with a 6" diameter dial containing the movement in Figure 8A. AUTHOR'S PHOTO.

style of headless wall clock case with an "S.N.s.4" movement has been seen, but it has a cheapened square-top door, so it was probably produced later.

Figure 7 shows a decorative walnut- and supposed sycamore-veneered 12" dial clock case that has Significant Details A and B. Its "S.N.s.4" movement has a 54-tooth escape wheel punched with a small "2" and a $4\frac{3}{4}$ " pendulum. This is the only 12" dial clock case with an "S.N.s.4" movement known at present.

"Square Nut" Timepiece Movements with a 4-Spoke Escape Wheel

At present there are complete data only on three "S.N.t." movements with 4-spoke escape wheels (now "S.N.t.4"). They are the most unresolved movements in the group being investigated. "S.N.t.4" movements have been found with either "Small Square Nuts" or "Large Square Nuts" and don't always have a punched mark at the bottom of their front left plate legs or a number on their escape wheels. Figure 8A shows the first "S.N.t.4" example that now has a repaired great wheel click return spring, "Small Square Nuts," and a punched "8" at the bottom of the front plate left leg but no



Figure 9. A punched leg mark that looks like five petals from a "Square Nut" timepiece movement with a 4-spoke escape wheel. Note the "Small Square Nut." AUTHOR'S PHOTO.

number on the 54-tooth escape wheel. It has a 4 ¾" pendulum that has been removed in Figure 8A.

The second "S.N.t.4" example (not shown) is now just a loose movement that again has "Small Square Nuts," a new punched mark at the bottom of the front plate left leg that looks like five petals (Figure 9), and a punched "2" on the 54-tooth escape wheel. The train count confirms it would require a 4 ¾" pendulum.

The third "S.N.t.4" loose movement, seen in Figure 10, now has "Large Square Nuts" and no punched mark at the bottom of the front plate left leg but does have a punched "2" on the 54-tooth escape wheel; again, it would require a 4 ¾" pendulum. Also notice in Figure 10 that this movement's bottom left square nut is now a sympathetic replacement, and the great wheel's click return spring and pawl have both been repaired and modified. Additional data is now needed before a clearer picture of the "S.N.t.4" movement development might emerge.

Four "S.N.t.4" movements in cottage cases have been found. Figure 8B shows the first example that has the movement seen in Figure 8A. Both the case

and movement have been presented before in the *Bulletin*.¹⁵ This case is veneered in lacewood¹⁶ and has decorative inlay work around the plinth, which has a raised bead on top (see Figure 8B). Notice that the dial's numerals have a Gothic look.

The second case with the "S.N.t.4" movement is identical to the first except it is veneered in walnut (Figure 11). This case has the same decorative inlay work around its plinth, again with a raised bead on top, and the dial has Gothic-styled numerals.

The last two cottage cases with "S.N.t.4" movements, not shown here but previously seen by the author, were veneered in burr walnut, and both had brass mounts instead of the inlaid plinth for decoration. Once again, they had the same distinctive, raised bead around the top of their plinths. One of these two examples still has a dial, and it had Gothic-styled numerals.

In past issues of the *Bulletin*, some very similar cottage cases (all believed to have been made by Holloway & Co., England) have been presented, all with imported American movements, so they can

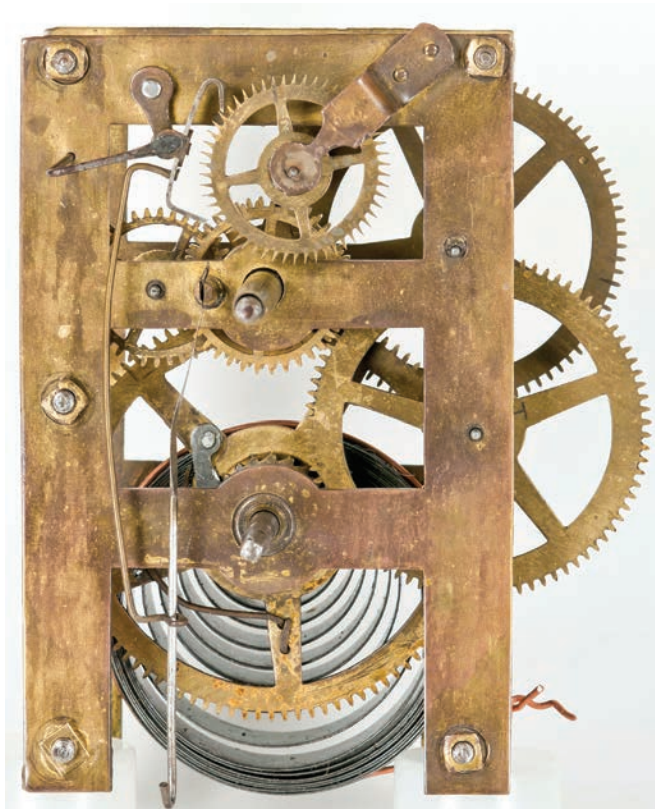


Figure 10. Front of a "Square Nut" timepiece movement with a 4-spoke escape wheel and "Large Square Nuts." AUTHOR'S PHOTO.



Figure 11. A second cottage clock case containing a "Square Nut" timepiece movement. AUTHOR'S PHOTO.



Figure 12A. Front of a "Square Nut" striking movement with a 6-spoke escape wheel. AUTHOR'S PHOTO.



Figure 12B. A damaged 12" drop dial case containing a "Square Nut" striking movement with the 6-spoke escape wheel in Figure 12A. AUTHOR'S PHOTO.

Figure 12C. Damaged "Superior No. 3" label from the case in Figure 12B. AUTHOR'S PHOTO.

be called "Anglo-American clocks."¹⁷ From studying all these cottage cases, it appears only those with "S.N.t.4" movements have a raised bead around their plinth as well as Gothic-styled dial numerals. Could these two features perhaps identify cottage cases with a "Square Nut" movement and could such cases have been produced by Cartwright and therefore be British-made throughout? More research is needed before any firm conclusions can be made. Two more "S.N.t." movements within 12" dial clock cases have also been reported, but more examples for examination are needed before conclusions could emerge.



“Square Nut” Striking Movements with a 6-Spoke Escape Wheel

Last come the “S.N.s” movements with a 6-spoke escape wheel (now “S.N.s.6”), with one of only two examples known shown in Figure 12A. Apart from the new 6-spoke escape wheel, the “S.N.s.6” movement example in Figure 12A has all the same components as the “S.N.s.4” movement as well as “Large Square Nuts,” a small punched “8” on the bottom front left plate leg, and another punched “8” on the escape wheel.

Figure 12B shows the remains of the unusual drop-dial case that the “S.N.s.6” movement in Figure 12A was found in; this movement and this case have been presented before in the *Bulletin*.¹⁸ This damaged case has both the lower part of the carved middle door (that still hinges to the right) and the upper part of the trunk, now missing. The case has Significant Details A, B, and C and is the only example with a carved middle trunk door found so far. Figure 12C is a close-up of the now slightly damaged label seen also in Figure 12B. Previously, this label was called “Colorful Superior label, Version 1A”; it will now be known as “Superior No. 3” (“S.3”) label. This new “S.3” label still employs the same black block, with the backwards “N” of “Movement,” used previously to print the “S.1” label; compare Figure 3H with Figure 12C. The “S.3” label now has the addition of the same three colors used on the “S.2” label (yellow, blue, and red) to upgrade it to a colorful label with each color printed with a new block that would have been made to match the old black “S.1” block. This clock’s “S.N.s.6” movement has a 38-tooth escape wheel punched with an “8” and a 10” pendulum. This upgrading of the colorless “S.1” label to the colorful “S.3” label helps to confirm that the “S.N.s.6” movement came after the “S.N.s.4” movement that in turn is now believed to have followed on from the “S.N.s.5” movement.

In Part 4 of this article series, the “Tempus Raptor” movements will be investigated, with “The Caledonian Registered” movements then examined in Part 5. As neither of these two have been found as timepiece-only movement versions, this seems to confirm that 8-day time-only movement production ended when “Square-Nut” manufacture ceased. This therefore strengthens the case, as proposed at the beginning of this part, that “Square-Nut” movements would have been those observed in the manufacturing process by the *Jeweller and Metalworker* correspondent on his visit to C. & H. Cartwright’s Atlantic Clock Works in 1875 (key point 4).

Notes and References

1. Peter Gosnell, “The Atlantic Clock Works of Birmingham, England, Revealed: Part 2: ‘First Attempt’ & ‘Early Production’ Movement,” *Watch & Clock Bulletin* 65, no. 462 (March/April 2023): 99–108.
2. Peter Gosnell, “The Atlantic Clock Works of Birmingham, England, Revealed: Part 1: Charles Cartwright & Sons,” *Watch & Clock Bulletin* 65, no. 461 (January/February 2023): 39–43. Key Points 4, 15, 17, and 18 are referenced here in Part 3 (the author’s comments are bracketed in italics):
 4. During the visit of the J&M correspondent in December 1875 both striking and timepiece movements were being manufactured.
 15. Basic cases are made with deal [*pine*] planks with oak, mahogany, rosewood, and walnut logs converted into veneers that could then be applied to bodies. (J&M 1875)
 17. Two European patterns of wooden cased wall clocks for shops, offices and dining rooms were produced: large dials [*dials would have meant drop dials, too*] with marquetry or inlay, and Vienna Regulator styled cases with mirror-backed pendulum box and imitation mercury pendulum [*these are both typical Anglo-American case styles*]. (IMTA 1878, 1879, 1880)
 18. Complete clocks could be exported to India, China, Japan, Australia, and America. (J&M 1875) *IMTA: The Ironmonger and Metal Trades’ Advertiser* (June 29, 1878; January 11, 1879; April 10, 1880); *J&M: The Jeweller and Metalworker* (December 15, 1875).
3. “Research Activities and News,” *Watch & Clock Bulletin* 56, no. 407 (January/February 2014): 103, Figures 3A–3E.
4. Anglo-American cases were cases made in England from the late 1850s until circa 1914 and were intended for imported American movements.
5. “Research Activities and News,” *Watch & Clock Bulletin* 54, no. 400 (November/December 2012): 666, Figures 10D–10I.
6. “Research Activities and News,” *Watch & Clock Bulletin* 52, no. 387 (August 2010): 466, Figures 10A–10C.
7. These pseudo-Royal Coat of Arms of the United Kingdom will be analyzed and discussed in the final conclusions presented in the last article in this series.

8. "Research Activities and News," *Watch & Clock Bulletin* 55, no. 403 (May/June 2013): 327–28.
9. Private communication with James Mosley, St Brides Printing Library, London.
10. "Research Activities and News," *Watch & Clock Bulletin* 55, no. 403 (May/June 2013): 327–28, Figures 9A–9C.
11. "Research Activities and News," *Watch & Clock Bulletin* 56, no. 407 (January/February 2014): 104, Figures 4A–4C.
12. "Research Activities and News," *NAWCC Bulletin* 50, no. 377 (December 2008): 729, Figures 16A–16D.
13. The printing sequence would have been black, yellow, blue, and red (from private communication with James Edgar, Camberwell Press, University of the Arts, London).
14. "Research Activities and News," *Watch & Clock Bulletin* 56, no. 407 (January/February 2014): 108, Figures 9A–9C.
15. "Research Activities and News," *Watch & Clock Bulletin* 54, no. 400 (November/December 2012): 664–65, Figures 9A–9I.
16. Herbert L. Edlin, *What Wood Is That? A Manual of Wood Identification* (London: Stobart & Son Ltd, 1977). Lacewood is quartersawn London plane (*Platanus acerifolia*), and it is sourced in England, Europe, Asia Minor, and the US.
17. E. J. Tyler, "The Story of Holloway and Co.," *Bulletin of the National Association of Watch and Clock Collectors, Inc.* 21, no. 198 (February 1979): 7, Figure 5; Bill Matthews, "Anglo-American Clocks," *NAWCC Bulletin* 44, no. 337 (April 2002): 229, Figure 1; and "Research Activities and News," *NAWCC Bulletin* 50, no. 372 (February 2008): 71–74, Figures 11A–14.
18. "Research Activities and News," *Watch & Clock Bulletin* 57, no. 417 (September/October 2015): 408–11, Figures 6A–6G.

About the Author

Peter Gosnell joined the NAWCC in 1997 and between 2001 and 2008 made yearly visits to the US to study the development of the Connecticut brass clock movement with the guidance of the late Dr. Snowden Taylor. Subsequently, Peter's research has focused on early industrialized clockmaking in England, with a number of articles on the subject published in the *Bulletin*.

What a Time for the Children

I wish I could sleep
 But to see those eyes
 Startled
 By wildfires missiles and floods
 And desperate in famine and drought
 (Then there's Covid an added bane)
 Has me twisting like a worm
 Imagine
 Shooter and AR-15
 New words they have to think of
 On their way to school
 What an awful time for children
 (It's like midnight at 2pm)
 Can you blame them for wondering
 If that sweet
 Eternal time
 Of giggling and playing tag
 Or pajamas on
 Tucked in and hearing I love you
 Really was

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Here is a poem dealing with the experience of time for many children around the world. It is a reminder that when calamities affect adults, they also affect children, who count on adults for their physical and spiritual well-being. Ray Comeau is a retired dean and director, and a current lecturer in Harvard University Extension School. His courses deal with the intersection of philosophy, literature, and management. A native of Massachusetts, he is a member of the state's NAWCC New England Chapter 8 and Greater Massachusetts Chapter 87. His email is comeau@fas.harvard.edu.

The Genesis and Development of the Model 1862N E. Howard & Co. Pocket Watch Movement: Part 1

BY ALAN MYERS (IRE) AND CLINT GELLER, NAWCC SILVER STAR FELLOW (PA)

Introduction

In Part 1 of this article, we briefly review some relevant preceding and contemporaneous events surrounding the development of the Howard Model 1862N three-quarter-plate movement design. Partly from this history, we propose a new hypothesis concerning the possible involvement of Daniel Bucklin Fitts in the design's creation. We also argue that the "thin" version of the Model 1862N movement design, with the later wheel train arrangement, was foreseen from the beginning. Part 2 will describe several successive structural and cosmetic design evolutions involving the escapement, pallet bridge, and balance cock of Model 1862N movements, as well as evolutions in their plate finish, steelwork, and engraving. The current work extends that of Geller,¹ especially with respect to the successive structural design changes that transpired during Model 1862N production. We begin by setting the historical context for the Model 1862N design's emergence.

The first E. Howard & Co. (E.H. & Co.) three-quarter-plate watches emerged in the early 1860s, a

seminal period of rapid change in the American watchmaking industry. It is worth briefly reviewing this history, in order to place the emergence of the E.H. & Co. Model 1862N design in a broader context. Founded by Edward Howard, the Boston Watch Co. (B.W. Co.), from which both E.H. & Co. of Boston and the American Watch Co. (A.W. Co.) of Waltham claimed succession, struggled throughout most of the 1850s, finally succumbing to bankruptcy during the first worldwide financial crisis that struck in 1857. However, while it was a financial failure, the B.W. Co. had accomplished significant advances in automating watch manufacturing technology. Thus, the tools and other materials left behind by the company found eager buyers.

Most of the B.W. Co.'s equipment and watch material was purchased at auction by a group of investors led by Royal E. Robbins, who founded the watch company that in 1859 would emerge, after two reorganizations, as the A.W. Co. The company's immediate predecessors, Tracy, Baker & Co., followed very quickly by Appleton, Tracy & Company (A.T. & Co.), began by finishing so-called "Model 1857" legacy material from the B.W. Co.

On the Front Cover



Shown on the front cover is the unique and enigmatic dial of E. Howard & Co. Model 1862N movement SN 11,498. The dial exhibits numerous unusual decorative embellishments seen on the signed work of the celebrated dial painter Josiah Moorhouse, identifying it as one of Moorhouse's most elaborate works. Yet this dial carries no Moorhouse signature on the back nor even an E. Howard & Co. signature on the front! More puzzling still is that Moorhouse did not move from the American Watch Co. (A.W. Co.) to become the dial room foreman at E. Howard & Co. until circa 1884, over a decade after Howard's last Model 1862N production run was completed. Thus, the curious absence from this dial of either the Howard signature or the painter's signature may signify that Moorhouse painted this dial, whose dial feet will only fit an early Howard N-size keywind movement, as an

unauthorized personal project while still employed at the A.W. Co. The intriguing possibility exists that this extraordinary dial may even have been created as a demonstration of Moorhouse's skills for his prospective new employers at E. Howard & Co.

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Figure 1. A. A.W. Co. grade 18-size Waltham Model 1859 movement No. 40,126, with D. B. Fitts’s patented reversing center pinion (concentric with the center wheel pinion); **B.** Dial of No. 40,126; **C.** A.W. Co. grade Model KW20 movement No. 50,042 with N. P. Stratton’s safety barrel. **D.** Dial of movement No. 50,042; **E.** N.W. Co. assembly number, 163, on the underside of the dial plate of the ébauche that ultimately was finished as A.W. Co. movement No. 50,042. PHOTOS IN 1A-1E BY CLINT GELLER; **F.** Movement No. 16 of 17 22-size 8-day movements with tandem mainsprings produced by the partnership of Edward Howard, David P. Davis, and Aaron L. Dennison at the American Horologe Co. (A.H. Co.). Movement Nos. 16 and 17 are signed “D. B. Fitts, Holliston Mass.”, and have cylinder escapements, indicating that Fitts likely received these two movements in an incomplete state and finished them after they left the Roxbury factory; **G.** Dial of No. 16 finished ca. 1851 by A.H. Co. PHOTOS IN 1F-1G COURTESY OF THE NATIONAL WATCH & CLOCK MUSEUM.

In January 1859, A.T. & Co. was reorganized as the A.W. Co. This firm continued to manufacture Model 1857 movements for decades. However, in its founding year, the A.W. Co. also debuted an 18-size three-quarter-plate key-wind movement that was wound and set from the rear, subsequently named the A.W. Co.'s Model 1859. The highest-grade examples of the Waltham Model 1859 were finished with 19 jewels and D. B. Fitts's patented reversing center pinion,² which protected the escapement and wheel train from damage due to mainspring breakages, similar to the purpose of George Reed's patented main wheel³ on the Howard Model 1862N. With the introduction of these new higher-grade three-quarter-plate watches exemplified by A.W. Co. movement No. 40,126 in Figures 1C and 1D, Waltham entered into direct competition with E.H. & Co. in the luxury watch market. However, the new Waltham three-quarter-plate movements were rushed into production using as many Model 1857 parts as possible, sacrificing a degree of reliability for reduced manufacturing cost and/or movement thickness.

