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COVER

This month's cover features Marcel Bérisey's Radiometric Clock.



President's Message

Jack Kurdzionak, CW

Our nominating committee for the Board of Directors has selected an excellent slate of candidates, three of whom will be selected by you to serve as directors for the next three years. You met each of these candidates in the pages of last month's *Horological Times*. Please take some time to review each candidate and his qualifications and then VOTE. This is your opportunity to place your choice of director on the board. If you do not VOTE, you let the other VOTING members make the choice for you. This is the time you can make a difference in the governing of AWCI.

Last month my son, David, and I attended the World Watch and Jewelry Fair in Basel, Switzerland. Attendance was down from previous years due to a confluence of several world situations far beyond the control of the fair's management. The war in the Middle East kept buyers and sellers away, as did the SARS epidemic in the Far East. Just before the fair opened the Swiss federal government banned vendors from many Asian countries from selling at the fair, although buyers from those countries were permitted to attend if they met some stringent conditions of medical testing. Consequently, many Asians just went home leaving many buyers and sellers at the fair deeply disappointed.

There were several notable changes in the mix of Swiss products on display this year. The most impressive change was the quantity of luxury watch tools now being sold by Bergeon and several other suppliers. I had never before seen, until this year, a watchmaker's bench, custom designed in laminated maple that was selling for over $10,000 (when fitted with a few accessories). Bergeon also produces screwdrivers and case openers with 18K solid gold handles fitted to a custom-made hardwood box in addition to loupes made of gold or hardwood. Many of these luxury accessories were for display only, as they bore the trademarks of luxury watch companies and were to be used in the boutiques of these companies.

It was a bit of a letdown to get back to my own non-luxury bench equipped with some well-worn, familiar tools that are neither made of gold nor hardwood.



Executive Director's Message

James E. Lubic, CMW

Congratulations to the Education and Certification Committees for the new certification standards that have been developed for the Institute (see page 48). Each member of these two committees was dedicated and worked very hard to obtain one of the objectives that President Kurdzionak had assigned to them at the beginning of his term back in August. That objective states: "Continue your current work on our traditional certification examination requirements and develop new certifications to meet current and future market requirements."

This project actually got started under Past President Robert Porter's direction last year. It was exciting to see these changes develop over time. There were numerous e-mails, telephone calls, conference calls, and one face-to-face meeting.

As you can see, those that volunteer to participate on AWI committees are very dedicated to the Institute and the future of our profession. It is time for AWI to start recruiting members for next year's committees, so if you have the time and a specific talent/skill that could be of use to the Institute, you can help shape AWI's future. Please contact me using our toll free number 866-367-2924, ext. 310, or e-mail me at jlubic@awi-net.org and let me know what committee you would be interested in working with.

The Education Committee members are:

Chairman: Jerry Faier, CMC, Arizona

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Questions & Answers

Question

I would like some information on this watch, the only number on it is on the dial "N40097". It has a helical hairspring, and a small hairspring on what should be the pallet fork, but the pallet fork works differently than the pallet fork on a regular watch. The case is not stamped 14K so I suppose it is G.F.; however, the design on the back has not worn through anywhere. There are several cap jewels, and I have counted somewhere between 17 and 22 jewels; however, I was not taking time to count them correctly. It is a lever set, the small stub on the lever has to be moved with a sharp instrument, as it is not made to pull out as with most lever-set watches. It has stop-works on the mainspring barrel. Seems to be in good condition and runs pretty good.

I would like to know if it is one valued by collectors, and any other information you can give me.

Mark Schuller
Rutherfordton, NC

Answer

Your photos reveal a beautiful, finely crafted and finished pocket chronometer. Made from a common Swiss machine-made ebauche (blank movement), the maker added jeweled bearings in gold settings in the right places and a pivoted detent escapement (a Helical Balance Spring and Temperature Compensated Balance) to create a high precision pocket timekeeper; and then cased it in a probably gold-filled case made by the Crescent Watch Case Company, a U.S. firm. From the style of the movement, the watch was made around 1878. In fact Cooksey Shugart, in his *Complete Price Guide to Watches*, 2002 edition, shows a very similar one made by Girard Perregaux on page 484.

The pivoted detent escapement (the first detached chronometer escapement) originated in France with Pierre LeRoy in 1765 and Ferdinand Berthoud in 1771. John Arnold, of England, invented his version in 1772. All of the great chronometer makers experimented with the pivoted detent escapement. The spring detent escapement followed the pivoted version (through the efforts of John Arnold and Thomas Earnshaw of England) and became the chronometer escapement of choice for the box chronometer (those used aboard ships), but the pivoted detent would more easily fit into the smaller pocket watch and was so used for precision watches from around 1775 until the later 19th century, when the detached lever escapement that we know today was accepted by the majority of watchmakers as the ultimate escapement for pocket and then wrist watches.

(Continued on page 9)













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J.M. Huckabee,
CMC, FAWI, FBHI

Ask Huck

Clockmaker's Tools

Question

What is a good set of clockmaker's tools?

Answer

This is an interesting question. By "good", I imagine tools for the immediate job; or for the most extensive repair that is ever made.

Small and simple hand tools will meet the need for most repairs. You need a cleaning method, and necessary tools for assembly work and adjustment.

A few days ago, I visited a hobby store to pick up some brass raw material. As I looked around the store, I saw essentially every hand tool that is needed to repair one of our old American clocks. The only tool I did not see was a mainspring clamp. A tool also needed is a mainspring winder.