Edward Howard was the unsuccessful bidder at the B.W. Co. bankruptcy sale. After the sale, he joined with Charles Rice, who had held a lien on the B.W. Co.'s assets, to remove a sizeable portion of the B.W. Co.'s watch material to the Howard clock factory in Roxbury (now part of Boston). There, in late 1857 and 1858, he finished approximately 500 18-size movements primarily from B.W. Co. material, but with Howard modifications, nearly all of which were engraved "Howard & Rice." Then, in December 1858 Howard bought out Rice's interest and began making watches of a new divided-plate design: the Howard Model 1858 (aka, the Howard "Series I"), signed "E. Howard & Co."

In 1860, a group of gifted but dissatisfied Waltham watchmakers and movement designers left the A.W. Co. to join with an outside investor, Belding Dart Bingham, to found the Nashua Watch Co. (N.W. Co.) in that New Hampshire town. The N.W. Co. set out to make superior watches on the most advanced watchmaking machinery they could design. Their enterprise might or might not otherwise have succeeded, but the timing of their new venture could not have been worse. South Carolina seceded from the Union in December 1860, followed quickly by six more southern states in the first few months of 1861. By April of that year, armed conflict had ignited, and four more southern states left the Union shortly thereafter. The war prostrated the northern economy in 1861 and into the beginning of 1862.

As the secession crisis loomed in Waltham's fiscal year 1860 (which began and ended in March), A.W. Co. treasurer's reports reveal that, as reported by McIntyre,⁴ staff was reduced by 20 hands from 180 to 160, and those who remained were reduced to 80% time, for a net contraction of 29% in hours worked. No employment figures are available for fiscal year 1861, but by fiscal year 1862, Waltham staff had dwindled to 80 hands who were reduced to contract laborers at 25% to 50% reductions in pay.⁵ Concomitant production fell from 12,055 movements and 3,768 silver and gold cases in fiscal year 1861, to only 2,734 movements and 1,654 cases in 1862.⁶ Production and employment levels more than recovered in fiscal year 1863 to 19,049 movements and 8,450 cases being made by 429 employees. But as the hurricane economic headwinds abated in 1862, they were followed by a burgeoning manpower shortage, as the federal army exploded in size and the Springfield Armory took many of the remaining skilled mechanics from the New England area. After brief negotiations, the undercapitalized and manpower-starved N.W. Co. was forced to close its doors after fewer than 100 movements were completed.⁷

In 1862, the talented Nashua renegades were repatriated back into the A.W. Co. fold along with their new, advanced 20-size three-quarter-plate watch design, various incomplete watch movements and parts, and their machinery, including their new and important three-bearing lathes. Edward Howard would have seen these events unfolding right next door to him, and he would have appreciated their implications for his own business. Watches that were begun at Nashua and finished at Waltham were signed "American Watch Company." Waltham movement No. 50,042 (Figures 1A and 1B) carries the original Nashua three-digit assembly number under the dial. Around the time that the first Nashua products were coming to market, Edward Howard debuted his own three-quarter-plate watch design, which collectors now call either the Howard Model 1862N (Visser and Geller) or the Howard Series III in the older collecting nomenclature (Small, Hackett, and Townsend⁸).

The Model 1862N had fewer parts than the Model 1858 divided-plate movement design and was probably more efficient and somewhat less expensive to manufacture and assemble. Like the contemporaneous Waltham three-quarter-plate products, it also looked more like the high-grade English three-quarter-plate watches that enjoyed the highest reputation in the American luxury watch market. Unlike the Waltham Model 1859, which had

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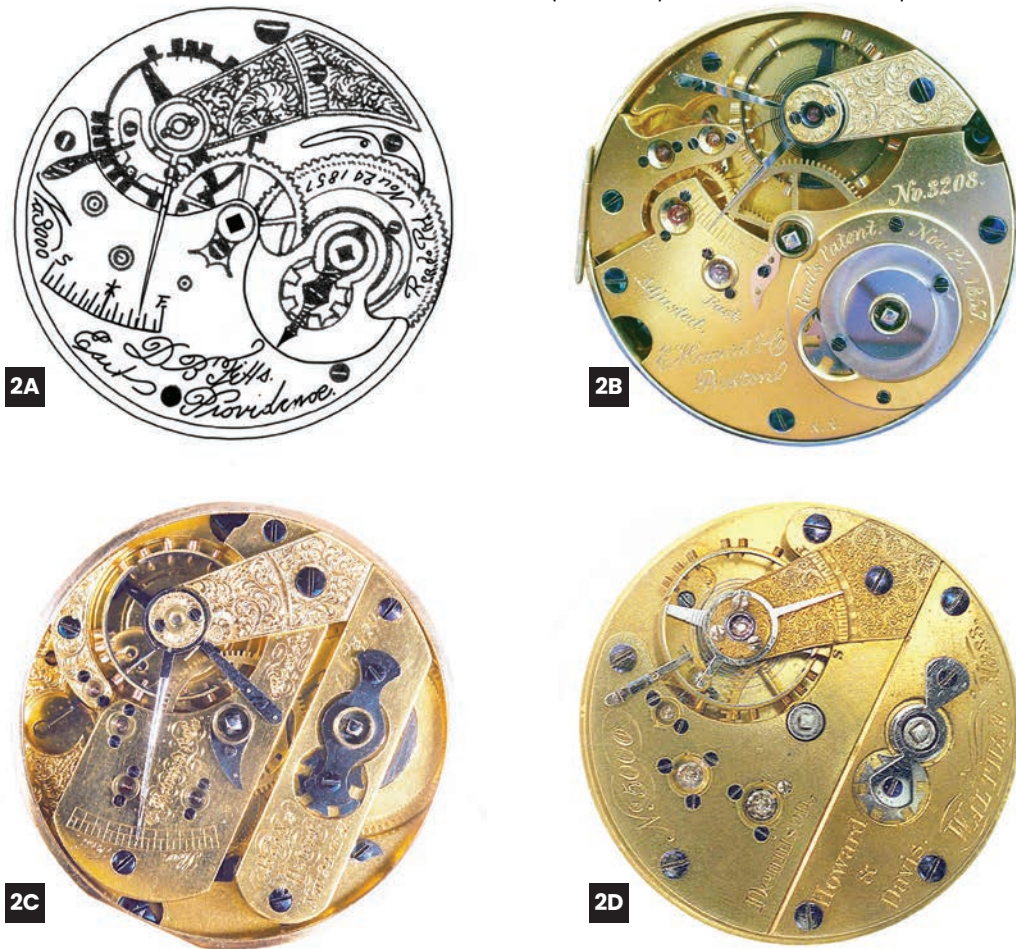


Figure 2. A. Line drawing of a Model 1862N movement with No. 3,000 and signed “D. B. Fitts, Providence Rhode Island.” REDRAWN BY ALAN MYERS FROM *E. HOWARD & CO WATCHES, 1858–1903* BY GEORGE E. TOWNSEND; **B.** E.H. & Co. N-size half-plate movement No. 3,208 with Stratton’s safety barrel, straight line lever escapement, and Breguet overcoil hairspring. **C.** E.H. & Co. N-size bar-style movement No. 3,120 with integral dial plate construction, right-angle lever escapement, Stratton’s barrel, and helical hairspring. **D.** “Dennison, Howard & Davis” movement No. 5,000 finished at B.W. Co. prior to April 1857, based on George P. Reed’s 1854 patent, reissued in 1857. PHOTOS IN 2B–2D BY CLINT GELLER.

by 1862 been relegated to lower-grade production only, the E. H. & Co. Model 1862N embodied an innovative design that mounted the stopwork on a thickened portion of the top plate. In conjunction with Reed’s ingenious main wheel design, this construction enabled the use of a wider mainspring while nevertheless achieving an overall reduction in movement thickness. A wider mainspring in turn enabled the mainspring to be thinner and therefore less susceptible to breakage due to the stresses induced by being tightly coiled within a small space. Another consideration possibly influencing the Model 1862N design is that it gave greater access and visibility to Reed’s patented main wheel, which was a major technical feature and selling point of the watch. Indeed, some very early top-end Model 1862N movements feature a gold-flashed asymmetric ray damaskeening pattern centered on the main wheel arbor, which draws the eye to Reed’s main wheel.

Genesis of the E.H. & Co. Model 1862N

An intriguing line drawing in a 1981 publication by G. E. Townsend⁹ appears to show an E.H. & Co. Model 1862N movement signed “D. B. Fitts, East Providence.” The serial number, shown in an unusual location along the edge of the movement near the hairspring stud, is 3,000. The same line drawing (Figure 2A) appeared the following year in another publication¹⁰ by the same publisher, Heart of America Press, which was owned by the late Roy Ehrhardt. Assuming that this drawing depicts an actual movement, it could show the prototype for the E.H. & Co. Model 1862N three-quarter-plate movement design that eventually received a patent in 1866.

Daniel Bucklin Fitts is not known to have been associated with E.H. & Co. He was a New England watchmaker who patented the reversing center pinion-mechanism that appeared on some higher-grade 18-size Waltham Model 1859 movements, and

the related safety mainspring barrel design that appeared on some 10-size Model 1861 movements. These movements featuring Fitts's inventions would have appeared roughly contemporaneously with the beginning of Model 1862N production at E.H. & Co.

Fitts and Howard were definitely known to have had an earlier business relationship. The last two of the seventeen experimental dual-mainspring 8-day movements begun by the partnership of Howard, Dennison, and Davis were completed and signed by D. B. Fitts. These watches were begun circa 1851 by the American Horologe Co. (A.H. Co.) of Roxbury, MA, of which Edward Howard was a cofounder. The A.H. Co. dual mainspring 8-day movement No. 16 is on permanent display in the National Watch & Clock Museum in Columbia, PA (Figures 1E and 1F; museum catalog no. BS27.77). The B.W. Co. and its predecessors had to be recapitalized at least twice prior to the final bankruptcy in 1857,¹¹ and Edward Howard frequently had trouble meeting the payroll during the financial struggles of his earliest watchmaking enterprises. Therefore, Fitts may have received these unfinished movements in lieu of salary or some other kind of payment owed to him, a policy that Howard is thought to have practiced at E.H. & Co. from time to time.

At least one other experimental movement design created at Edward Howard's behest by either an employee or an associate of the B.W. Co. is known to have served as a prototype for a later E.H. & Co. watch model.¹² By 1854 the Howard, Dennison, and Davis partnership was doing business under the name of the Boston Watch Co. A movement designed at B.W. Co., "Dennison, Howard & Davis" (DH&D) movement No. 5,000 (Figure 2D), was the prototype for the E.H. & Co. divided-plate key-wind Model 1858 design. DH&D movement No. 5,000 has no provisions for a case screw, clearly indicating that it was never intended to be cased and sold. It displays all the design features of the earliest E.H. & Co. Model 1858 movements, including Reed's patented main wheel, separate train and main wheel bridges, both on three pillars and with an aperture provided in the train plate for the balance wheel, and an exposed Geneva-style stopwork. DH&D No. 5,000 is 18-size, rather than N-size, showing that it predated the advent of Howard's own movement sizing system. Significantly, the serial number 5,000 assigned to this B.W. Co. movement, which is right at the end of the 18-size full-plate DH&D production run, strongly suggests that prior to the failure of B.W. Co. in 1857, Howard planned to put this new prototype into production there.

We conclude that there was a clear precedent for Edward Howard creating a prototype watch movement at B.W. Co. that he would later use at E.H. & Co. It seems like no accident that D. B. Fitts was bidden to engrave No. 3,000 on the Model 1862N movement bearing his name, as No. 3,000 coincides with the end of E.H. & Co.'s Model 1858 production run. The serial number of the Fitts movement further suggests that it was conceived after E.H. & Co. Model 1858 production began in late 1858 but before the last Model 1858 movement, No. 2,999, was completed in 1860 or 1861.

The Move from Divided Plates and Pillars to an Integral Three-Quarter-Plate

Between the end of E.H. & Co.'s Model 1858 production and the beginning of Model 1862 production, the company produced about 300 movements of varying sizes (K, N, and I) and plate configurations (three-quarter-plate and half-plate with Breguet hairsprings) that anticipated later Howard movement designs in two crucial ways. First, these special movements had dial plates with integral side walls, thus dispensing with the cumbersome individual pillars and screws of the Model 1858 design. Second, the balance wheels of these movements were pivoted underneath their center wheels, which prefigured and enabled the subsequent emergence of movements with reduced thickness. Indeed, the integral plate construction style had debuted earlier, both on a short run of bar-style movements with helical hairsprings at No. 1,601, and as well as on a single half-plate movement, No. 1,198, which may have been an early N-size prototype for the brief K-size production. The existence of these experimental or limited production movements clearly shows that the integral plate construction concept considerably predated the start of Model 1862N production at No. 3,301.

The Drive for Reduced Movement Thickness

To understand why the D. B. Fitts Model 1862N "prototype" movement (Figure 2A) has the features that it has, it is necessary to ask why a three-quarter-plate movement was designed in the first place. In the 1850s and early 1860s, high-grade movements by prestigious English makers like Charles Frodsham and A. P. Walsh probably enjoyed the best reputation among American watch buyers, and contemporaneous high-grade English watch movements were primarily three-quarter-plate. Also, as previously suggested, Howard was likely beginning to feel competition in the luxury market in 1860 from a dangerous and better-resourced

domestic competitor as well, the American Watch Co. of Waltham. A.W. Co. had begun to produce limited numbers of 19-jewel three-quarter-plate movements and larger numbers of 15-jewel three-quarter-plate movements beginning in 1859, which it was advertising as its “thin model.” By 1862, Howard may also have caught wind of Waltham’s plan to begin producing high-grade 20-size and 16-size key-wind three-quarter-plate watches, as the Nashua breakaway group was being reabsorbed and installed in a new, separately managed and equipped wing of the A.W. Co.’s Waltham factory: the Nashua Department.

Three-quarter-plate watches generally had a flatter profile than full-plate watches, because the balance wheel of a three-quarter-plate watch could share the same vertical space with the movement plates. Though Howard’s divided-plate movement shared the same characteristic, the trend in gentlemen’s watches of the day was indeed the thinner, sleeker three-quarter-plate watch designs. That E.H. & Co. was aware of this trend is made clear by the fact that the 1854 patent application for Reed’s protective main wheel apparatus, which is central to both E.H. & Co.’s Model 1858 and the Model 1862 movement designs, claims that Reed’s invention enables a thinner watch to be created.¹³ The D. B. Fitts movement No. 3,000 embodied the ultimate intent of the Model 1862N movement design to make a thinner watch movement more closely resembling contemporaneous high-grade English and A.W. Co. watches.

The Early, Thick E.H. & Co. Model 1862N Movements

Some design features of the early, thick version of Howard’s Model 1862 suggest that the transition to the later, thin Model 1862 movement was already anticipated. For example, there are recesses milled into the interior side of the dial plate (Figure 3), making it possible to secure a dial with short feet. We suggest that the first Model 1862N dials were made with insufficiently long feet because the thinner Model 1862N design that ultimately emerged was already envisioned when the dials were made. The same dials then had to be used for the interim thick movements by milling recesses in the pillar plates.

The suggestion above begs the question: why make a thick 1862N model at all? One reason may have been the desire to use all, or at least most, of the remaining parts that were stockpiled to support Model 1858 production. Another consideration may have been to minimize the number of case thicknesses that retailers would be required to stock in order to provide their customers with an adequate range of casing choices without expanding their case inventories. Once several thousand Model 1862N movements had been produced, E.H. & Co. may have considered itself in a stronger position to impose this same burden on its wholesale customers. By then the Northern economy had recovered from the shock of the secession crisis. With the North ready for wartime production, Waltham resumed movement production,¹⁴ and the entire watch market dramatically improved.



Figure 3. Arrangement of train wheels of E. H. & Co. Model 1862N movement: **A.** Thick plate movement, with (a) showing the countersinking of the dial pin, necessitated by the thicker plate; **B.** Thin plate movement. PHOTOS BY JOHN WILSON.