Now, if you think like I did as a young man, you can go crazy over tools. Just "work your heart out" and ultimately "buy everything!" Now I am aged and more wise.

I recommend that you obtain the basic tools to do your simple jobs well. Then add tool items along the way as the need requires. This is wise because it is a nice "pay-as-you-go" situation, and avoids many expenses that are not ultimately profitable. If I had tooled my shop by this method, and kept the money, I could prepay "the finest funeral in Texas."

Major Clockmaking Tools

Question

What are major tools for the clockmaker?

Answer

I think of major tools as those which are most expensive. Examples are: lathe and accessories, bushing tools, mainspring winder, polishing and grinding tools, hand-held motor tools, drill press, cleaning machine, timing machine, gear cutting tools, and many other "high-dollar" items. These are needed for a "high-volume" service center.

Not every shop can justify the cost of the tools I would like to buy.

It is prudent to make your major purchases as the needs present themselves. Most major tools are used infrequently, yet are the most expensive. The market you are located in is the most important indicator to guide your investment.

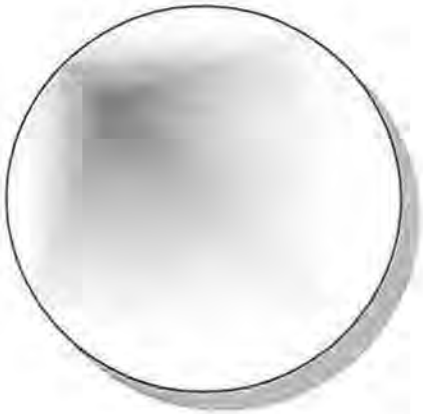
It has been my experience that a major tool investment never pays off quickly. On the other hand, attention to efficient use of time, and work methods that improve productivity will pay off immediately.

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Marshall F. Richmond
1916 - 2003

Marshall F. Richmond, CMW, 87, AWI's illustrious board member and beloved husband of Marcella and father of Terrance and Stephen, died Sunday, March 16, 2003, following a long battle with cancer.

Director Richmond's career as a watchmaker/jeweler began with an interest developed during his time in the U.S. Army Corps of Engineers in France during World War II. Marshall then entered the Cunningham School of Horology in 1948. He studied watchmaking, jewelry repair and engraving. Upon graduation he returned to Indiana where he passed the Indiana State Watchmakers License examination. From 1950 to 1971 he owned and operated his own jewelry shop in Milan, Indiana and then continued working out of his home. He is past president of the Madison, Indiana Watchmakers Guild.

Marshall was one of the 1,835 charter members of American Watchmakers-Clockmakers Institute. He earned his Certified Master Watchmaker designation in 1959. Always a generous contributor to AWI of his many skills, he also donated to the AWI 1977 building fund that led to the current AWI headquarters in Harrison, completed in 1995.

Listed in *The History of the American Watchmakers-Clockmakers Institute 1960-2000* by Marvin E. Whitney and Fred S. Burckhardt, Marshall was elected AWI's 16th president on June 21, 1982 at the Drawbridge Inn, near Cincinnati. He was re-elected to a second term in 1983. During Marshall's reign, AWI switched to a July 1- June 30 fiscal year. He has chaired and served on many AWI committees, most notably the Constitution & Bylaws Committee, Contracts & Legal Committee, and Nominating Committee.

In 1985 Marshall taught a traveling workshop class on Jewelry repair. It was well received in eight cities. He also wrote for the *Horological Times* for many years, beginning in 1979, in a column entitled "Pickle Barrel." In October 1987, Marshall produced a video for sale by AWI on "Basic Jewelry Repair" revealing a wealth of practical tips and information learned by this master jeweler during a lifetime of working and learning the craft.



The tape combined with the *Horological Times* articles is believed to be a solid base for self study in the art of jewelry repair.

While we have our professional memories of Marshall, his sons remember his untiring work with the Boy Scouts of America, Lion's Club, and his humanitarian efforts on behalf of stray cats and dogs. In the early 1980s he and Marcella built their own modified A-frame home in Ripley County, Indiana. He was able to utilize his mechanical and construction skills, learned in the 1930s, when he was a steward for the International Union of Operating Engineers.

Is it any wonder he will be grievously missed?

AWI Material Search/Movement Bank

EDITOR'S NOTE: This column is designed to work in conjunction with the AWI Movement Bank. If you can supply any of the items listed here, please send details to the Material Search Network. **Do not send the items to AWI.** Members requesting these items will be advised of their availability, and will contact you directly.

1I1 Movado Chronograph, 90M, *center wheel*, #206/219

1I2 LeCoultre 814 Alarm, *case back with lugs*, #3016

1I4 Ulysee Nardin 19L, pocket watch, chronograph, *balance staff*

1I5 Patek Philippe 28-255C, *male snap stem*, #360/?

1I7 E. Howard 16s, Series "O", *4th wheel*, #16156 or Swartchild #360

1I8 Rolex 280, *balance (with or without hairspring or roller table)*, #2487 or #2488.

If you can supply any of these items please contact: AWI Material Search Network, American Watchmakers-Clockmakers Institute, 701 Enterprise Drive, Harrison, OH 45030-1696. Toll Free: 1-866-367-2924, ext. 305; Phone: (513) 367-9800, Fax: (513) 367-1414 or E-mail: mhuff@awi-net.org.

The AWI-ELM Trust, in cooperation with the American Watchmakers-Clockmakers Institute, maintains this unique member service to assist professionals in replacing hard-to-find parts for vintage timepieces. When a member cannot locate a replacement part through normal sources, the Movement Bank/Material Search Network (which consists of movements, timepieces and materials donated to the Trust) is often able to help. There is a fee of $10.00 for each search. The fee will be waived if a part or movement of equivalent value is donated to the Movement Bank.

The AWI Material Search Network first contacts several dozen material houses and outlets on behalf of the member to determine if the missing part is available from any commercial source in the United States or Canada. If no other source is available, the Movement Bank is searched for a usable spare part. If found, the fair market value of the part will be assessed and the part made available for sale to the member. If the part cannot be found in the Movement Bank, the search will be listed in the *Horological Times*.

Questions & Answers

(Continued from page 4.)

A line drawing showing your pivoted detent escapement is shown in Marvin Whitney's masterpiece, *The Ship's Chronometer* (AWI Press, Cincinnati, 1985). In his book, Mr. Whitney gives an excellent description of the pivoted detent's action along with a detailed review of its repair and adjustment. The helical balance spring was used to provide stable balance oscillation through an even expansion and contraction of the hairspring; i.e., making it more nearly isochronous than other types of balance springs at the time.

I don't know who the maker of this watch was, although I suspect that the watch number on the dial served also as a property identification number and, since it was cased in the U.S. was probably sold to the U.S. Navy for use on board ship or perhaps even to the U.S. Coast and Geodetic Survey (USCGS) to be used by land surveyors, in either case to find their longitudinal position on the earth.

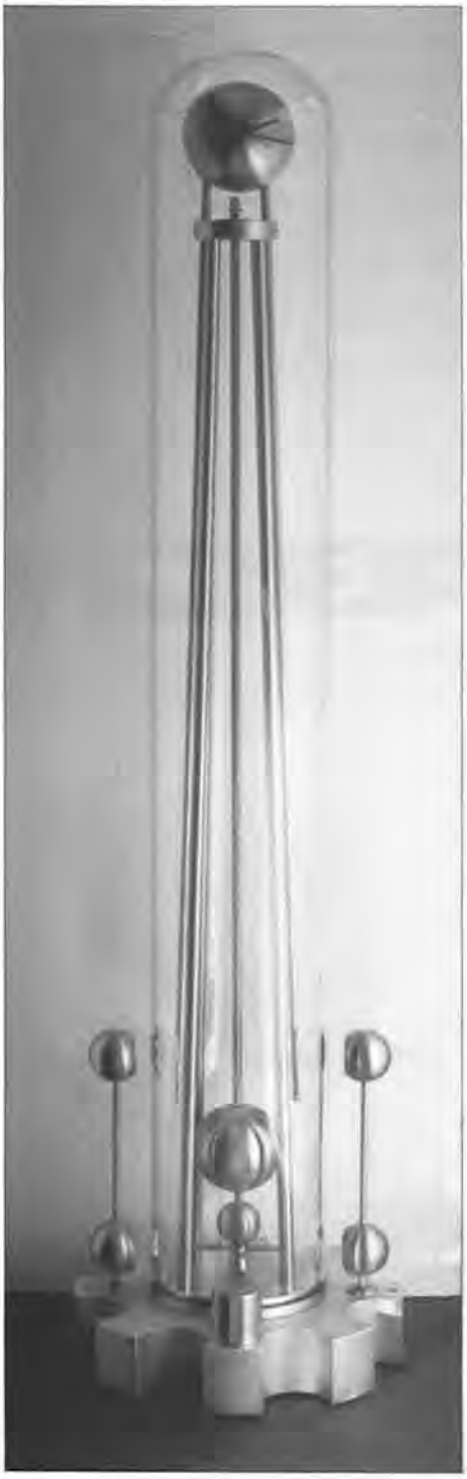
And to answer your question ... this is a very desirable collector's item.

David A. Christianson, CMW, CMEW
Technical Editor



Marcel Bétrisey's Radiometric Clocks

Bob Holmström



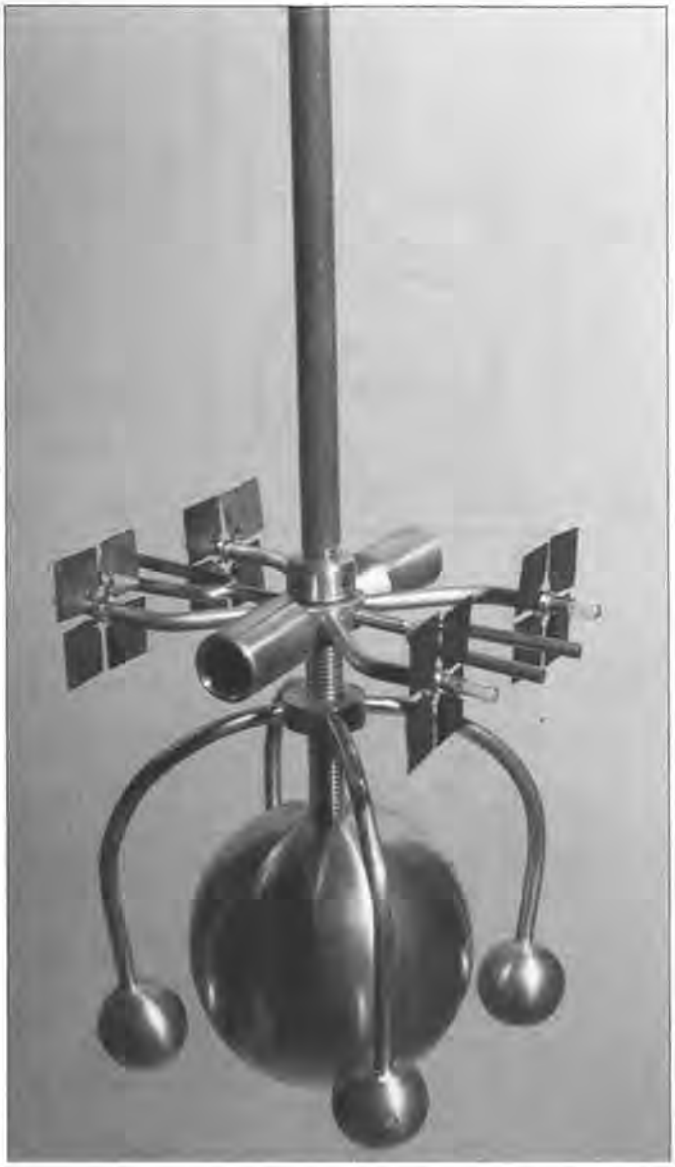
Marcel Bétrisey is a clockmaker in Sion, Switzerland. Marcel says that he may be a strange clockmaker because he prefers to use controlled "hazardous" effects instead of precise effects to drive his clocks. He uses puffs of air, moving balls, etc., to create his works of art that also tell time. His web site at *www.betrisey.ch* shows many examples of his work.