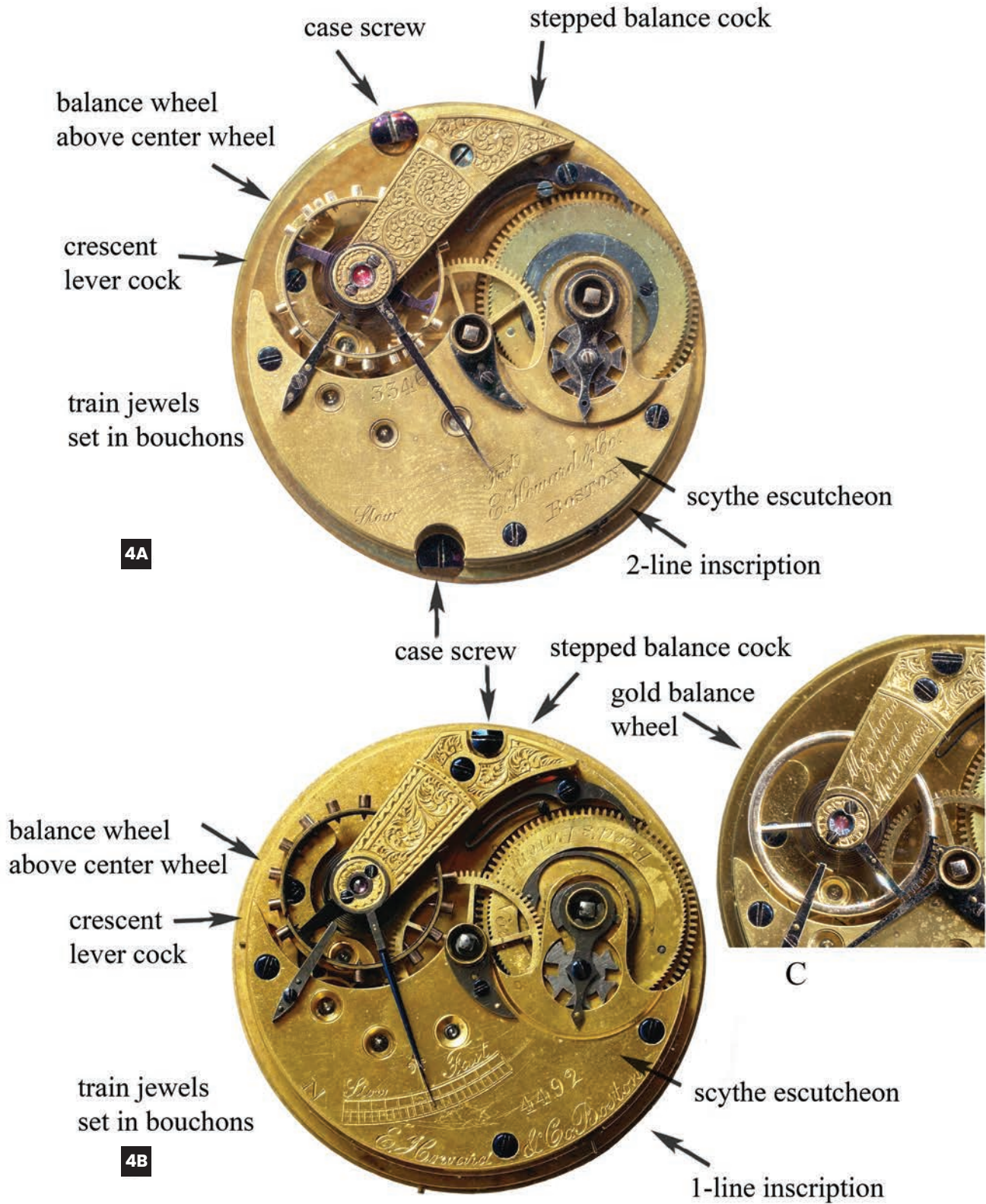


Figure 4. E.H. & Co. 1862N movements: **A.** Model 1A, thick plate, No. 3,646, note the balance wheel above the center wheel, flat balance cock, crescent lever cock and two case screws on the pillar plate; **B.** Model 1B, thick plate, No. 4,492, note the balance wheel above the center wheel, stepped balance cock, crescent lever bridge and single case screw on the balance cock. **C.** Gold balance wheel of No. 4,520. PHOTOS BY ALAN MYERS.

Design Experiments Preceding the Model 1862N

As production of Model 1858 movements continued throughout 1861, E.H. & Co. evidently planned a shift to a new movement design. The motivating principle for this change was that it would have an integrated dial plate attached directly to a single-piece top plate, thereby dispensing with the separate pillars of the Model 1858. Beyond that important innovation, Edward Howard apparently entertained multiple design options before settling on the Model 1862N Type 1, with its three-quarter top-plate configuration, and with the top of the lever cock¹⁵ (aka pallet cock) lying below the plane of the train plate (Figure 4A). All previous E.H. & Co. movement designs have the top of the lever cock lying in the same plane as the train plate (Figure 2B). From around 1865 onward, all E.H. & Co. movements would have the lever supported by a bridge rather than by a cantilevered cock. This change from a lever cock to a lever bridge was not possible in the preceding designs that had the lever cock in the plane of the train plate. It is surmised that the option of changing the lever support from a cock to a bridge may have influenced the 1862N design that ultimately was put into production. Although a reduced-height lever cock was used on the early 1862N movements, for the reasons discussed here, we believe that a transition to a modified 1862N design with a lever bridge was already envisioned at an early stage.

In addition to short runs of K-size¹⁶ and I-size¹⁷ movements at Nos. 3,001 and 3,401, respectively, each of which included examples with two different top-plate shapes, Edward Howard also produced a short run of perhaps 10 N-size movements at No. 3,201. Two extant examples of this run are known: Nos. of 3,202 and 3,208 (Figure 2B). These half-plate movements have the lever arbor and escape wheel pivoted on a joint cock separate from, but lying in the same plane as, the main train plate. They also feature Breguet overcoil hairsprings, making them the only known E.H. & Co. movements so equipped during Edward Howard's time in management of the company. They are also the earliest American watches of any make known to have been engraved "Adjusted," making the purpose of the Breguet hairsprings clear. Like the immediately preceding K- and I-size movements, these novel N-size movements have train layouts with the balance wheel pivoted *under* the center wheel.

The serial number range from 3,101 to 3,299, most of which apparently was never used, was reserved

for limited production experiments. E.H. & Co. and A.W. Co. both briefly flirted with helical hairspring movement designs in the same short period around 1859–61, before settling on other design choices. In the same period in which Edward Howard experimented with Breguet hairsprings, he conducted similarly limited experiments with bar-style movements with right angle escapements and helical hairsprings, of which Nos. 3,120 (Figure 2C) and 3,126 are known. Even within the three-quarter-plate design space, the existence of movement No. 3,000 suggests that important details concerning the lever cock design and the layout of the wheel train, dictating whether the balance wheel would be pivoted above or below the center wheel, took a while to finalize. All of these limited production or experimental movements featured Reed's patented main wheel, like the Model 1858 divided-plate movements before them. Ultimately, however, Edward Howard settled on the N-size three-quarter-plate movement design with flat hairspring, which we now call the Model 1862N Type 1, for initial large-scale production.

Primary Sources of Information for This Article

The Howard Factory Production Records

The portion of the original E.H. & Co. factory movement production records that is known to have survived is located at the Smithsonian's Archives Center of the National Museum of American History in Washington, DC. Records currently are available from the beginning and from the end of the Model 1862N serial number range, with a gap from approximately No. 8,951 to No. 17,001. These records generally list the completion dates of each movement 10-lot (movements moved through the factory in trays holding 10 movements each), the style of balance wheel (solid gold or "chronometer," i.e., bimetallic), the type of regulator (plain, when not mentioned, or "patent," meaning either Mershon's rack-and-pin or Reed's whip spring, depending on the serial number), whether or not all the top-plate train jewels were in screwed-down jewel settings, and the level of adjustment (isochronism only [U], isochronism and heat and cold [HCI], or isochronism, heat and cold, and six positions [HCI6P]). The records make no distinction between types of "patent" regulator, nor do they distinguish between movements with no top-plate-hole jewel settings at all and those with only the third-wheel-hole jewel in a setting. The records only appear to mention jewel settings when all the

top-plate train jewels are in screwed-down settings. The records are similarly silent about lever cock/bridge design changes and major escapement evolutions. They make no mention of changing from single banking pin escapements to escapements with two adjustable banking pins attached to the dial plate, or the scattered appearances of Cole’s resilient banking escapements with no banking pins.

Beginning around No. 18,021, movement inventory prices were included for each serial number, which mostly correlate quite well with both the movement features listed in the records and the known features of surviving movements. The level of adjustment affected movement price more than any other single movement feature; before the advent of electronic timing machines, the adjustment process could take months. The wholesale inventory value of the most basic E.H. & Co. Model 1862N movement produced in the period for which we have factory pricing information—a gilt movement with bimetallic balance, spun-in train jewels, simple regulator, and adjusted only to isochronism—was \$58. The most expensive \$125 movements were fully adjusted to isochronism, temperature, and positions (always six); were equipped with either Mershon’s or Reed’s patent regulator; had screwed-down top-plate train jewel settings; and had a nickel-plated and

damaskeened finish. Other details often included in the records are the party to which particular movements were sold or consigned, and less frequently, the finisher who completed them. The most frequently mentioned assignee in the early records is Edward Howard’s nephew, Albert Howard, who was the company’s principal sales agent for a time.

The surviving factory records proved very useful in filling in some of the missing information for many movements, especially as the level of adjustment was not engraved on Howard movements until after approximately No. 10,961.

Data from Known Surviving Model 1862N Serial Numbers

Table 1 provides the lowest and highest serial numbers at which the structural, functional, informational, and cosmetic finishing details of Model 1862N movements are known to have occurred.

Master Table

A master table of Model 1862N serial number information is supplied on the NAWCC Forums website.¹⁸ As of March 20, 2023, this table provides basic information on 1,235 Model 1862N movements that have been reported or recorded by collectors over roughly the past half century. The movements

Table 1A. Main changes in the movement design of Howard 1862N types.

Type	Date	Dial Plate	Pallet Bridge	Escutcheon	Balance Position	Case Screw Position	Balance Cock	Train Jewels	First Known Serial
1A	1862	Thick	crescent	scythe	above	dial plate	stepped	pressed-in	3,302
1B	1863	Thick	crescent	scythe	above *	balance cock	stepped	pressed-in or screwed	3,689
1C	1865	Thick	circular	scythe	above *	balance cock	stepped	pressed-in or screwed	6,341
2A	1865	Thin	yoke	trefoil	below	balance cock	stepped	spun-in or 3 rd or all screwed	8,237
2B	1868	Thin	yoke	Trefoil or none	below	train plate	Stepped or planar	spun-in or 3 rd or all screwed	18,643

* Below in helical balance spring movements

Table 1B. Main changes in escapements of Howard 1862N.

Type	Approx Date	Escape Wheel	Teeth	Lever Counterpoise	Lift	Banking
1A	1862	3-spoke	toe ended	absent	pallets	Lange style
1B	1863	3-spoke	toe ended	absent	pallets	Lange style
1C	1865	3-spoke	broad	present	divided	2 pins
2A	1865	3-spoke	club foot	present	divided	2 pins
2B	1868	4-spoke	club foot	absent	divided	2 pins

reported comprise about 5% of the total Model 1862N production, and likely from a fifth to a quarter of surviving Model 1862N movements overall. Like the factory records, the information about particular movements in the table identifies the movement features that affected inventory value or sales price. Unlike the terse factory records, this table also details the information that pinpoints the sequence of basic design evolutions that occurred during the Model 1862N production period.

The master table combines movement information from a number of different sources:

1. Hands-on inspections of Model 1862N movements by one of the authors
2. Movement images from private sources, books, printed auction catalogs, or the Internet
3. Notes compiled directly by one of the authors but without accompanying pictures
4. A notebook begun by the late Colonel George E. Townsend and subsequently augmented by Clint Geller
5. The surviving E.H. & Co. factory records

Other Sources

Major Internet sources of data include the sales archive of Jones & Horan Horological Auctions, the NAWCC Forums, and eBay, as well as other venues. The private notes compiled by Clint Geller, which go back more than 25 years, often do not contain all the information about observed serial numbers that is of interest to the current research. George E. Townsend's notebook, which may have been started over half a century ago, has similar issues but to an even greater extent.

Sometimes data from different sources conflict. In those instances, data directly from watch images decided the matter whenever an image was available. In a few instances in which no images are currently accessible to resolve a dispute between the factory records and another data source, both data may be provided.

Model 1862N Quality Levels or Functional "Grades"

No numerical grade code for E.H. & Co. watch movements is known to have existed, either from trade literature or the factory records, before July 1885. Prior to approximately movement No. 18,941, which was completed in January 1869, the combinations of movement features listed in the factory records served as the only functional

movement grading system. In January 1869, prices appeared in the records alongside the relevant movement features that determined their price. These were presumably wholesale prices used by company management to value the inventory. Inasmuch as these prices correlated so well with the listed movement features, these prices can also serve as effective grade designations. The correlation between stated movement prices and finishing features is shown in Table 2A.

In the factory records, finishing features were often identified by the absence of a specific notation. For instance, movements with no level of adjustment indicated, which was a very common occurrence, were adjusted only to isochronism. Similarly, movements not marked "Set Jewels" did not have a complete set of screwed-down top-plate train jewel settings (SDJS), and no further distinction was made between movements with no top-plate train jewel settings at all, movements with spun-in but not screwed-down train jewel settings, and movements with only the third-wheel train jewel setting screwed down. Finally, movements with no notation as to the type of regulator invariably are seen to have simple rather than patent regulators. Movements with some kind of patent regulator were distinguished from those with simple regulators by the notation "Pat. Reg." or simply "P. R." However, no further distinction was made between kinds of patent regulator (i.e., Mershon's or Reed's), although a \$1 price difference eventually developed between the two kinds of patent regulator movements. This small price difference emerged shortly before Mershon's regulators disappeared from the E.H. & Co. product line.

To clarify the differences in quality levels represented by the Model 1862N pricing scheme, and to provide a grading system covering all of E.H. & Co.'s movement production, including that part which was completed before prices were indicated in the records, a three-digit grade code was defined by Geller.¹⁹ With respect to Model 1862N production, the first digit designates the type of balance wheel and the plate finish, the second digit indicates the type of regulator and the manner of top-plate train jewel setting (i.e., full top-plate SDJS, or not full top-plate SDJS), and the last digit indicates the level of adjustment. Hence, a basic \$58 movement with bimetallic balance, gilded finish, and a simple regulator, without screwed-down top-plate jewel settings and adjusted only to isochronism, is a grade {2-0-1}. At the other end of the quality spectrum, a top-of-the-line \$125 nickel-plated and damaskeened movement with a bimetallic

Table 2A. Model 1862 Movement Grades Identified in the Factory Ledgers

Grade Code*	Verbatim Description	First Serial No.	Price (\$) **
0-0-1	Steel Balance (not described in ledgers)	4,393	
1-0-1	Gold Bal. Movt.	3,566	
1-1-1	Gold Bal. Movt. Pat. Reg. ^b	3,511	
1-2-1	Gold Bal. Movt. S ^a	3,401	
1-3-1	Gold Bal. Movt. Set & P.R.	3,601	
2-0-1	Chro. Bal. Movt.	3,371	58.00
2-0-2	Chro. Bal. Movt. Adj. to H & C ^c	3,393	70.00
2-0-3	Chro. Bal. Movt. Adj. to H, C & P	3,301	95.00
2-1-1	Chro. Bal. Movt. Pat. Reg. ^b	3,331	64.00
2-1R-1	N Reed's P.R.	24,351	64.00
2-1-2	Chro. Bal. Movt. P.R. Adj. to H & C ^c	3,716	76.00
2-1R-2	Reed's P.R. Adj. to H & C ^c	23,991	76.00
2-1-3	Chro. Bal. Movt. P.R. Adj. to H, C & P	3,383	101.00
2-1R-3	Reed's P.R. Adjusted	23,951	101.00
2-2-1	Chro. Bal. Movt. S ^a	3,441	
2-2-2	Chro. Bal. Movt. Set Adj. to H & C ^c	3,671	
2-2-3	Chro. Bal. Movt. Set Adj. to H, C & P	3,361	100.00
2-3-1	Chro. Bal. Movt. Set & P.R.	3,652	69.00
2-3-2	Chro. Bal. Movt. Set & P.R. Adj. to H & C ^c	3,658	81.00
2-3-3	Chro. Bal. Movt. Set & P.R. Adj. to H, C & P	3,321	106.00
2-3R-3	Reed's P.R. Set Jewels Adjusted	23,451	106.00
3-0-3	Chro. Bal. Movt. Adj. to H, C & P Rayed	4,135 ^d	
3-1-3	Chro. Bal. Movt. Pat. Reg. Adj. to H, C & P Rayed	4,507 ^d	
3-2-3	Chro. Bal. Movt. Set Adj. to H, C & P Rayed	3,362	73.00 ^g
3-3-3	Chro. Bal. Movt. Set & P.R. Adj. to H, C & P Rayed	4,199	116.00
4-3-3	Pat. Reg. Set Jewels Rayed Nickel Adjusted ^e	21,561	125.00
4-3R-3	Reed's P. R. Set Jewels Rayed Nickel Adjusted	23,461	125.00
?	Others in 10-lot are 4-3R-HCP	24,337	88.00
?	Appears in 10-lot of 2-3R-HCPs	23,458	128.00
4-3R-3	Reed's P. R. Set Jewels Rayed Nickel Adjusted + ?	24,332	135.00
L-4-3R-3(?)	L. Reed's P.R. Set Jewels	24,301	125.00 ^f
L-3-3R-3(?)	L. Reed's P.R. Set Jewels Adjusted	24,321	116.00 ^f
L-2-3R-3(?)	L. Reed's P.R. Set Jewels Adjusted	24,311	106.00 ^f

* The system of grade codes here employed is Clint Geller's invention. The factory ledgers employed no numerical grading system in this period.

** The first prices appear after the beginning of the fourth ledger at No. 19,431 dated January 2, 1869. Movements of the same grade appearing substantially before this date may not have had the same price. The absence of an entry in this column of the table indicates that the grade in question had been discontinued prior to No. 19,431.

a. "Set Jewels" sometimes was abbreviated as "S."

b. "Pat. Reg." often was abbreviated as "P.R." Prior to No. 23,451, this referred to Mershon's patent regulator. After No. 23,451, it referred to Reed's patent regulator.

c. "Heat & Cold" usually but not always was abbreviated as "H & C."

d. This grade is rare. Only one movement has been seen.

e. Only the 10-lot of nickel Model 1862 movements at No. 21,561 are listed explicitly as being "Nickel" (actually, nickel-plated) in the factory ledger. This 10-lot is dated July 23, 1869. In subsequent 10-lots, nickel movements are identified by price (\$125.00), as confirmed by cross-references with visual examinations and the Extended Townsend Database (ETDB).

f. Most 10-lot descriptions in the second and fourth ledgers (corresponding to the I-size and the N-size Model 1862 serial number runs) include the movement size. These references have been omitted in the table for the sake of brevity, but 20 movements from No. 24,301 up to 24,320 are listed as L-size. The prices listed for these movements, from which tentative grade codes were decided, are inconsistent with the written descriptions. The ETDB lists one of these movements, No. 24,309, as an N-size, gilt movement, with expansion balance and Cole's escapement, and marked "Adjusted," contradicting the already somewhat self-contradictory ledger.

g. This price is considered especially uncertain.

balance, screwed-down jewel settings, Mershon’s or Reed’s patent regulator, and fully adjusted to HCl6P, is a grade {4-3-3} or {4-3R-3}, depending on the regulator style. A more complete explanation of this grading system is shown in Table 2B.

Part 2 of this article will examine the production history and timeline of Model 1862N. We will highlight the key structural evolutions as distinct movement “types,” which we hope may serve as a richer basis for future communication among collectors.

Acknowledgments

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by Don Barrett. We also thank the NAWCC Managing Editor, Laura Taylor, and the publications team for their fine editorial work in the production of this article.