The Chronolithe, with its radiometric pendulum is different from his other clocks in that the driving force is light. This force is provided by two pairs of 5 watt halogen lamps placed on either side of the pendulum that alternatively illuminate "flags" on the pendulum rod to push the pendulum. This "motor" is simple, and it appears that nobody has employed it before for driving a pendulum. Marcel states that the lamps act not only to push the pendulum, but also act as a brake thus controlling the pendulum amplitude to a very precise range. The clock is composed of a glass tube, the pendulum assembly, two photoelectric cells, two relays and the stepper motor from a quartz crystal controlled clock.

The pendulum has an Invar rod and the bob is a stainless steel sphere filled with lead. The total weight of the pendulum is 2.3 Kg. The pendulum is supported by a conventional suspension spring in the interior of a tube that is at a vacuum with a pressure of approximately 0.01 bar. The frequency of oscillation is 0.5 Hz with an amplitude of 5 millimeters. The flags are grey mica sheets. The black side is coated with lamp black







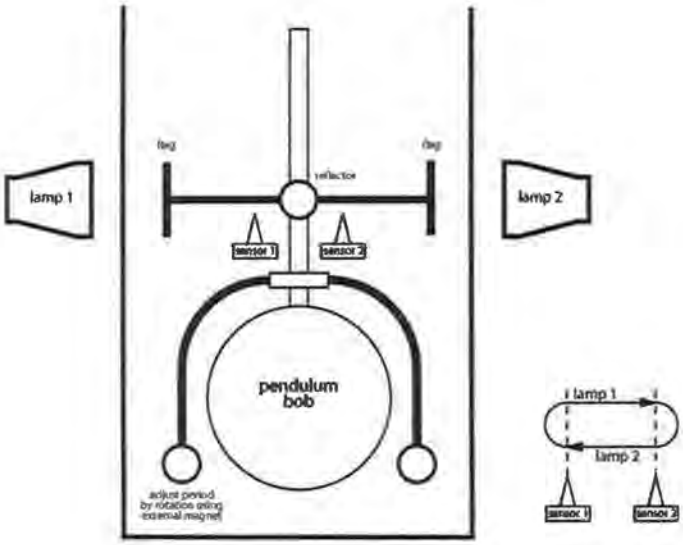
from candle smoke. Marcel used 4 Crookes radiometers with the vanes rotated because they were a convenient source and mounting for the mica material. The forked extension located between the flags is used to guide the pendulum assembly into the tube without damage.

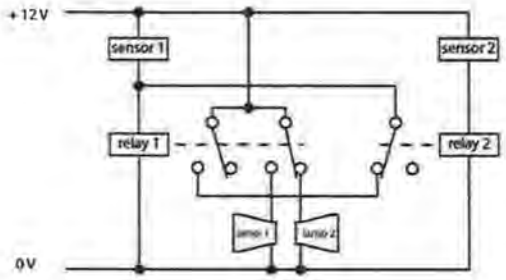
The pendulum is started by use of a magnet that is moved close to glass. The adjustment of the period is done from the outside by turning the 4 planetary spheres as a group around the sphere of the pendulum bob using the same magnet. This avoids having to let in air, dissemble the clock and re-evacuate the air for each adjustment.

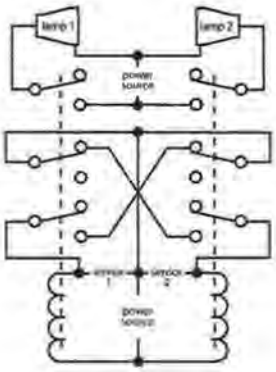
The illustration on page 13 shows the performance measured using a MicroSet for a period of 2 ½ days. Measurements were made every 10 seconds. Marcel thinks that the short term instability shown is due to inaccuracies in the infrared sensor/receiver and cat's-eye reflector used to control the lamps.

The basic principle of Chronolithe's operation was demonstrated by Sir William Crookes 120 years ago. Crookes found that the force was proportional to the intensity of the illumination. The force also increases with gas pressure to a maximum and then falls rapidly. The pressure at which the peak occurs decreases as the flag dimensions increase. The mechanism by which it operates is very complex and is frequently stated incorrectly. The accepted explanation involves the concept of "thermal creep" proposed by James Maxwell and Osborne Reynolds.