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3. George P. Reed, US Patent No. 17,055 of April 14, 1857 (originally issued in 1854, reissued 1857), as shown in Risch, “Evolution of the Safety Pinion,” 339.
4. Thomas P. McIntyre, *Waltham Watch and the Civil War. The Impact of the Civil War on the Fortunes of the Waltham Watch Company*, mcintyre.com/present/WalthamGoesToWar.pdf, slide 12, data from Waltham factory records and A.W. Co. treasurer’s reports.
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7. Michael C. Harrold, *American Watchmaking: A Technical History of the American Watch Industry, 1850–1930*, NAWCC Bulletin Supplement (1984), 25. The authors are aware of eight 20-size three-quarter-plate movements signed “Nashua Watch Co.” that are known to exist: three 19-jewel movements with Nos. 1,036, 1,055, and 1,057, and five 15-jewel movements with Nos. 1,215, 1,219, 1,227, 1,230, and 1,233. However, while Nashua prepared to make a run of 1,000 movements, this clearly did not happen. Much of Nashua’s material subsequently was used in products completed by the A.W. Co., which inherited the material. The earliest of these Waltham movements show the original Nashua assembly numbers on their dial plates, which indicates that the Waltham-finished movements originated from the same short runs as the known examples signed “Nashua Watch Co.”

Table 2B. Geller (2005) Universal Howard Grade Code: N1–N2–N3

N1	=	0: Solid Steel Balance, Key Wind, Gilded Finish (may not have been made in Model 1862)
	=	1: Solid Gold Balance, Key Wind, Gilded Finish
	=	2: Chronometer Balance, Key Wind, Gilded Finish
	=	3: Chronometer Balance, Key Wind, Rayed Gilded Finish
	=	4: Chronometer Balance, Key Wind, Rayed Nickel-Plated Brass Finish
	=	5: Chronometer Balance, Key Wind, Rayed Solid Nickel Finish
	=	6: Chronometer Balance, Stem Wind, Gilded Finish
	=	7: Chronometer Balance, Stem Wind, Nickel-Plated Brass Finish
	=	8: Chronometer Balance, Stem Wind, Solid Nickel Finish
	=	9: “Ball” Model watches, with 17 jewels, Breguet hairsprings, and three-quarter-plates
=	10: Split plates, 17 jewels, and Breguet hairsprings	
N2	=	0: No Jewel Settings, Simple Regulator
	=	1: No Jewel Settings, Patent Regulator
	=	2: Jewel Settings, Simple Regulator
	=	3: Jewel Settings, Patent Regulator
	=	1R: No Jewel Settings, Reed’s Patent Regulator
	=	3R: Jewel Settings, Reed’s Patent Regulator
N3	=	1: Adjusted to Isochronism Only
	=	2: Adjusted to Isochronism and Temperature (i.e., heat and cold)
	=	3: Adjusted to Isochronism, Temperature, and Six Positions

8. See George E. Townsend, *E. Howard & Co Watches, 1858–1903* (Kansas City, MO: Heart of America Press, 1982); Gerrit Nijssen, “The Watches of E. Howard & Co.,” transmitting a previously unpublished manuscript by Dr. Percy Livingston Small, *NAWCC Bulletin* 36, no. 292 (October 1994): 563–93; and F. Earl Hackett, “The Numbering of Howard Watches,” *Watchmaker’s Journal* (June 1958).
9. Townsend, *E. Howard & Co Watches, 1858–1903*, 43.
10. Roy Ehrhardt, and William Meggers, *American Pocket Watches Identification and Price Guide: Beginning to End, 1830–1990* (Kansas City, MO: Heart of America Press, 1987), 111.
11. William H. Keith (former A.W. Co. president) in “A Family Tale: A History of American Watch Making in Five Chapters,” edited by Richard Watkins, transcription of an unpublished manuscript in the Harvard Business Library, 1883. On page 19, Keith states: Mr. Curtis, who made no claim to mechanical skill in the business, was the capitalist who brought \$20,000 to the concern; which, at first, was thought ample for its complete success. But this sum, ... was very soon exhausted. And Mr. Curtis and Howard & Davis supplied \$20,000 more, which in a few months was also engulfed. Thus \$40,000 were expended without success.... To go on more money was indispensable, but how was it to be obtained? Pluck decided that point, and \$20,000 more was supplied conditionally by parties in New York. But in a few months this also was absorbed; and the business not yet paying, but at every step a losing one, ... Thus in the first three years, or less, \$60,000 had been invested in the Roxbury plant; and yet its demand was for more. Nothing discouraged, the indefatigable treasurer exerted his talents at ways and means, and provided through friends, whose names, ..., and by loan of money and credit kept the works in motion until the money panic of 1857, brought not only this company bankruptcy, but some others who had aided it. So that when it finally yielded to the unavoidable, the company estimated their investments at \$150,000 and their shrinkage at \$90,000.
12. Clint B. Geller, “The Origin and Evolution of the E. Howard & Co. Divided-Plate Keywind Movement,” *NAWCC Bulletin* 42, no. 324 (February 2000): 21–22.
13. George P. Reed, US Patent No. 61,867 dated February 5, 1867.
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15. We call this a cock rather than a bridge, because it is cantilevered from one end rather than being supported on both sides.
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18. “E. Howard & Co. Data Sources and Discussion Threads,” NAWCC Forums, post no. 2, <https://mb.nawcc.org/threads/e-howard-co-data-sources-and-discussion-threads.174788>.
19. Geller, *A Study of E. Howard & Co. Watchmaking Innovations: 1858–1875*, 86, Table II-13a and 88, Table II-16.

About the Authors

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A Rare and Early Oxford Lantern Clock by Richard Quelch

BY GEOFF COX (UK) AND STEPHEN BARASI (UK)

The following describes an early lantern clock with several interesting features. It appears to be the only example of a lantern clock made by a known Oxford watchmaker and has the very unusual characteristic of having the maker's name on a semicircular arch incorporated within the front fret.

Maintaining the clocks of Oxford colleges was the responsibility of Triumph de St. Paul. Born in Oxford, he was made a Freeman of the city in 1601. This allowed him to make and sell clocks in his own name. Records show that he was the son of a French immigrant. St. Paul took Richard Quelch on as an apprentice in 1608 and Quelch was "admitted free" in 1616. Beeson refers to St. Paul and Quelch as "for many years the only local craftsmen supplying the demand for balance wheel lantern clocks and watches [in Oxford]."¹ Quelch was known as a watchmaker, and an example of one of his watches (circa 1650) in the Ashmolean Museum in Oxford is illustrated in Beeson's book.² Loomes³ also notes that Quelch was said to have made clocks, although apart from the one described here no examples are currently known.

Beeson cites accounts from 1653 declaring Quelch "lately dead." Of his three sons, John and Richard (Jr.) became clockmakers. Richard Quelch Jr. was awarded the Freedom of Oxford in 1652 and died in 1667. A lantern clock signed by Johannes (John) Quelch was recently offered for sale.⁴ A miniature timepiece by John Quelch is shown by White,⁵ and Loomes featured a lantern clock made by John, which was particularly interesting because it retained the original balance wheel.⁶ There may be no more than about a dozen lantern clocks with their original balance wheel. Since this mechanism was unreliable and only ran for about 12 hours per winding, the majority were upgraded when the pendulum was introduced to England in 1657. Upon examining casting marks on the clock, Loomes concludes that many of the components originated in London.⁷

Historical Background

Lantern clock production is generally divided into three periods during the 17th century. This is not a



Figure 1. Front view of the Quelch clock, pre-restoration. The dial shows the typical second-period shading of the tulip flowers and the half hour markers. Note the canon pinion and minute-hand shaft for the hands and the unsuitable replacement hand. PHOTO BY GEOFF COX.

rigid division, however, and mainly applies to clocks made in London.

Clocks of the first period (1580–1640) are rare and mostly well documented. The second period (1640–60) coincided with the English Civil War and the period of recovery immediately afterward. Since the pendulum was not introduced into England until 1657, almost all clocks from the second period

were made with a balance wheel movement. The third period of clock production (1660–1700) was initially severely disrupted by the Great Fire of London in 1666, which destroyed all the clockmaking workshops around Lothbury. Clock production recovered quickly and eventually achieved a huge increase in output.

Mechanism and Construction

Figure 1 shows the Richard Quelch clock before restoration in 2022. Note the presence of the modern two-handed gearing arbor, canon pinion, and modern hour hand (Figure 2). Figures 3 and 4 show the side and back views of the clock.

The clock is likely a second-period (1640–60) lantern clock. As will be shown, most of the components appear to have been sourced from London, with its wealth of brass foundries working during this period. Many of the components used in this Richard Quelch clock are also found in lantern clocks originating from makers working in the Lothbury area of London.

The English Civil War occurred between 1642 and 1651, and documents from the Clockmakers Company show that there was either no clockmaking activity or very few new clocks recorded in this period. Immediately afterwards, however, trade picked up rapidly,⁸ and by 1660

40 known clockmakers were trading in London. Prior to the Civil War, lantern clocks were mostly sold to the nobility and landowners. After the Civil War many of them lost their titles, land, and large houses in London and the countryside and also of course their interest in buying expensive clocks. In contrast those who prospered from the war were Cromwell’s advisors and those who had been involved in maintaining Cromwell’s army and navy. The 17th-century London diarist Samuel Pepys was one example of the group of people who became affluent during and after the Civil War. Since there were many who fell into this newly wealthy group, including a growing number of merchants, there was a much larger market for the relatively expensive lantern clocks.

Most of those who had thrived under Cromwell’s rule lived in a rapidly expanding mid-17th-century London. There were three main clockmaking areas in London at this time: around Holborn Bridge (which crossed the River Fleet), Fleet Street and Blackfriars, and Lothbury (an area near the modern-day Bank of England). Figure 5 shows Lothbury and the site of Thomas Loomes’s workshop, the “Mermayd” at Bartholomew Lane, as it appears on an Agas map circa 1664.

This area was also recognized as having many metalworkers and founders casting and turning



Figure 2. The clock was received with modern two-hand gearing fitted. PHOTO BY GEOFF COX.



Figure 3. Side view, pre-restoration. Note the pinned door. PHOTO BY GEOFF COX.



Figure 4. Back view, pre-restoration. PHOTO BY GEOFF COX.

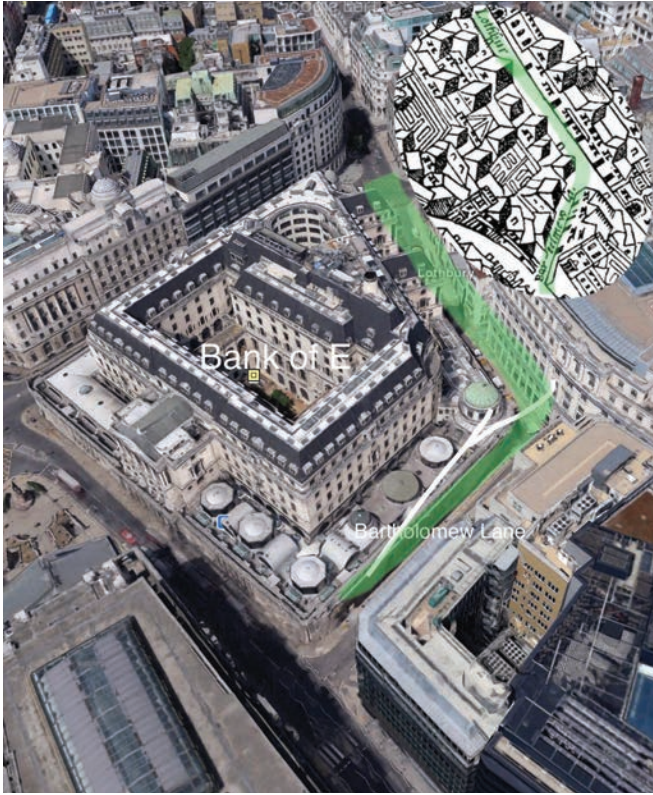


Figure 5. Lothbury and the site of Thomas Loomes's workshop the "Mermaid" as it appears on Agas map ca. 1664 and currently. IMAGE OVERLAYS BY GEOFF COX.

copper and latten (brass) products. One such founder's mark on the Quelch clock is shown in Figure 6 behind the chapter ring (a similar location is shown by White⁹). While illegible, the mark is comparable to the shield-type marks illustrated by White.¹⁰

White proposes that many second-period lantern clock parts have similar founder's marks, suggesting the existence of a significant trade in rough clock parts.¹¹ In contrast, a few lantern clockmakers appear to have been able to make their parts from brass castings in their own foundries (for example, Jeffrey Bailey and Peter Closon).

Dating clocks from this period by examining frets, the bell strap, dial engraving, movement, and so on, should be approached with caution. Clockmakers often brought in parts from foundries and other suppliers and may also have kept stock from earlier years. Even the engraving was sometimes done by other workers.

The following account considers important elements of the Richard Quelch clock and where and when they were likely to have been made.



Figure 6. Founder's mark on the reverse side of the chapter ring. PHOTO BY GEOFF COX.

The Dial

A clear difference between the form of the engraving found on first- and second-period clocks relates to the leaf-shading detail. The engraving of flowers in the second period is more naturalistic, following the direction of plant growth or the natural curve of leaves or petals. Although the form of second-period engraving was comparable to the first, rather than being presented as a scroll or wreath around the alarm disc, depictions of the tulip flower and leaves are shown as growing upwards from a central flower at the base to an upward-pointing flower.

The engraving on the Quelch clock dial is typical of the form used on some Lothbury clocks: for example, those made by Henry Ireland, an established mid-17th-century lantern clockmaker.

The alarm disc is of the same period style as the clock and possibly original to the clock or alternatively re-engraved on period material. It is very similar to one fitted to a clock by Ireland made in the 1650s.¹²

In contrast to first-period half-hour markers (which were usually free floating), second-period markers were simple or more complex variations of an arrowhead with a stem tying it to the minute circle. The Quelch clock has double-matchstick half-hour markers similar to those used on clocks from the 1650s—for example, Thomas Loomes's. The dials have recently been resilvered/lacquered appropriately as they appeared originally (Figure 7).

Frets

First-period and some second-period clocks generally display the maker's signature on the fret, while later clocks have the signature on the upper or lower dial center.¹³ This further suggests that the Quelch is a second-period clock. The crossed dolphin motif is also found on the side frets.

The semicircle on the front fret carrying the maker's name is particularly unusual (see Figure 7). It appears that the only other example of this arrangement is found on a lantern clock signed by Fromanteel (Figure 8). Fromanteel was made a full Freeman of the Clockmakers Company in 1656 by order of Cromwell, whose cause he had supported. As the first maker to offer pendulum-regulated clocks, advertising this feature in 1657, Fromanteel changed the way society relied upon the domestic clock and timekeeping from that point forward. Figures 7 and 8 show frets from the two clocks.

Frame

There were two different forms of the columns in second-period clocks. The Quelch clock shows the concave form of the finials.¹⁴ This type was used by Ireland,¹⁵ Beck, and Fromanteel, all makers working during the second period.

A clock by Thomas Loomes from the 1650s has similar finials and acorn feet in the pre-Civil War style. Interestingly, Loomes worked very close to Ireland's workshop in Lothbury.¹⁶

Bell Strap

The design of the bell strap is markedly restrained in second-period clocks, and the very simple form found on the Quelch clock is in keeping with the period. This is similar to one shown by White: a first-period bell strap conventionally fastened with a nut on a threaded top finial stud¹⁷ (the original finial had been shortened at some stage to fit a case or ceiling height).



Figure 7. Illustrating the Quelch signature on the front fret on the semicircular element. PHOTO BY GEOFF COX.



Figure 8. Same fret pattern and signature placement as seen in Figure 7, here signed by A. Fromanteel. PHOTO BY GEOFF COX.



Figure 9. Left side and rear showing the angled count-wheel slots. PHOTO BY GEOFF COX.

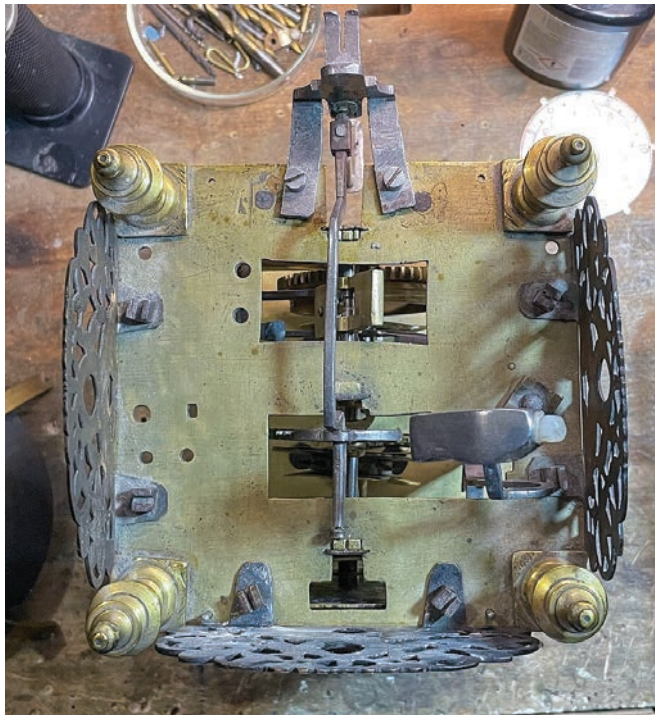


Figure 10. The top plate from above, including a number of unfilled holes originally used to carry the balance wheel mechanism, possible fly cover, and the two rear side holes for top hinge pins before the rear pillars. PHOTO BY GEOFF COX.