Kennard in *Kinetic Theory of Gases* says: ".. A tempting hypothesis at first sight is that the radiometric force is due to the reaction from gaseous molecules rebounding with higher velocities from a hot surface than from a cold one; but this is quickly seen to be untenable when we reflect that such molecules, upon reentering the gas, must drive it back and thereby thin it out until the pressure is reestablished, whereupon the force on the hot surface will become the same as on the cold one and no radiometric action can occur. The cause must, therefore, be sought in some secondary action. The effect has very commonly been regarded as occurring at the edge of the radiometer disk, where condition in the gas must be far from uniform; experiments designed to show that it is simply proportional to the length of the perimeter failed, however, to yield this result. Recent theoretical and







experimental studies have now made it pretty clear that most, if not all, radiometric phenomena are due, in one way or another, as Maxwell suggested in 1879, to the thermal creep of the gas over an unequally heated solid. ... It can be seen easily that this creep must give rise to forces on the surface whenever the resulting flow of gas is hindered .... by viscosity, and consequently the gas accumulates somewhat over the blackened surfaces and exerts a slightly increased pressure on these and so pushes them back, ..."

The action of the Chronolithe pendulum is also effected by the alternative heating and cooling of the flags as evidenced by the following statement from a reference on the Web: "Why a radiometer runs backwards after the light is turned off - Heat escapes quickly from the black sides of the vanes. Thus, the black molecules cool off first. Meanwhile, the white molecules take longer to lose heat and cool down. The result is that gasses from the white vane push off with more force (Newton's third law) and the vanes spin in the opposite direction."

Chronolithe is now on loan to the International Museum of Horology in La Chaux de Fonds, Switzerland. Chronolithe won the first prize in July 2002 International Kinetic Art Competition.

Marcel ends the description of Chronolithe on his web site with the statement: *"I've learned a lot with this clock. The most difficult thing was always to keep the look I wanted. It would have been much easier to build something bigger, with a bigger glass pipe, without the stone base, without all those vacuum tight problems... The next clock will be different: I want to make the most precise clock I can with the same radiometric principle, and this time I won't care about aesthethics. At least it's what I'm thinking now...*

Marcel has now constructed his second radiometric clock. It is called Conti and Marcel says that it should surpass Chronolithe since it has inherited all the knowledge that Chronolithe slowly instilled into him during its construction.

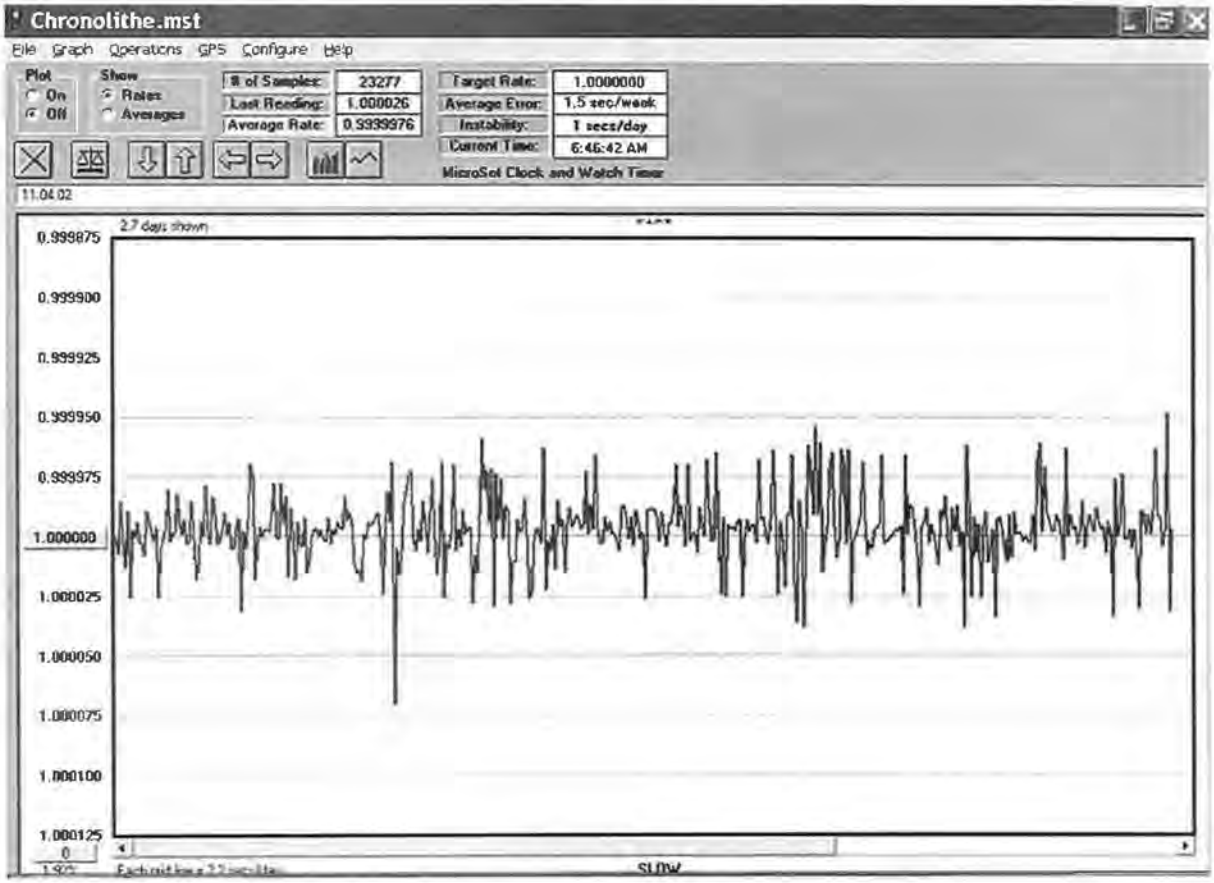
Conti is designed to be superior in sealing and precision. It is superior in sealing because it has only one joint at the bottom of the tall glass dome and no internal clamping rods. It is superior in precision because it is controlled by laser and not by infra-red sensors. It is also much more practical to work on and to adjust.

The driving force of the pendulum is the same as that of Chronolithe. The hands for the hours, minutes and seconds are moved by a stepping motor connected to two small solar panels that are illuminated at the same time the pendulum is impulsed.

The glass dome enclosing Conti is 1300 mm high, 200 mm wide and has a thickness of 20 mm. The pendulum rod is Invar. The pendulum is a sphere of stainless steel filled with molten lead and weighs approximately 4 kg. The base is a massive piece of bronze.

Two laser beams "look" at the pendulum rod. When it passes between them, the lamps in one side are turned on (depending on the sense of the swing). The lower lamp moves the pendulum, the higher lamp powers a solar panel which moves the magnet of the stepper motor for the seconds hand. The main difference from Chronolithe is that the lamps are only on during the period when the pendulum rod blocks the laser beams.

Without the benefit of horological or scientific



training, Marcel Bétrisey has taken the concept of the Crookes Radiometer and transformed it into a precision timekeeping device with great potential. If his work had been done when the pendulum was the standard of timekeeping perhaps the history of precision horology would be very different. Marcel has now turned his attention toward Foucault pendulum clocks – see his web site *www.foucault.ch* for details.

Reference list:
Orginal papers by Maxwell and Reynolds:
"On stresses in rarefied gases arising from inequalities of temperature" James Clerk Maxwell, Royal Society Phil. Trans., (1879).
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History of the Crookes radiometer:
"The Kind of Motion that we Call Heat" S.G. Brush North-Holland, 1976.
"William Crookes and the Radiometer" A.E. Woodruff, Isis, Vol. 57, No. 188, 1966, pages 188 - 198.

Text books with coverage of the theory involved:
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Recent useful references:
"Concerning the Action of the Crookes Radiometer" Gorden F. Hull, American J. Phys., 16, 185-186 (1948).
"The Radiometer and How it Does Not Work" Arther E. Woodruff, The Physics Teacher 6, 358-363 (1968).
"Crookes' Radiometer and Otheoscope" Norman Heckenberg, Bulletin of the Scientific Instrument Society, 50, 40-42 (1996).
"How does a light-mill work?" Philip Gibbs 1997 http://math.ucr.edu/home/baez/physics/General/LightMill/lightmill.html.



The Levers of American Striking Movements

Part 4

David J. LaBounty, CMC, FBHI

Editor's Note: Unless otherwise noted, the letter references used this month in Part 4 correspond to Figures 1-3 in "The Levers of American Striking Movements" Part 1, February 2003, pages 10-14.

Repairing Severe Damage

Replacing Levers: Levers that have been broken and are now too short to be adjusted properly should be replaced. The diameter is 0.60" – 0.65" in most cases. The lever is mounted into the arbor through a hole and then the lever end peened to tighten the lever in place. Use a small, flat punch to push the old lever out of the hole in the arbor. Use the old lever as a pattern in measuring and shaping the new lever. Select a steel that is soft so that it will bend without fracturing, and is the same diameter as the old lever. Cold rolled steel is ideal for this purpose. Be sure the new lever is long enough to allow for shaping. The hardest part of replacing a lever is getting it tightly affixed to the arbor. File a slight taper on the end of the lever so that it can be fit snugly into the hole in the arbor and just protrude out of the other side. Hold the lever tightly in a vise, clamped just under the arbor with a little lever showing above the vise. Peen the end of the lever until the lever is good and tight. An alternate method is to machine a shoulder on the lever instead of filing a taper. This gives the arbor something to rest against while peening. Other methods such as knurling the end or flattening the end could be used as long as the lever is secure in the arbor. Once the lever is tightly inserted into the arbor it can be shaped and fitted to perform like the original.

Soldering Levers: I do not promote soldering levers; however, it is something that can be properly done without damaging the lever or ruining its looks. Don't use solder to tighten a lever, however. Tightening levers should be done by the methods described in Replacing Levers above. Soldering should only be done at a break and only if the break isn't in a working area. Use a hard silver bearing solder (5% Ag) that will hold up under stress. Remove any excess solder by round filing the area until the break becomes invisible. Be sure to clean the flux off of the lever. Solder, even silver solder, won't last in an area that is susceptible to wear so if a break is near a working surface the lever must be replaced.

Missing Levers: When faced with replacing a missing lever it is necessary to understand what the lever was supposed to do. Once this is fully understood the shape of the lever should be apparent. Most levers will have very few bends, be a consistent diameter, and shaped to provide the best leverage for the ease of the movement. Use the existing levers as a guide for size and historical information as a guide for shape. Expect to have to fit and file to get the best possible replacement.

Movement Assembly

Part of having the levers work properly is getting the strike train assembled in the movement in proper relationship to the levers. Setting a wheel one tooth off will cause an unnecessary adjustment of a lever. The following steps will aid in the proper alignment of the gears to the levers.