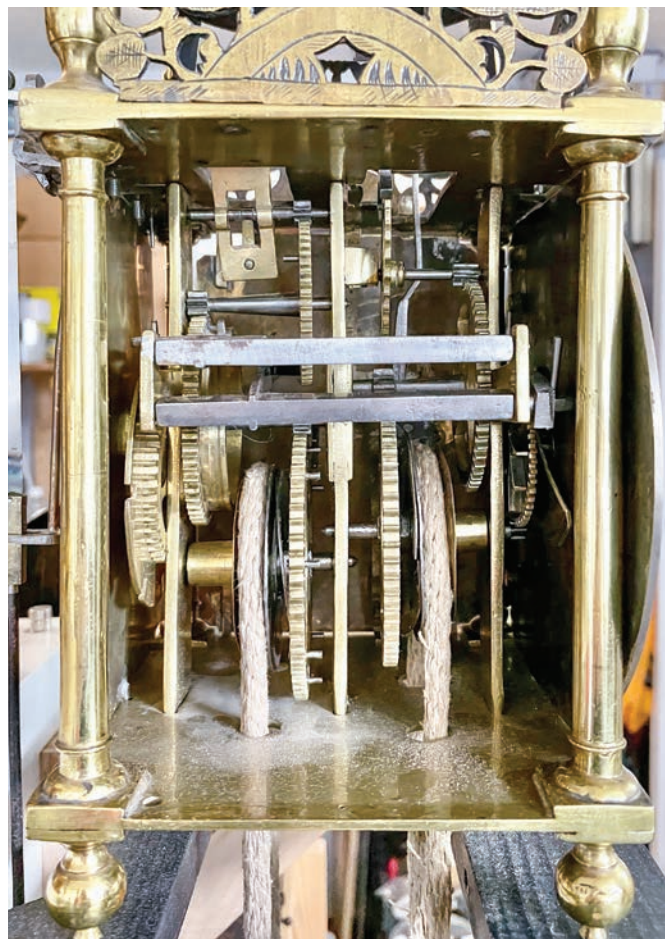


Figure 11. A view of the hammer spring and counter showing a chamfer on the latter, typical of second-period work. Note that the original stepped potence remains, supporting the escape wheel originally to clear the balance arbor. PHOTO BY GEOFF COX.

The Movement

A detailed description of the going and striking train is not included here, but the layout and construction follow the same convention as other lantern clocks of the period. This design had been well established in the first period and continued virtually unchanged in subsequent 30-hour pillar and post frame clocks well into the 19th century. The striking count wheel is a single set of a 1-12 count as opposed to the double count wheel (two sets of 1-12) occasionally seen in earlier examples (presumably to increase the duration before rewinding).

One point of note is the shape of the hammer spring and counter (Figure 9). White illustrates a form that is very similar to the one found in the Quelch clock.¹⁸ This design typifies clocks made by William Sellwood (a maker of first-period clocks), which are examples of relatively undecorated components typical of pre-Civil War work.

The Quelch clock was originally fitted with a balance wheel, also typical of most second-period clocks. This is seen in the unblocked, empty holes in the top plate, also indicated by the hammer stop and hammer on the right side of the movement (facing the dial). Figure 10 shows the top plate of the Quelch clock, revealing several of these interesting features. The two filled holes at the rear of the plate edge opposite the front fret were originally used to secure a hoop, indicating that the clock was of the hoop-and-spike type. There are no holes for the two spikes at the back of the clock. They were most probably attached to the original backplate, now replaced.

The two holes to the left of the rectangular opening, through which the fly can be seen, may have been used to secure a cover. The group of four patent holes close to the left-side fret were probably used to secure the cock for supporting the balance wheel. Figure 10 also shows the front and rear cocks supporting the long pendulum, added later. Note



Figure 12. Replacement pinion of report/cut-down hour and star wheel assembly. PHOTO BY GEOFF COX.



Figure 13. Reworked doors that include hinges and a latch. PHOTO BY GEOFF COX.

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Figure 14. The finished Quelch clock awaiting the second phase: the crown-wheel balance reinstatement. PHOTO BY GEOFF COX.

the typical square-headed screws holding the frets in place. The two holes toward the rear of the side frets housed pins to hold the side door hinges.

Balance wheel-based clocks as a rule had their strike hammer, stop, and strike operation located on the left side of the clock (facing the dial; Figure 11). This arrangement allowed the independent train weights to fall on opposite sides of the frame without interference, retained in this example. Both anchor and verge pendulums are on the right side, allowing the use of the Huygens endless rope and a heavier single weight.

The style and execution of the conversion from the original crown wheel balance escapement to anchor-pendulum suggests an early 18th-century modification.

The gearing of the time train remains largely unchanged, with independently driven time-and-strike trains of the same short, approximately 10-hour duration as its original balance configuration. The resulting pendulum length is considerably shorter than the usual nearly 29".

The pinion of report driving the count wheel found in the Quelch clock (Figure 12) is comparable to those found in first-period clocks where the pinion filed directly from the end of the arbor. As with a Bowyer clock dated 1623, four leaves have been cut into the pinion.¹⁹ Later clocks had pinions of more leaves (usually six), and in third-period clocks the pinion was made of brass.

The doors that came with the clock are not original (Figure 13) and were possibly added when the escapement was converted. Someone went to considerable effort in engraving corner decorations patterned after those on the dial plate. This is somewhat in line with a Victorian Gothic Revival restoration of earlier antiques. They originally had soldered hinges then probably changed to pinned hinges when the clock was converted to two hands. The doors have now been restored to conventional fitting and operation.

The Clock Currently

When purchased, the Quelch clock was fitted with a long pendulum. It is likely that this was fitted 50 to 75 years after the clock was made. It was common practice to make this modification, since the long pendulum offered significantly better timekeeping than both the original balance wheel and the short pendulum. All British lantern clocks were fitted with a balance wheel before 1657, when the short pendulum was introduced to London. Salomon Coster of The Hague is attributed with having first used the short pendulum in commercial clockmaking. John Fromanteel, from an Anglo-Dutch family, is thought to have introduced the short bob pendulum to London.

Some makers continued fitting balance wheels after 1657, probably because they were familiar with that form of movement, and perhaps because the customers resisted the change.

About 40 years ago, someone removed the original integral arbor (great wheel) four-prong pinion of report and hour wheel/star and installed a

two-handed system from modern components. Fortunately, the Quelch clock retains its original escapement train gearing and, therefore, gear ratios allowed the latter hand-gearing additions to be removed and period replacement components added to reinstate single-hand indication. However, the hour wheel had to be cut down from a period lantern movement original, with its smaller diameter and slightly reduced tooth size due to the 15mm raised great wheel from the two-handed gearing conversion. The restored clock is shown in Figure 14.

Conclusion

The approximate production date of the Richard Quelch clock may be established. Considering the form and origin of the clock components and the available evidence that Quelch was probably dead by 1653, it seems likely that the clock was manufactured just before or just after the English Civil War. It was likely made from at least some parts sourced from Lothbury clockmakers.

Future Balance Reinstatement: The Journey Continues

It has been demonstrated recently that correctly done verge balance regulation can achieve accurate timing (by fine-tuning its running weight) to within 1 minute per day, given a stable temperature.²⁰ Based upon review of the successful balance wheel reinstatements completed over the last few years by Geoff Cox, it has been decided to reinstate the balance to complete the restoration of the clock. A future *Bulletin* article will chronicle that journey. If you'd like a sneak peek of the clock in operation, visit <https://earlyclocks.uk/quelch-balance-recon>.

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About the Authors

Stephen Barasi trained as a physiologist in London then for a higher degree in neuroscience in Edinburgh. He worked as an academic researching in the field of sensory neuroscience and teaching medical and science students. After retirement he became interested initially in 18th-century long case clocks then in English lantern clocks. He is particularly interested in linking early lantern clocks to the history of early and mid-17th-century London.

Geoff Cox has been interested and involved in early clocks since he was a student roaming museum collections and NAWCC events during summer holidays. Completing an education at Michigan State University, the work travel that followed allowed the opportunity to network with important collectors such as Norman Langmaid and others who were enthusiastic in sharing their collections and vast experience with early English clocks. After retiring from a commercial scientific career spanning the US and UK, he shares decades of restoration experience and knowledge with others though Earlyclocks.uk.

E. Howard Street Clock Movement Model "00"

History, Design, and Test Data

BY YIFAN XU (SC), DAVID MOLINE (SC), AND JOHN WAGNER, NAWCC FELLOW (SC)

The presence of a street clock in a city is somewhat unusual today, although they were prevalent a century ago for public time display and accompanying advertisement of the sponsoring business. Tower clocks with bells were installed in churches, courthouses, and schools to visually and audibly note the passage of time for residents and students. The E. Howard Clock Co. of Boston, MA, manufactured a variety of large movements, including the nicknamed Model "00". The E. Howard catalog does not list a Model 00 but rather refers to the movement as a small timepiece. This time-only movement powered one- and two-dial street clocks using an anchor escapement. In this article, the design and quality factor of the Model 00 clock will be experimentally explored to provide insight into its general operation and performance.

Introduction

In the mid-19th century, the transformation of the United States from rural-agricultural to urban-industrial was slowly underway, along with territory growth as the western states were founded. Railroads were growing and passenger and freight volume increased as commerce flourished. To regulate the railroad schedules and help the emerging manufacturing plants with fixed workforce hours, the availability of standard time and dependable clocks and watches were requirements.¹ The synchronization of clocks with a known time in a defined geographic region, or time zone, required the public display of time so that individuals and companies could set their timepieces. The large dials, typically 3' or



Figure 1. E. Howard & Co. street clock from 1878 that resided in front of Hertzberg Jewelry Co. in San Antonio before its relocation to N. St. Mary's and Houston Streets. PHOTO BY RICHARD MARINI AND USED WITH PERMISSION.

4' in diameter, on street and tower clocks provided a much-needed visual display of the time, along with the accompanying hour strike with an attached bell in some instances.

Jewelry stores often had high-precision clocks inside, or street clocks out front, so that customers and others could set their watches. An E. Howard Clock Co. (Boston, MA) two-dial street clock was erected in 1878 outside the Eli Hertzberg Jewelry Co. in San Antonio, TX.² "The Hertzberg Clock has been the 'official' timepiece for generations of San Antonians" (this quote appears on an informational bronze marker in the sidewalk at the clock's base, as shown in Figure 1).

Edward Howard (1813–1904) was involved in a number of clockmaking business ventures that included watches, clocks, and tower clocks with partners, as shown in Figure 2. The E. Howard & Co. (Boston, MA), under other names and ownership, manufactured tower clocks from 1843 to 1964.³ The 4,000 tower clocks produced by the company included weight-driven models with time and possibly strike trains to sound bells. The painted cast iron structural frames and polished steel arbors with brass and steel wheels created a decorative appearance for these elegant movements. The

company catalogs list street and tower clocks for various applications, including one-, two-, and four-dial displays for sidewalks, brackets, church steeples, and courthouses.⁴ Eventually, the hand-cranked weights could be automatically rewound or the clock hands could be driven directly with electric motors.

In this article, the design and performance of a circa 1912 No. 3494 Model 00 movement shown in

Figure 3 will be investigated. Paul Middents⁵ reported that the E. Howard Model 00 first appeared in the 1912 catalog and was also used in twin-dial street dials produced by Joseph Mayer of Seattle, WA. This movement was listed as driving clock hands for single 3' (weather exposed) and 4' (weather protected) diameter dials.⁶ Robert Shaw⁷ discussed the restoration of a similar E. Howard Model 00 movement in a two-dial street clock in Hamilton, Bermuda, that featured a 90-pound weight in a triple compound style. These movements were widely manufactured and installed in the early 20th century for public time displays, with operational examples of interest remaining today for the horology community.

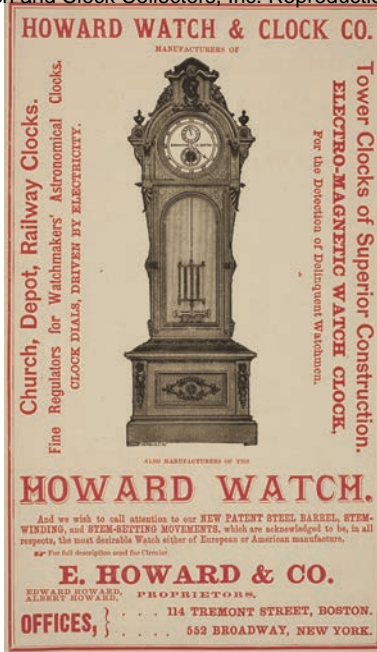


Figure 2. Ca. 1884 Howard Watch & Clock Co. advertisement. COURTESY OF HISTORIC NEW ENGLAND.

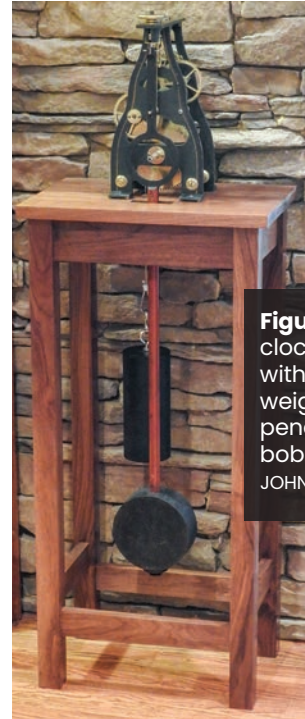


Figure 3. Tower clock on a stand with attached weight and pendulum plus bob. PHOTO BY JOHN WAGNER.

Clock Design and Operation

The time-only clock movement design will be explored in terms of the configuration, components, and parameter values. The clock features six arbors between two parallel plates as shown in Figure 4. An external weight of $W_{ext} = 30$ pounds (it should be much heavier per catalog data but adequate to run this movement without hands) is suspended

on a cable that wraps about the winding drum to provide the input torque, $T_{A1} = \frac{1}{2} D_{A4} W_{ext}$. Similarly, the vertical drop of this weight can be expressed as $y_{ext} = \left(\frac{1}{2}\right) D_{A4} \theta_{A1}$. A series of four meshed gears (pinions, gears) reduce this input torque that is eventually presented to arbor pinion E2, which interacts with the escape wheel. The relationship

Table 1. Summary of E. Howard Model 00 Clock Component Parameters

Arbor	Gear	Symbol	Description	No. Teeth	Diameter (inches)	Thickness (inches)
A	1	A1	Great wheel	90	6.087	0.455
A	2	A2	Wheel & safety pawl	100	5.730	0.200
A	3	A3	Wheel with ratchet	40	3.820	0.400
A	4	A4	Winding drum		3.000	
B	1	B1	Input pinion	18	1.264	0.680
B	2	B2	Arbor B wheel	80	3.900	0.284
C	1	C1	Input pinion	18	0.945	0.485
C	2	C2	Arbor C wheel	96	3.723	0.258
D	1	D1	Input pinion	12	0.515	0.440
D	2	D2	Arbor D wheel	90	3.500	0.210
E	1	E1	Input pinion	12	0.515	0.335
E	2	E2	Escape wheel	30	2.410	0.150
F	1	F1	Verge			
F	2	F2	Crutch			
W			Suspension spring			
X			Time display shaft			
Y			Pendulum rod, bob			

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Figure 4. Schematic diagram of E. Howard Model 00 clock movement time train. DIAGRAM BY YIFAN XU.

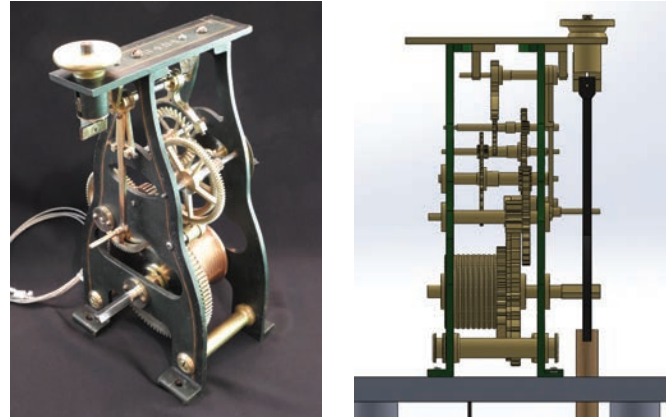
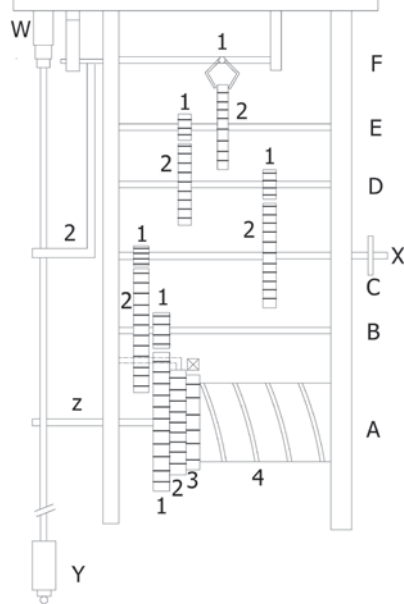


Figure 5A. E. Howard clock movement. PHOTO BY JOHN WAGNER; **B.** Corresponding 3D CAD model for virtual engineering design studies. MODEL BY YIFAN XU.

between the input and output torques and rotational angles can be expressed as

$$T_{E2} = \left(\frac{1}{R_t}\right) T_{A1} \text{ and } \theta_{E2} = (R_t)\theta_{A1}$$

where the train ratio becomes

$$R_t = \left(\frac{N_{B1}}{N_{A1}}\right) \left(\frac{N_{C1}}{N_{B2}}\right) \left(\frac{N_{D1}}{N_{C2}}\right) \left(\frac{N_{E1}}{N_{D2}}\right)$$

The summary of wheel teeth and diameters is listed in Table 1. The substitution of values results in a train ratio of . For the time display, the train ratio is 22.20:1, which offers a rather high torque to accommodate the larger hands and accompanying load. Accordingly, the thickness of the mechanical components is large to help ensure the strength and longevity of the wheel teeth.

The clock features an anchor escapement with two adjustable pallets, F_1 , engaging with the escape wheel, E_2 . The escapement divides the time train rotational motion into fixed time intervals (beat of 1 second) during motion of the pendulum (period of 2 seconds) acting through the attached crutch. The pendulum swings approximately $\theta_{pen} = \pm 2^\circ$. The E. Howard pendulum bob is a short, circular cylinder or thick disk weighing approximately 25 pounds. The pendulum bob's larger diameter is turned on its edge in contrast to other tower clocks that feature a tall, vertical, circular cylinder of narrow diameter. This is notable, given the aerodynamic resistance of the bob that effects the overall clock performance as measured by the quality factor.

A computer-aided-design (CAD) model of the E. Howard Clock Model 00 was created during this investigation using the SolidWorks™ software package to support future engineering optimization studies (refer to Figure 5). The dimensions for each

component were carefully gathered and assembled into the three-dimensional (3D) virtual model. The animation of the 3D model will enable the clock's operation to be explored for different designs, including gear thickness, pendulum bob profile (horizontal versus vertical cylinders), and arbor layout changes.