1. Install the time and strike train.
2. Weave levers into proper positions.
3. Arrange the 3rd wheel/maintenance cam (I) so that the maintenance lever (B) rests in the middle of the notch with the count lever (C) resting on the side of the count wheel (K) simulating a stopped position.
4. Arrange the stop/warning wheel (H) so that the stop pin hits the proper side of the stop lever (A).
5. Make sure the previous relationships haven't changed.
6. Assemble the plates together.
7. Attach the lever return springs to their posts and check for proper tension and clearance. The springs should have just enough tension

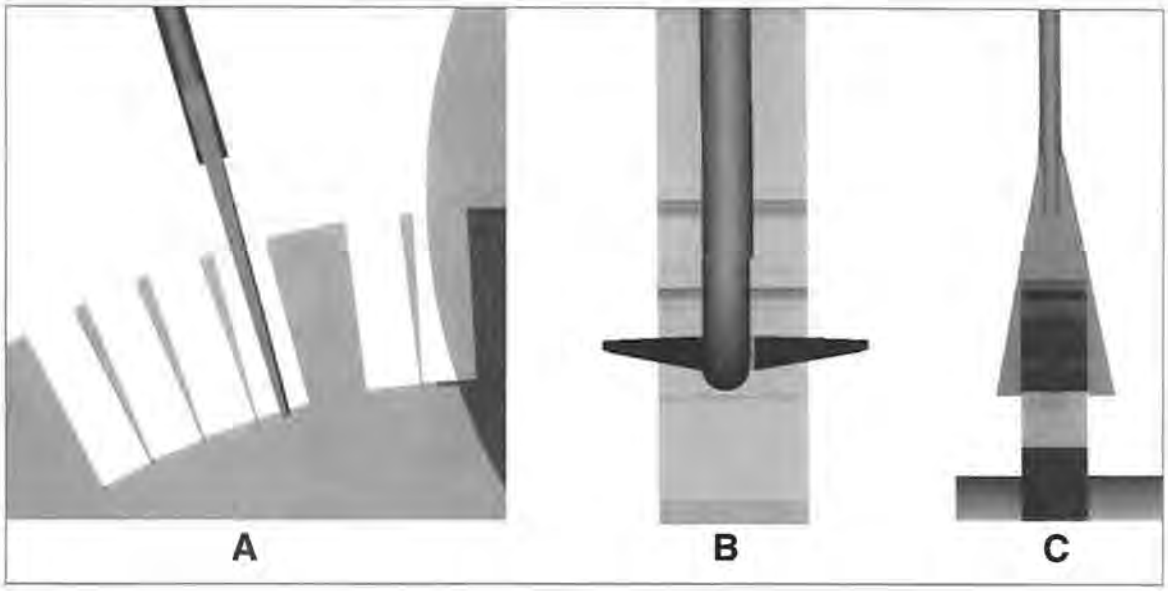


*Figure 13: Correct attitude of count lever: **A** - radial and in the middle of a stop notch; **B & C** - square in all directions.*

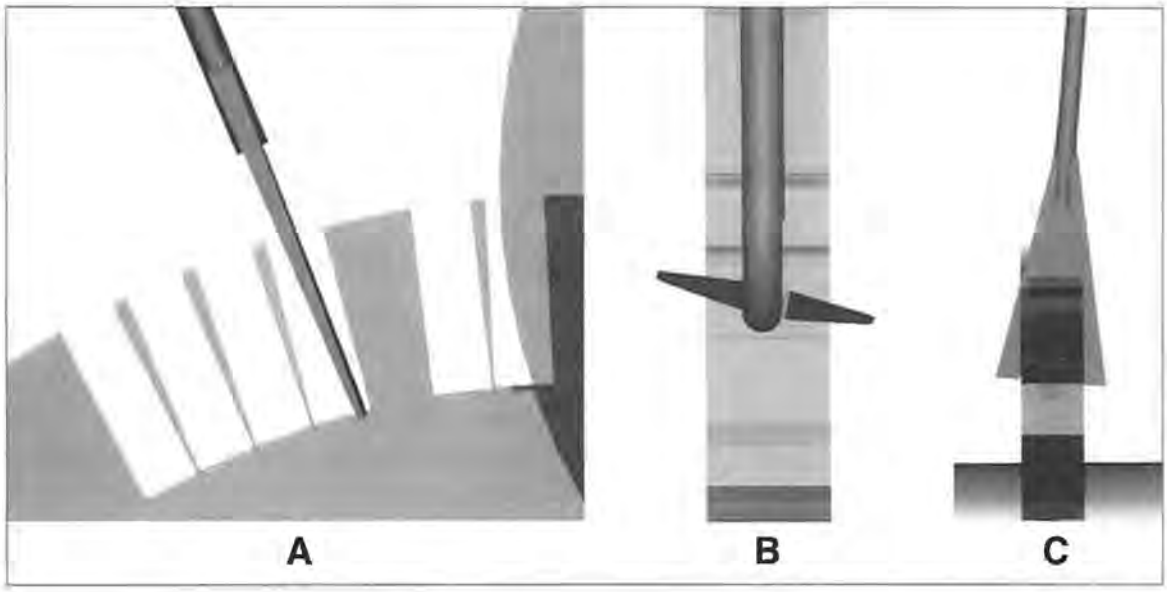


*Figure 14: Incorrect attitude of count lever: **A** - Not radial nor in the middle of a stop notch; **B & C** - not square in all directions.*

to keep the levers in position when the movement is turned upside down. Too much tension and the movement will stall. Be sure the "tail" of the spring doesn't interfere with the operation of either train.