Quality Factor

The quality factor, Q , of a pendulum system in horology corresponds to the logarithmic decay of the underdamped mechanical oscillator. Simply put, it is a measure of how "long" a pendulum will swing back and forth when given an initial condition (displacement) and released with the crutch removed so that only frictional effects of the suspension spring and aerodynamic forces act on the pendulum rod and bob to dissipate the initial stored energy. The expression for the quality factor can be stated as

$$Q = 2\pi \left(\frac{\text{Energy Stored in Pendulum}}{\text{Energy Lost per Period}} \right) \quad (1)$$

A minimum amount of energy is absorbed/released continually by the suspension spring, which will not be considered. An inverse relationship exists between the quality factor value and the energy loss rate. Typically, clock pendulums demonstrate higher Q values (3,000–15,000), as they will oscillate for an extended time before coming to rest.⁸

To calculate the quality factor, the pendulum's damping ratio, ζ , or the exponential time constant, τ , may be determined by measuring either the logarithmic decrement⁹ and/or the free response motion decay¹⁰ based on

$$Q = \frac{1}{2\zeta} = \frac{\tau\omega_n}{2} \quad (2)$$

One time constant corresponds to a 63.2% change between the initial and final steady-state values of the pendulum’s transient response.

To collect experimental data, analog sensors were attached to the clock and connected to a National Instruments data acquisition board with LabView™ software. In Figure 6, a portion of the pendulum’s angle response is graphed when subjected to an initial displacement of 2.12° from a vertical zero angle. The pendulum oscillates with gradual decay due to aerodynamic drag and suspension spring losses and eventually comes to rest. The time constant can be identified as the elapsed time when the pendulum motion decays by $0.632 \times 2.12^\circ$ or 1.34° such that the oscillation amplitude envelope passes through $2.12^\circ - 1.34^\circ = 0.78^\circ$. Using the collected test data, a time constant of $\tau = 5,599$ seconds was measured. The period of the E. Howard movement is $T=2.0$ seconds, so $\omega_n = \pi$ (rads) and $f = 0.5$ (Hz). The quality factor is calculated as $Q=8,795$, which falls within the expected range for this pendulum street clock.

The normal operation of the clock movement was further investigated for the escape wheel, crutch, and pendulum angles. Three small magnets were mounted at the ends of the escape wheel and the crutch arbors, and on the pendulum rod at the center of rotation near the suspension spring guide at the bottom of the adjustable upper mount. Non-contacting magnetic sensors were mounted near each of these magnets to measure the angular motion of the three components. A slightly more than two-second-long portion of the collected data is plotted in Figure 7 versus time. The graphs show the complete start and finish of one period of the pendulum oscillation and the lock, impulse, and drop cycles on each of the two pallets.

When examining the escape wheel data, before 55.0 seconds an escape wheel tooth drops and lands on a pallet, stopping the rotation, though the tooth does bounce about 0.3° . It remains there and recoils slightly (about 0.1°) as the pallet slides under it until the start of an impulse after 55.8 seconds. As this impulse ends, the change in angular slope indicates the drop onto the other pallet, again with a slight bounce. On this pallet there is a very slight recoil until the next impulse begins before 56.75 seconds. Upon dropping, the tooth again bounces, this time about 0.4° .

During this time interval, the pendulum is moving smoothly in sinusoidal motion. The crutch would follow the same oscillatory motion, except that it is connected to the pendulum rod via a pin in a slot that is slightly larger than the pin. Thus, the crutch

can shift within this slot as observed by the periodic discontinuity in the crutch angle per Figure 7. It is believed that the motion during this shift may be described as follows: During the impulse, the escape tooth contact force on the impulse face of the pallet pushes the crutch and pendulum, via the crutch, through a vertical (zero angle) position. However, when the impulse ends and the drop begins, gravity is the predominant force on the crutch. The pendulum continues rising by its own momentum, but the crutch slows quickly and would start to fall back toward vertical except that the still-rising pendulum closes the gap, overtaking the crutch, and starts pushing the crutch. The transition from the crutch pushing the pendulum to the pendulum

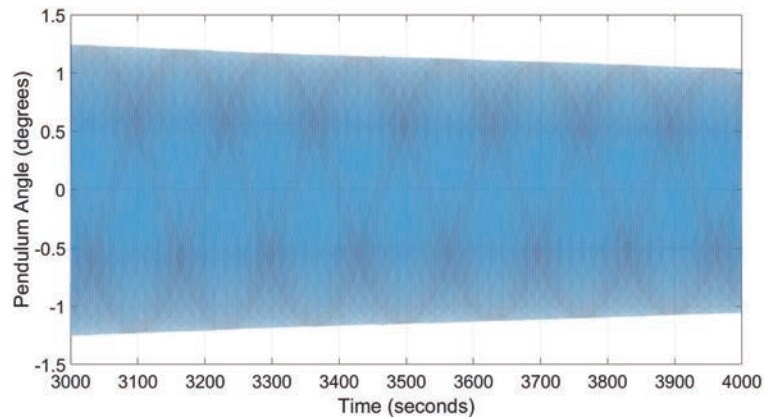


Figure 6. Quality factor determination by free response of clock pendulum; pendulum angular position vs. time for a select portion of the total decay time. IMAGE BY DAVID MOLINE.

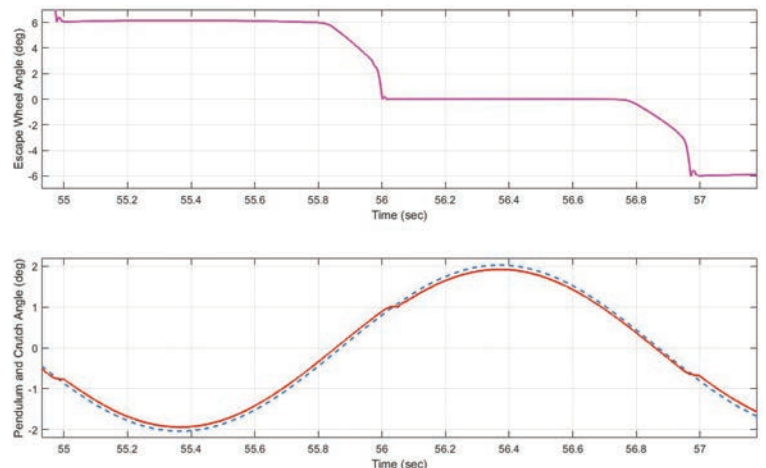


Figure 7. Angles of escape wheel (magenta), crutch (red), and pendulum (dashed blue) versus time from experimental data collected on the E. Howard Model 00 with three installed magnetic sensors and data acquisition system. GRAPHS BY YIFAN XU.

pushing the crutch takes about 50 milliseconds. The crutch is then pushed by the pendulum to the maximum angle. When the pendulum starts swinging back toward vertical, gravity acts to keep the crutch in contact with the pendulum. The next impulse starts before the two reach vertical, and the cycle is repeated.

Even in this short duration of the E. Howard clock movement operation, one can observe that the mechanical behavior is not quite symmetric. The difference in recoil has already been noted. The time between the alternating drops is not quite symmetric either, varying in this case by 0.05 seconds. While this might suggest the clock is slightly out of beat (which is adjusted by screws on the crutch), it is also possible that select teeth on the escape wheel are the root cause. This is not a new movement, after all, but nevertheless it demonstrates what may happen in the motion of a large pendulum street clock.

Conclusion

Street and tower clocks displayed public time in small towns and large cities across the United States during the late 19th and early 20th centuries. The ability for individuals to set pocket watches and household clocks from these public clocks enabled society to begin adopting uniform time for factory shifts, commerce, transportation, and many other aspects of everyday life. The E. Howard Model 00 movement features a robust design with heavy-duty arbors, pinions, gears, and end plates that has enabled the clocks' continued operation for many decades with regular maintenance. Although many of these large clocks were manufactured, few installations and examples remain of these horological achievements due to their destruction in urban modernization efforts. Those that remain are a vivid testimony of a bygone era when artistic flair, the science of timekeeping, large-scale clock design, manufacturing excellence, and the need for public time all intersected to create a truly unique solution that was implemented across the country.

Acknowledgments

The authors wish to thank Richard A. Marini of San Antonio, TX, for graciously taking and sharing the photographs of the Hertzberg Street clock (Figure 1). We also thank Donna E. Russo, Library and Archive Specialist, and Historic New England, Boston, MA, for providing the 19th-century advertisement of the E. Howard Clock Co. (Figure 2).

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Research Activities & News

Follow-Up to Snowden Taylor’s Research: A Previously Unknown 1-C Box Clock by Seth Thomas

BY JIM DUBOIS, NAWCC FELLOW (TX)

Introduction

In the June 1992 Research Activities & News (RAN) column of the *Bulletin*,¹ Snowden Taylor researched a suspected Model 2 Box clock (Figure 1). His piece was written based on his inspection and review of a partial box clock in the hands of an anonymous member. I believe my recent box clock find may add new detail to Snowden’s findings.

As I have grown to appreciate, Snowden’s approach was a well-researched deep dive into the details of the pieces and parts on hand. The relationship between Eli Terry and Seth Thomas drove the creation of these early woodworks shelf clocks that

we call box clocks. They quickly evolved into the more common form we know well—a pillar and scroll (P&S) model. The particulars of that evolution are not always apparent based on the information I have today.

To elaborate, these early woodworks shelf clocks were the immediate successors to the Porter contract clocks as completed in 1809 by Eli Terry, Silas Hoadly, and Seth Thomas. They depended partly on the mass production methods and techniques developed to deliver the clocks on that contract. The original product we identify as box clocks quickly grew in popularity, later as P&S clocks.

Figure 1A. Possible Model 2 box clock.



Figure 1B. Inside door of Figure 1A. Note cross bar is not part of original construction.



Figure 1C. Back of Figure 1A. Note case construction of corners. Middle board of back is a Model 2 movement back plate (installed up-side down).



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Figure 1. Box clock details from Snowden’s Research and News article “A Model 2 Box Clock?”

These clocks required no additional cases, unlike the other woodworks tall clock movements and dials, they were less expensive, they fit into the modest homes of the targeted customers, and they were popular almost immediately. In part, they drove the manufacturing of clocks and other products to increased mass production levels.

In his 1992 RAN article, Snowden refers to *The Developmental Era of Eli Terry and Seth Thomas Shelf Clocks*,² which was based on a presentation to the 1984 NAWCC Research Seminar in Hartford, CT. This document is somewhat rare³ but provides us with much additional and needed insight on box clocks and their relationship to early P&S clocks and the like.

Only a few Model 1-C box clocks now exist; Snowden cited nine of the Model 1-C that were known. He stated that the clock in his research and the subject of his RAN discussion was a Model 2 box clock, with no other complete examples known at the time of his writing. He cited several consistencies with the other known box clocks and some of the so-called reeded P&S clocks. He identified five Model 1-C clocks in P&S cases to further confuse us on the chronological story's whos, whats, whens, and wheres. I also note that Terry and Thomas gave claim to the production of these clocks. In Snowden's work we read, "This would seem to imply that Thomas was making some cases . . . the 1-B model could have been made by Terry or Thomas."⁴

I can suggest some new information to support Snowden's findings, as seen in the following photos and details.

Discovery and Features of the Unknown Box Clock

I obtained my clock after photos surfaced on Facebook. The clock's owner posted a request for information in April 2020, just as Covid shutdowns began. The clock had been stored in a closet in rural southeast Nebraska for more than 50 years after the current owner bought it at a local auction due to his interest in its wooden gears. It lay in the closet all those years, preserved but never "improved," repaired, or displayed. It was understood by the owner to be a bit usual, but he had no information about the clock. After some discussion with him, I struck a deal and made the trip to pick it up.

This clock has been discussed in previous presentations and Cog Counter articles.⁵ I overlooked Snowden's work on the Model 2 version in my previous efforts to document this example. Plus, I am now able to supply further information about these clocks.

This particular clock is a Model 1-C in all respects, other than initially having had the wood dial mask in place of the reverse-painted glass dial. From the case details, I can demonstrate that this example originally had the Model 2 dial. Furthermore, the rest of the clock has all the correct features of a Model 1-C.



Figure 2. Model 1-C rack-and-snail-strike movement. AUTHOR'S PHOTO.



Figure 3. Model 2 count-wheel strike. This was the immediate successor to the rack-and-snail version in my 1-C example. AUTHOR'S PHOTO.

A possible source of confusion is there being two versions of clocks that are both called Model 2. As P&S clocks came to market, Terry had moved on to making his second version of a strap movement. It carries a count wheel instead of the early patent rack-and-snail-strike strap movement, called his Model 2 movement. Since no movement was included in the example used in Snowden's investigation, I cannot say which one may have been in that clock. His example does have one trait of the later Model 2 movement: the backplate of the movement was not dovetailed into the caseback, which Model 1-C seems to feature consistently (Figures 2 and 3).

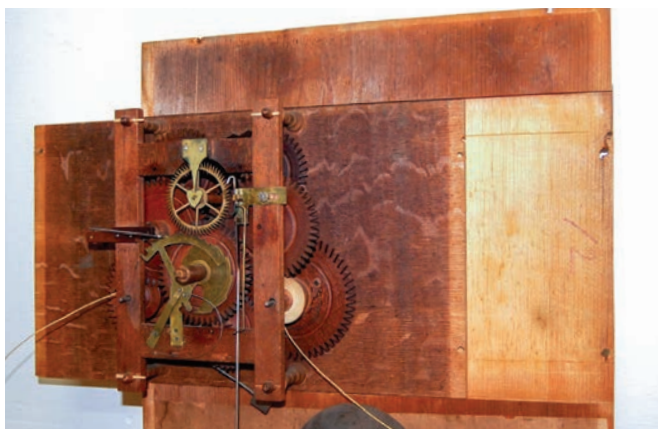


Figure 4. Detail of the movement sliding into the backboard dovetail of a Model 1-C box clock. AUTHOR'S PHOTO.

In Figure 4, we can see the movement sliding into the dovetail backboard of a Model 1-C box clock. This feature is thought to be consistent in the known Model 1-C box clocks, but not followed in the Model 2 P&S with the count-wheel strike movements. By 1816, the patent had been granted for the Model 1-C rack-and-snail-striking movement, and Terry had already started production of the Model 2 count-wheel strike movements.

Figures 5 and 6 show my clock as found on Facebook and located in Nebraska. I noted damage to the case: the one-piece glass was missing its numbers, the tablet scene was also missing on the lower glass, there were no weights, and the minute hand was incorrect. However, the movement was complete and more or less in running order. It had not been treated well many years ago.

When I brought the clock home, I thought it was a conventional Model 1-C. Further research strongly suggests that this clock is one of the unicorns that Snowden believed existed. Furthermore, I surmise



Figures 5. The clock as found in Nebraska with features of a Model 1-C. AUTHOR'S PHOTO.



Figure 6. Clock in Figure 5 with the door open, showing dial relief details. AUTHOR'S PHOTO.



Figure 7. A closer photo of dial relief cut into the case sides, as also seen in Snowden’s example. AUTHOR’S PHOTO.

that the clock does stray into the Snowden-defined Model 2 arena. It has a recess cut in the case sides for a dial. The movement, the label, and the movement-mounting and case details all correspond with the Model 1-Cs in existence. Adding the dial takes us toward the Model 2 version of P&S while remaining a Model 1-C in all other respects. Figure 7 shows the dial reliefs cut into the case sides as well as screw holes from the original dial-retention methodology.

The clock’s use of a wooden dial mat contributes significantly to readability from across a dimly lit room. This is an absolute improvement over the chapter rings and numbers painted on the glass tablets, as seen in other Model 1-C clocks. Figure 8 shows a true Model 1-C featuring its difficult-to-read dial-on-glass approach.

My clock is marked with “59” in two places: on the case and on the movement backboard (Figures 9 and 10). This suggests mass production, though they must not have been robustly produced as there are few around today. The clock also has the more sophisticated sliding dovetail movement/backboard found in the 1-C model but not in the Model 2s.



Figure 8. Authentic Model 1-C clock. PHOTO COURTESY SCHMITT HORAN & CO.



Figure 9. Note the “59” on the backboard of the movement itself. AUTHOR’S PHOTO.



Figure 10. Production number 59 on the case top. AUTHOR’S PHOTO.

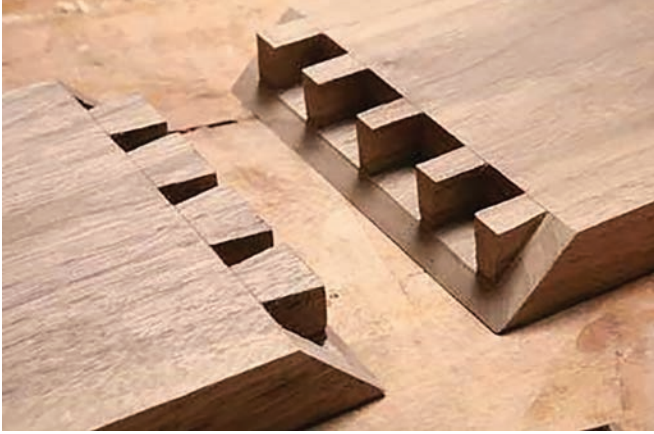


Figure 11. This is a model of an opened blind-mitered dovetail joint, showing the construction details of the joints used on all four corners of these box clocks. IMAGE COURTESY OF WOODWORKERSINSTITUTE.COM.

The clock has blind-mitered dovetails on all four corners, as do later second-generation box clocks (Figure 11).⁶ Snowden was not entirely correct in his analysis of these joints; he refers to them as being lapped: “A pure bevel joint would be suspect, as it is not a high-quality joint. However, Figure 1D, an inside view, shows what appear to be lap joints. In fact, the corners use a rather sophisticated combination of lap and bevel, which could be considered an improvement on the dove-tail, as the only externally visible joints are at the actual corners.”⁷ In the clock I have, a small amount of disassembly was necessary to see the subject joints. This is a complicated joint to make; it does not lend itself to machine cutting. It would have been done by hand, perhaps using some modest jigs and fixtures. I have found these blind-mitered dovetails on two clocks evaluated to date. It is also noteworthy that the case sides, including the top and bottom, are all veneered.

Restoration

Given the rather rough condition of the clock, as received, several case repairs were undertaken. No effort was made to make the repairs invisible; they are legitimate parts of the history of the clock, but it needed to be preserved in a fashion befitting its original appearance. Missing pieces of wood were filled using veneer pieces and appropriate fillers. Color was added to the case to more nearly match its original appearance. One very small patch of the apparently original finish was left under one of the later applied brackets. I replicated that color for the repaired casework.

Figure 12 shows the original finish under this poorly implemented repair to one of the hinges. I can see



Figure 12. Sadly, all that remains of the original finish was this strip, about 10mm x 25mm, found under the repair attempted on the lower hinges. AUTHOR'S PHOTO.

why the method of hinging these cases never caught on. Repeated repair attempts damaged this already fragile area. The hinges are retained by two wood screws 5 mm long into wood that is only 6 mm thick.

A pair of proper weights were made and aged. I followed published drawings and details from the *Cog Counter's Journal* (Figure 13).⁸

The original hour hand was made of sheet brass, showing coping saw marks and filing marks. A matching minute hand was created and is shown



Figure 13. Picture of two proper, different sized weights made using methods from the *Cog Counter's Journal*. AUTHOR'S PHOTO.

in Figure 14. An extension on the escape wheel arbor suggested the clock originally had a second hand, so a single known example of a second hand on a Model 2 P&S was located (Figure 15) and recreated for this clock. A dial, shown in Figure 16, was recreated and aged using the Model 2 box clock and P&S as examples.

One of the unpublished peculiarities of some Model 1-C box clocks is their lack of a door latch. The door in these clocks is held closed by inserting a pin through the case side into the door. In this case, a bone knob was recreated to open the door (Figure 17). Snowden addressed a more conventional latching approach in other box clocks and in the Model 2 he investigated.

This clock carries the more or less conventional oval, over-pasted "Made by Seth Thomas" label along with the "Patented by Eli Terry" label that appears to be water damaged. However, recent research suggests that the culprit is a mold that was sustained by moisture from the wood backboard a very long time ago, so not water damage per se.



Figure 14. The matching minute hand of brass, and the brass hour hand. AUTHOR'S PHOTO.

The dial mat is positioned using four screws into the original screw holes to retain it (Figure 18). From the general lack of damage to the screw holes, it appears that the dial was not long retained or was seldom removed and reinstalled in the clock. It may well have reverted to the classic Model 1-C approach as a result of the dial interfering with the hands or the working parts of the front of the movement. Both problems are evident with the recreated dial properly positioned on the case.

The restored clock is shown in Figure 19. It seems I should declare it a Model 1-C with a Model 2 dial. As referenced elsewhere, this style of the dial was used on several of the reeded P&S Model 2 clocks and on Snowden's research example. Some of those clocks had a rack-and-snail-strike movement, and some feature the slightly later strap-with-count-wheel movement, also called a Model 2 movement.

A tablet was recreated on old glass, similar to possible original glasses. In this case, the spandrels are on the glass, and the numbers are on the dial



Figure 15. An original Model 2 P&S-cased clock with the seconds hand. PHOTO COURTESY GEORGE GOOLSBY.

plate. This is consistent with one example from the Model 2 box clock/reeded P&S.

Snowden asked, "This clock is evidence that Model 2 box clocks were made. Is there another one more complete, still unreported?" I think we can confidently answer "yes" on that point.

Notes and References

1. Snowden Taylor, "A Model 2 Box Clock?" *Research Activities & News* (June 1992): 337–39.
2. Snowden Taylor, *The Developmental Era of Eli Terry and Seth Thomas Shelf Clocks* (Fitzwilliam, NH: Ken Roberts Publishing Co., 1985).
3. Copies are available in the Fortunat Mueller-Maerki Library & Research Center, Columbia, PA.
4. Taylor, *The Developmental Era of Eli Terry and Seth Thomas Shelf Clocks*.
5. Jim DuBois, "Seth Thomas 1-C Box Clock: A Previously Unknown Example," *The Cog Counter's Journal* (Summer 2021): 52–68.

6. P. Michael Henderson, "Secret Miter Dovetails," *Mike's Woodworking Projects*, <https://mikes-woodwork.com/SecretDovetail.htm>.
7. Taylor, "A Model 2 Box Clock?"
8. Adolph Amend, "The Seth Thomas Box Clock," *Cog Counter's Journal* 17 (January 1980).

About the Author

Jim DuBois is a product of Indiana and Indiana University. He joined the US Navy in 1965, working in electronics, and after serving his enlistment, he enjoyed a career in several Fortune 500 companies. He developed an interest in clocks starting in 1970 after acquiring a 30-day time-only Waterbury store regulator from his father. He found an avocation that has only grown and has certainly driven him since. He is a contributor to the *Watch & Clock Bulletin*, *The Cog Counter's Journal*, and other clock-related publications, and has authored a book on the work of Joseph Ives. He recently received the NAWCC's James W. Gibbs Literary Award.



Figure 16. A dial was recreated and aged using the Model 2 box clock and P&S as examples. AUTHOR'S PHOTO.



Figure 17. A bone knob was recreated to open the door of the clock. The door is held closed by the pin inserted in the case side. AUTHOR'S PHOTO.



Figure 18. Restored clock with a remade dial and hands, with the door open. AUTHOR'S PHOTO.



Figure 19. Picture of the restored Model 1-C clock with a recreated tablet on old glass. AUTHOR'S PHOTO.

Research Activities & News (RAN) is currently accepting submissions. RAN submissions should be approximately 2,500 words in length, plus images. Contributors may send information directly to Ed Fasanella, RAN Editor, at edwinfasanella@gmail.com.

Keeping Time with the School of Horology

Restoration of a “Basket-Case” Long Case Clock

BY PAUL KRAUS (PA) WITH KEN DE LUCCA (PA)

The Clock

A long case clock was recently advertised by an online auction house. It was described as a circa 1800 30-hour, single-weight English long case clock with some damage due to moving. The words “some damage” should have been the wake-up call that alerted me to potential troubles ahead. At first it appeared to me that the clock had only a minimal problem: a broken pendulum. In any case, I purchased the clock even though I was one week away from taking my first introductory clock workshop at the NAWCC School of Horology. Looking back over the past few months, I can admit I really knew nothing about clocks of any type!

During the School of Horology workshop, all participants were invited to bring a personal clock for analysis and discussion. The education director and workshop instructor, Ken De Lucca, informed me that my clock was in fact an 8-day time/strike English-type movement clock. It appeared that the clock movement, dial, and seat-board have always been together with this clock. The complete case has only been assessed by myself; however, I feel it fits the seat-board and may actually be a complete, original clock. A best guess on the age of the clock was determined by reviewing a number of books about these types of clocks and included research on pillar style, hand style, and dial (especially the chapter ring). With this information, we determined that this clock dates from approximately 1750 to 1800. I hope to have a narrower range of dates once the case itself can be more closely examined. Due to its approximate age, Ken and I decided that this clock had significant historic value and that any repairs or restorations should be viewed in consideration of that fact. With that first discussion, the first seeds of a *conservation* plan were firmly planted in my mind.

Required Repairs

Full of excitement and the newly obtained knowledge from the workshop, I returned home and

began learning more and more about the clock. Ken loaned me some of his own books on such clocks, which made the entire matter more and more intriguing. Following disassembly and cleaning, the full extent of the required repairs was fully revealed (isn't that always the case?). Quickly realizing that I was in over my head, I reached out to Ken again with many more questions. Perhaps sensing my desperation, he offered some bench time to help with cleaning up some of the poor restoration practices that were found after cleaning. That was when the term “basket-case clock” was first used. I would like to believe Ken used that as a term of endearment, but I am not sure.

After further discussion, we decided to consider more of a conservative restoration technique rather than an aggressive overhaul of the clock. We noted that each repair would be a part of this clock's story. Each past repair was examined, and a plan was created to address each of them. Each repair that was structurally sound and functional was left alone or perhaps just refined a bit (Figure 1). The lifting lever was repaired with solder and added brass in a rough manner; however, it was still functional. If structurally questionable, like the gathering pallet wheel (Figure 2), or nonfunctional, like the loose pin on the end of the rack tail (Figure 3), some repair and cleaning was needed. In the case of the broken pendulum, the only reusable pieces were the bob and the regulating spike (where the regulating nut interacts with the bob). Also, the suspension spring and crutch block were missing. The wooden pendulum rod was broken in three pieces.



Figure 1. The lifting lever needed some cleanup from previous soldering.
PHOTO BY PAUL KRAUS.



Figure 2. The gathering wheel was broken in two of its four spokes. The wheel was thoroughly cleaned and resoldered—with much less solder! PHOTO BY PAUL KRAUS.



Figure 3. The rack tailpin was previously soldered but still loose in the rack tail. It was resoldered and much solder was removed. PHOTO BY PAUL KRAUS.

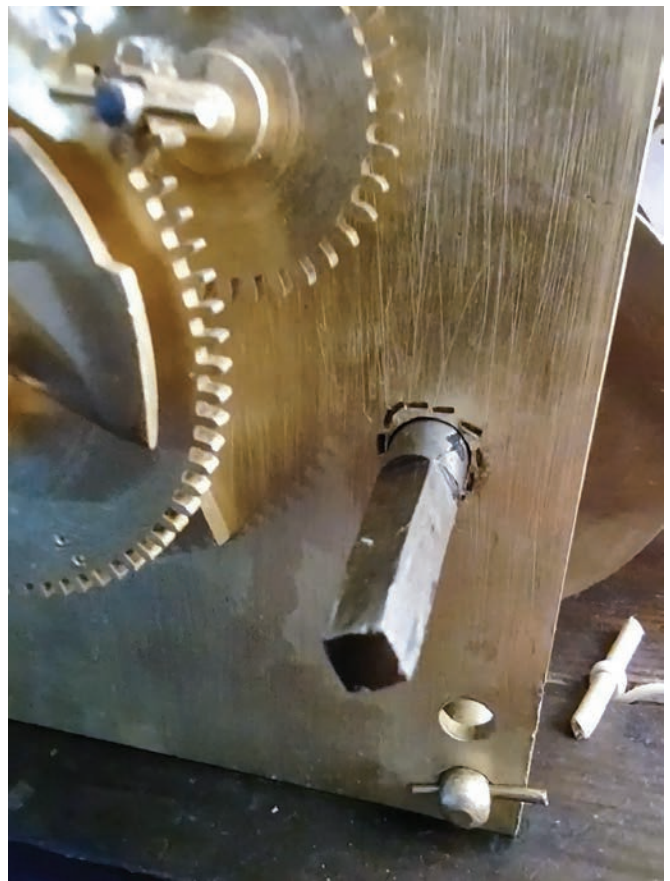


Figure 4. The staking repair. PHOTO BY PAUL KRAUS.

There were a number of previous repairs that were made with solder. Copious amounts of solder covered wheel spokes and the rack tail. These repairs were improved upon and much solder removed. Our goal here was to change nothing, just improve what was there. Not having experience with a lathe, I polished and burnished the clock pivots by hand, something the original clockmaker would have done. Smooth broaching (with oil) was conducted on each pivot hole. There were some pivot hole closing punch marks, but we decided not to bush the closed holes. We believed the careful smooth broaching would more than compensate for the hole closing attempts. Plus, those hole closing marks were now part of the story of the clock (Figure 4). The movement had some oil sinks but lacked oil sinks on all pivots. After some consideration it was determined that the “best practice” we could take would be to cut oil sinks into all of the pivot holes. This would also ensure that “tunneling” (where a pivot cuts into the plate below the outside surface of the plate) would not take place on an arbor that was a bit short.

The broken and incomplete pendulum was the next repair we needed to address. An off-the-shelf



Figure 5. Soldering additional brass onto the suspension block. PHOTO BY PAUL KRAUS.



Figure 6. The suspension block with brass shims soldered into place. PHOTO BY PAUL KRAUS.

suspension spring assembly was available. However, with a clock of this age nothing off-the-shelf quite fits. The first modification of the new mass-produced part was to shorten it so the crutch block landed properly. It should be vertically centered between the crutch forks. This required cutting the spring and re-pinning it to the crutch block. Once this was accomplished, there was too much of a gap inside the crutch loop and the suspension block. The most conservative repair for this problem was temporary and reversible “chops” applied to the crutch sides to get the clock through some testing until a better solution could be researched. We did note that applying chops to a crutch was known as an acceptable and historic repair, but we wished to have a less obtrusive repair.

The thickness of the block was determined along with the measurement of the width of the crutch. The ultimate goal was to have a gap on either side of the block of about the thickness of a thin piece of paper. This is where the impulse is given to the pendulum from the escapement. Too much gap and there’s less impulse and the pendulum (and clock) may stop. Too little gap, and there will be binding or interference and the clock will also stop. The difference between the thickness of the block and the width of the crutch was divided by 2, and we determined the amount of brass sheet that needed to be added to each side of the block. All mating surfaces were thoroughly cleaned and tinned with solder. Then each side of the block and brass sheet was heated and soldered together. The process was then repeated on the opposite side (Figures

5–6). The block was then filed with well-used files (solder removal from files is a difficult and possibly incomplete process) to remove excess solder and square up the brass sheeting that was added. The block was filed in the direction of movement from the crutch so the least friction was obtained.

Conclusion

After many repairs and many weeks of work, this piece of history is now running in my living room (Figure 7) and its story continues. To many, this simple basket-case clock is not a highly collectible object. However, to me, it is a priceless timekeeper in the number of learning opportunities it has given and still gives me. It challenges me to learn still more and grow in the craft of clockmaking.

Acknowledgment

I wish to thank Ken De Lucca, NAWCC education director, for sharing his knowledge, time, and patience for this project. But more importantly, for instilling in me the concept of conserving this historic clock for the future.

About the Author

Paul Kraus has a background in electronics engineering and is a new member of the NAWCC. He has attended several School of Horology workshops since its reopening. He is interested in the preservation of historical techniques of repair.



Figure 7. An image of the clock, a piece of history now part of my home. PHOTO BY PAUL KRAUS.

Library & Museum Connections

Gallery Update

BY RORY MCEVOY (PA)

Recent posts on the Museum's Instagram account (@nawccmuseum) and on the Forums (mb.nawcc.org) have offered glimpses of the ongoing conservative restoration of one of our most interesting tower clocks. The clock is signed for the Turret and Marine Clock Co. and is numbered 51 (Figure 1). It has several special features, including the wonderfully hypnotic walking pawl escapement. The action of the escapement is similar to that of the Bulova Accutron tuning fork mechanism and is described in detail in Frederick Shelley's 1991 *Bulletin* article.¹

In addition to the intriguing escapement, there is a remontoir mechanism that resembles an oversize watch balance that rewinds the tiny mainspring that is hidden in the hub of the escape wheel. The clock will draw significant interest, as the pendulum is not suspended from the clock frame, as is normal with most tower clock movements. Instead, it will be suspended several feet away from a pillar and appear to swing independently on the wall. Impulse is transferred from the escapement to the pendulum through two wires that connect to a see-saw mechanism that is situated close to the ceiling.

The clock frame has a good coating of its original paint and so we opted to give it the lightest possible treatment. The movement was fully dismantled

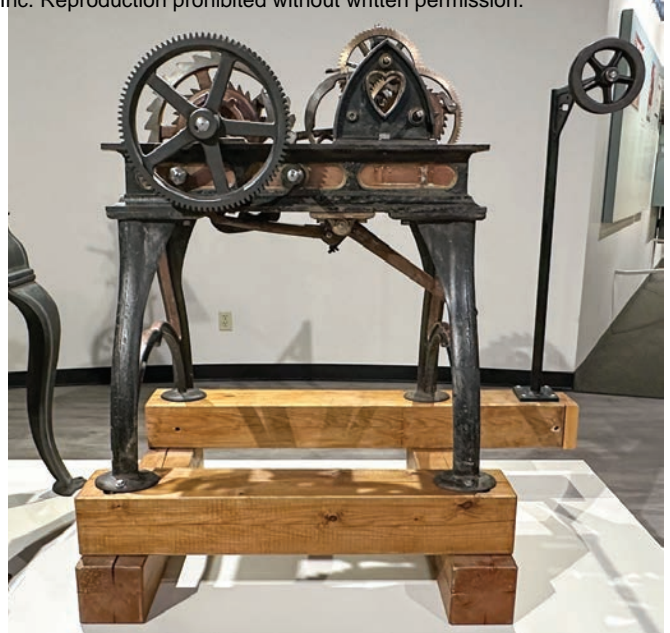


Figure 1. This tower clock from the Turret and Marine Clock Co. was recently added to the Museum's public time gallery.

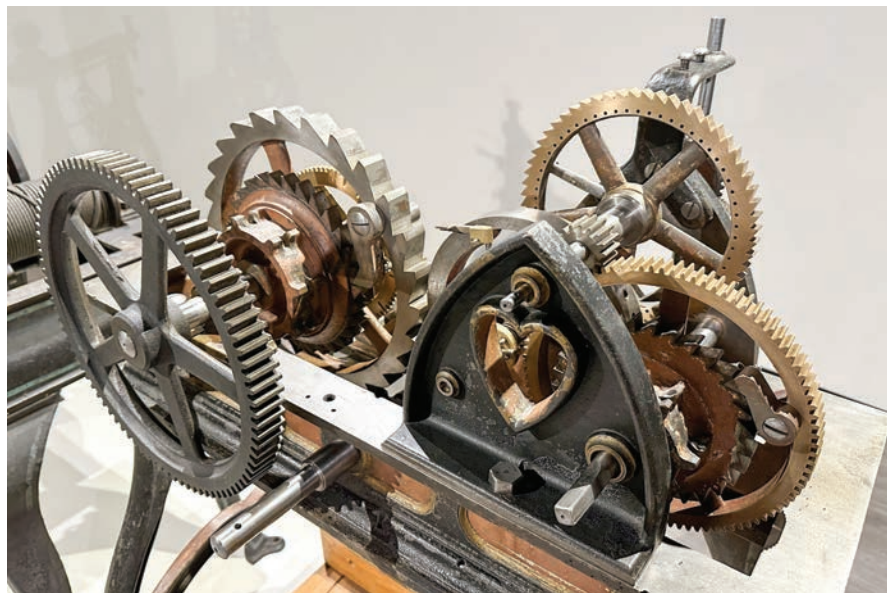
and degreased using a nonaggressive detergent (Vulpex) dissolved in distilled water. Surface rust was removed manually using fine steel wool, and once fully cleaned the parts were coated with a microcrystalline wax.

The clock movement is now mounted in the public time gallery (Figure 2), and the next step will be to hang the pendulum and set it running.

Note

1. Frederick Shelley, "Aaron Dodd Crane Revisited: 1991 Update," *NAWCC Bulletin* 33, no. 273 (August 1991): 401–10.

Figure 2. The movement has been degreased, freed from rust, cleaned, and waxed.



The White Matlack Tall Case Clock

BY RALPH POKLUDA, NAWCC SILVER STAR FELLOW (TX)

The first clock conserved by the Museum's "Adopt a Clock/Watch" program (see the September/October 2022 *Bulletin*) has been returned to the collection (Figure 1). Feet of an appropriate profile have been added to this 18th-century clock retailed by White Matlack of New York (Figure 2). Other minor repairs have been made to this 240-year-old tall case clock, returning it to its original stately appearance. During conservation, attention was given to the wood incorporated in the construction of the case. Red oak and white pine (both native to America) were used as secondary woods. I still believe the case was made in New York, even though those woods were imported to England for the furniture trade. The case is very heavy, which is rare in an English clock.

There are so many reasons to come to Pennsylvania this July for the National Convention, including the opportunity to see this beauty in person. Plus, you can weigh in on the Matlack clock controversy: English or American?



Figure 1. Tall case clock sold by White Matlack of New York.



Figure 2. As part of the clock's conservation, feet appropriate to its time period and style were added.

Horologica

A General History of Horology

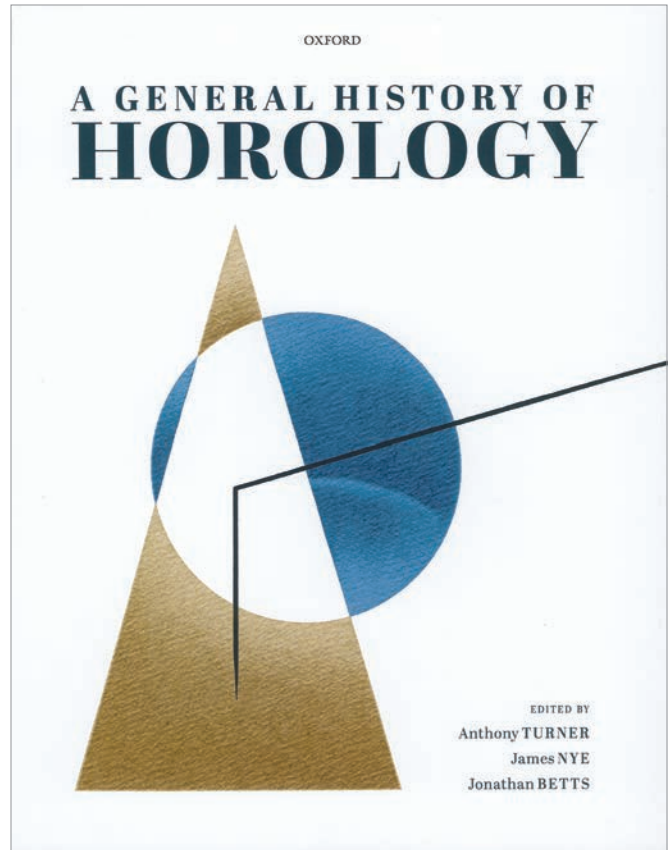
A General History of Horology sets out to explain the evolution of timekeeping from antiquity to the current day and to examine the importance of each development in geographical, technical, and societal terms. It is a monumental effort to provide an overview of such a colossal subject, and much of it is well done and engaging. A sizable chunk of the content, however, would have been better placed in a different book without “general” in the title. More than a few contributors dive deep into technical minutiae or niche topics that are beyond the ken of a lay reader and in no way *General*. A multi-author, multi-editor work can provide a wealth of expertise in many subsections of a field; in this case it also produces a kind of literary cacophony, like an orchestra without a conductor and the oboes all improvising in different keys.

It’s not encouraging for a reader when a book’s first paragraph trips you up: “To write the history of horology before Antiquity is next to impossible,” declares Jérôme Bonnin. He then spends the next 200-odd words regurgitating variations on this simple thesis before starting the next paragraph with another clear, and by now painfully familiar assertion: “The origin of time measurement is an insoluble question.”

Reading *A General History of Horology* left me with two other insoluble questions: Who is this book for? Why is there such a gulf between the thought and dedication that it clearly took to assemble the book, and the less-than-stellar quality of the final product?

Unfortunately, that first encounter with *A General History of Horology*, edited by Anthony Turner, James Nye, and Jonathan Betts, is of a piece with what follows: *A General History* is a book undermined by own-goals and unforced errors that distract from—or completely overwhelm—what otherwise could and should be engaging and enlightening content complemented with fine photographs.

Too often, photographs are grainy, a jarring sight in a book of this heft and cost, and bearing the imprimatur of Oxford University Press. Including subpar images is a basic oversight that should never have made it past the proofing stage. Besides lending the tome an incongruous amateurishness,



these blurry images also deprive the reader of the enjoyment and edification the depicted subjects were included to provide.

Ironically, for a primer on horology, the chapters don’t proceed in a logically linear way. For example, we jump from Chapter 14: “Precision Attained: The Nineteenth and Twentieth Centuries” to Chapter 16: “Eighteenth-Century Clock Exports from Britain to the East Indies.” The latter, by Roger Smith, reads more like a 20-page aside than an article meant to increase the generalist’s knowledge of horology. Smith’s entry leaves one with more questions than answers, and one big question in particular: Why is this topic important? It would make sense as an article in a horological journal, as a niche scholarly work. Smith focuses largely on the what, how, and why of the motives and mechanisms of British-Chinese trade. Totally missing is any attempt to connect this side street of clock history to the main road of humans and timekeeping down the years.

Having said that, my knowledge of this corner of the horology world is greater than when I started. But how and where this corner fits into that wider world remains a mystery. This subject may be catnip for members of horological academia, but presumably they're beyond an entry-level reference book, and the intended audience of lay readers is left feeling adrift. Smith answers many questions in his piece, but is silent on the largest ones: Why is it in this book and who does he suppose is its audience?

More disappointing was "Electricity, Horology, and Networked Time," by James Nye and David Rooney. The shame of this chapter is the shame of the whole book: it could be excellent if it got out of its own way. It starts brilliantly, reading like a lucid, persuasive, and interesting encyclopedia entry. It introduces nuance to long-held beliefs, pushing back on the idea that railroads alone drove the standardization of time and suggesting that the real story is bigger and more complicated.

Nye and Rooney soon commit the first of what will become a repeat offense: wandering from the subject (regulators, atomic clocks, electric movements) into an abstruse technical tangent on how these devices work. Consider this paragraph on atomic clocks on page 508:

When the caesium atoms emerge from the oven, they enter a tubular vacuum chamber and pass through a magnetic field, then through a cavity, and then through another magnetic field. The first magnetic field has the effect of deflecting the atoms in two opposite directions, dependent on the direction of rotation of their electrons when they enter the field. One of the two sets of atoms will continue through a further fine slit in the cavity in the centre of the vacuum chamber, and from there pass through the second (identical) magnetic field, where once again, those electrons that have changed polarity will be deflected away. Atoms that successfully pass through the centre line then reach a detector, formed of a hot platinum or tungsten wire, which gives up an electric charge before emitting the atoms again, which are now drawn to an electrode, allowing for the measurement of a resulting electric current.

It's only in passing after 20 more pages that the authors mention how these ultra-precise clocks form the backbone of modern communications networks, GPS satellite navigation, and, basically, the bulk of our modern, digital existence.

While these flaws and missed opportunities are unfortunately prominent, they aren't representative of the whole book; some chapters of *A General History* are simply excellent.

Marisa Addomine's "Public Clocks in the Nineteenth and Twentieth Centuries" lays out a fascinating history in clear and crisp prose peppered with colorful anecdotes and factoids that give the text a conversational—but no less authoritative—tone.

David Boettcher's "Wristwatches from Their Origins to the Twenty-First Century" delivers a similarly satisfying experience, capped off with his playfully cheeky observation that "the future for an obsolete piece of technology has never looked brighter!"

"Women in Horology" by Joëlle Mauerhan also deserves special mention. Her writing flows, filled with revealing examples as she unspools a story that has gone largely untold in earlier horological histories.

If all of *A General History of Horology* were written to the same standard as these scholars' chapters, the only fair criticism of the book would be its blurry photos. Unfortunately, *A General History* seldom meets that standard, and sometimes falls short of it. This is all the more perplexing because the book's editors are as expert as expert gets. Oxford University Press markets the book as being "accessible to students, historians, collectors, and the general reader," but it strains credulity to think the average general reader would choose "accessible" if asked to sum up the book in a word.

A General History of Horology could have been great, because indeed some of it is. Some of it is decidedly not great, and that portion is the proverbial bad apple spoiling the bunch. It's unfortunate that a book with so much promise falls short of what it could have been.

A General History of Horology, edited by Anthony Turner, James Nye, and Jonathan Betts, 2022, 776²/₅ pages, 220 color images, 12¹/₈" x 9³/₈", hardcover. ISBN 978-0198863915. Available from Oxford University Press (global.oup.com/academic), \$195.00.

—Michael Schwartz (PA)

Clocks at the Frick

The Gregory Gift exhibition at Frick Madison runs from February 16 through July 9, 2023, and includes items from the collection of Alexis Gregory. The exhibit includes 15 Limoges enamels, two 18th-century clocks, two ewers, a gilt-bronze sculpture of Louis XIV, a serpentine tankard, two pastels by Rosalba Carriera, and several other special items.

Two clocks, one made by the British jeweler and goldsmith James Cox (ca. 1723–1800) and the second by Johann Heinrich Köhler (1669–1736), jeweler at the court of Dresden, diversify the Frick's

holdings of important clocks and watches and are key examples of their respective types (Figures 1 and 2). Both jewelers worked for powerful patrons: Köhler for Augustus II ("the Strong"), Elector of Saxony and King of Poland, and Cox for the Chinese Qianlong Emperor. Cox crafted automatons with musical movements, also called "sing-songs," which were exported to China, India, Persia, and Russia.

Details about the exhibition and The Frick Collection are available at www.frick.org/exhibitions/gregory.

—Provided by Frick Madison



Figure 1. James Cox (ca. 1723–1800) *Musical Automaton Rhinoceros Clock*, ca. 1765–72, gilt bronze, silver, enamel, paste jewels, white marble, and amber, 15 $\frac{1}{16}$ x 8 $\frac{3}{8}$ x 3 $\frac{1}{2}$ in. (39.5 x 21.3 x 8.9 cm), The Frick Collection, gift of Alexis Gregory, 2021. PHOTO BY JOSEPH COSCIA JR.



Figure 2. Attributed to Johann Heinrich Köhler (1669–1736), *Parade Clock with Cameos*, 1700–10, gilt bronze, cameos, emeralds, diamonds, rubies, heliotrope, and marble, 9 $\frac{1}{2}$ x 6 $\frac{3}{16}$ x 3 $\frac{3}{4}$ in. (24.1 x 15.7 x 9.5 cm), The Frick Collection, gift of Alexis Gregory, 2021. PHOTO BY JOSEPH COSCIA JR.

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Entry forms are due by June 1.



John Stouffer, People's Choice, 1st in Experimental Timepiece Design, 2014



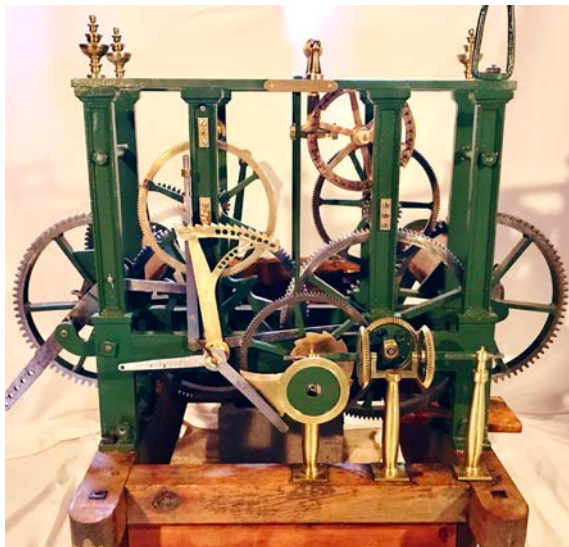
Atlanta Chapter 24, 1st in Chapter Clock Restoration, 2015



Tsutomu "Mark" Endo, 1st in Watch Movements, 2017



Trevor Herbstreit, 1st in Experimental Timepiece Design, 2018



Russ Oechsle, People's Choice, 1st in Clock Restoration, 2021



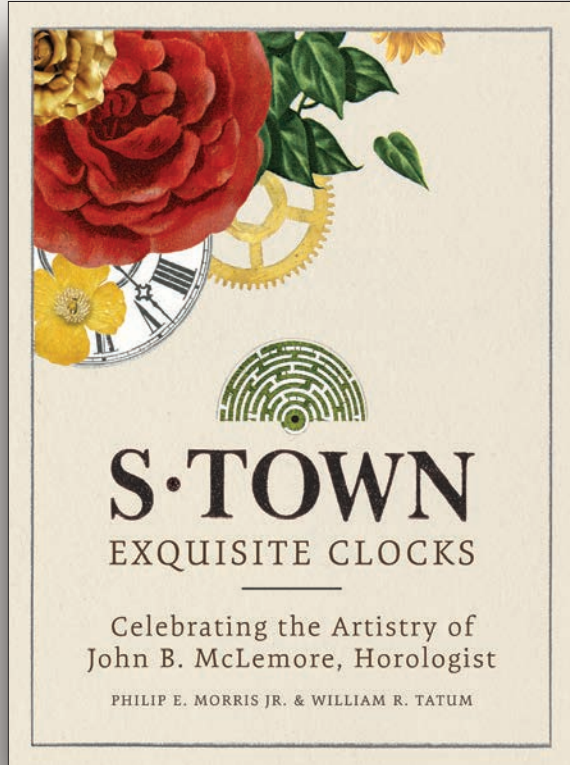
John Evans, 1st in Clock Restoration, 2018

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Industrial Diver's Helmet Mantel Timepiece

Unmarked
FRANCE | CA. 1885

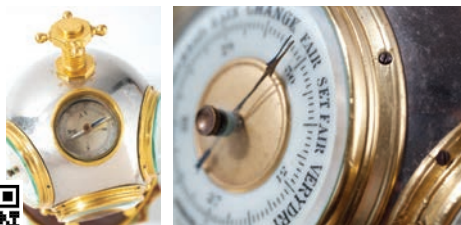
The diver's helmet is one of the smallest of the industrial series of clocks and timepieces that relate to a nautical theme. This model was patterned after deep sea diving helmets that were used in Europe and the United States and became popular in the 1870s. Although this particular example is unmarked, similar timepieces are known that are marked "Gulmet" indicating they were manufactured by clockmaker André Romain Gulmet.

38
minutes

CASE: The gilt, nickel, and onyx case bears the mark of "2459" and is in the form of a diver's helmet set with a barometer, thermometer, and engraved dial compass resting on a veined green onyx base. The helmet can be revolved on the base to align the compass or change the angle of the helmet to feature the separate instruments.

DIAL: 2-inch round porcelain dial with Arabic numerals.
MOVEMENT: Eight-day time-only movement bears the mark of "2459" with original cylinder escapement bearing the stamp "59"

HEIGHT
10 inches
WIDTH
6 inches
DEPTH
6 inches



**S-Town
Clock Exhibit**
NAWCC Museum
July - Dec
2023



In Memory Of

We recognize here those individuals and Chapters whose gifts to the NAWCC were given in memory of fellow members.

Howell Harris given by Roy E. Storck

Paul Hickin given by Roy E. Storck

John R. Howatt given by New England Chapter 8

Jim Price given by David Hardy

Jim Price given by Matthew Rothert

Jim Price given by Thor Eakes

Jim Price given by Bertram Townsend

Snowden Taylor given by Mary Jane Dapkus

Obituaries

Dr. T. F. Blackwelder

13506 Scottsdale, AZ

Irene Du Pont

75671 Montchanin, DE

Edward Eastman

89321 Union Beach, NJ

Alfonso Fariello

126216 Wall, NJ

Robert Fedele

48169 Bergen, NY

Alan Goodridge

157284 Spring Hill, FL

Dr. John L. Hall

27559 Davenport, IA

L. Paul Hickin

32189 Huntingtown, MD

John Howatt

64421 Bedford, MA

David Hughes

186219 Bideford, UK

Jerry Kenney

142172 Haines City, FL

Richard E. Kramer

85236 Orlando, FL

Edward Paragi

98398 New Haven, IN

Martin Perry

132583 Brewster, MA

Al Riss

36435 Blairstown, NJ

Larry Rush

131294 Guthrie, TX

Phyllis Sanders

170736 Walker, LA

Rubens Sigelmann

52586 Shoreline, WA

Robert P. Strasser

121492 Canfield, OH

Joe Wilkins

64523 Lawrenceburg, KY

In Memoriam articles for the *Watch & Clock Bulletin* are written to mark the passing of an NAWCC member. Submission guidelines are as follows:

- A maximum of 550 words submitted in a Word document (no PDFs). Including birth-death dates is recommended. Text will be edited for grammar, spelling, style, and word count.
- Images are optional, and there is typically a limit of one image. High-resolution images are preferred (a minimum of 300 dpi or 1,000 kb) and must be submitted as a separate JPG or TIF file. Do not embed the photo in the Word doc. Images of very low resolution/quality may be rejected.
- The author's name and state must be included.
- An In Memoriam will be printed in the next *Watch & Clock Bulletin*. Deadlines are the first of the month, 60 days prior to publication (e.g., the deadline for the March issue is January 1).
- Send Word docs and JPGs or TIFs to editor@nawcc.org.

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NAWCC Dates to Remember

All Regional meetings must be scheduled through Convention Committee Coordinator John Koepke by emailing him at jskoepke@comcast.net, calling 510.236.2197, or mailing 2923 16th Street, San Pablo, CA 94806-2362.

For complete information about Regionals, the National Convention, and the NAWCC Ward Francillion Time Symposium, please see the *Mart & Highlights* or go to nawcc.org.



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