Once the movement is back together check the following relationships:

Stop Lever** (A) **to Stop Pin

Make sure the strike train is not in, or about to go into, warning by rotating the strike release pin (L) away from the "J" lever (F). Check the location of the stop pin. It should be fairly close to the stop lever (A). Rotate the stop wheel (H) until the stop pin comes to rest against the stop lever (A). You may have to pull the count lever (C) to the side of the count wheel (K), in order to simulate a stop notch and get the stop lever (A) to engage the stop pin.

***Maintenance Lever** (B) **to Maintenance Cam** (I)*

Without disturbing the strike train from its previous position, examine the maintenance lever (B) and observe whether it is in the middle of the notch on the maintenance cam (I). This is where proper assembly pays off! If the lever isn't close to the middle then the stop/warning wheel (H) will need to be reset. Loosen the plates a bit at the top and spread them with finger pressure until the pivot of the stop/warning wheel (H) comes free. This will enable you to disengage the pinion of the stop/warning wheel (H) from the 3rd wheel/maintenance cam (I) and rotate it independently. Either rotate the stop/warning wheel (H) the appropriate direction for the maintenance lever (B) to be more in the middle of the maintenance cam (I) or move the maintenance cam (I) while maintaining the position of the stop pin to the stop lever (A). Re-assemble the plates. With a little practice this will become easier.

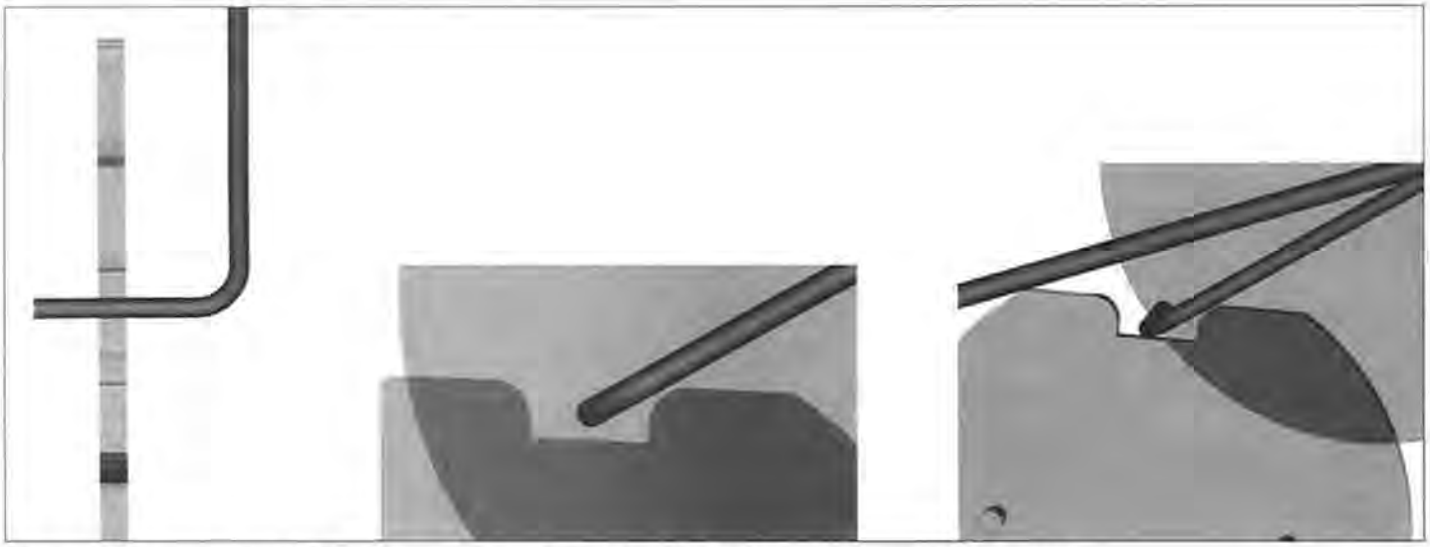


Figure 15: Correct attitude of maintenance lever. Square in all directions and centered in the notch.

Adjustments And Clearances

After assembling the movement, oil the pivot holes and add power to the strike train.

Movement at Stop

Rotate the center shaft to be sure the strike train is **not** in warning.

Control the motion of the strike train by keeping a finger on the butterfly. Slowly let the strike train advance until the count lever (C) falls into a stop notch and the stop pin rests on the stop lever (A).

Count Lever (C): The count lever (C) is the most likely lever to be out of adjustment since it protrudes outside the protection of the plates and is easily bent when handling the movement. In some extreme cases the count lever (C) may need to be adjusted up or down to allow the stop pin to rest on the stop lever (A). Adjusting the count lever (C) up or down will change the positions of both the maintenance lever (B) and the stop lever (A). It is important to become familiar with their ideal positions to know whether a single adjustment of the count lever (C) will solve what appears to be two other levers out of adjustment.

Reshape the end of the count lever (C) until the action brings it in the middle of the stop notch in the count wheel (K). You may have to lengthen or shorten the arm of the lever by using a pair of round-nosed pliers at the bend. To make the arm longer, use the fat part of the pliers and squeeze. To make it shorter use the narrow part of the pliers and twist. This will enable you to hit a different notch at a more optimal angle. The count lever (C) must also be true side to side. It should hit the stop notch in the middle of the paddle, be square in all directions, and be on a radius of the count wheel (K). (See Figures 13 and 14.)

Maintenance Lever (B): Again, with the strike train in the stop position, examine the location of the maintenance lever (B). It should be in the middle of the notch in

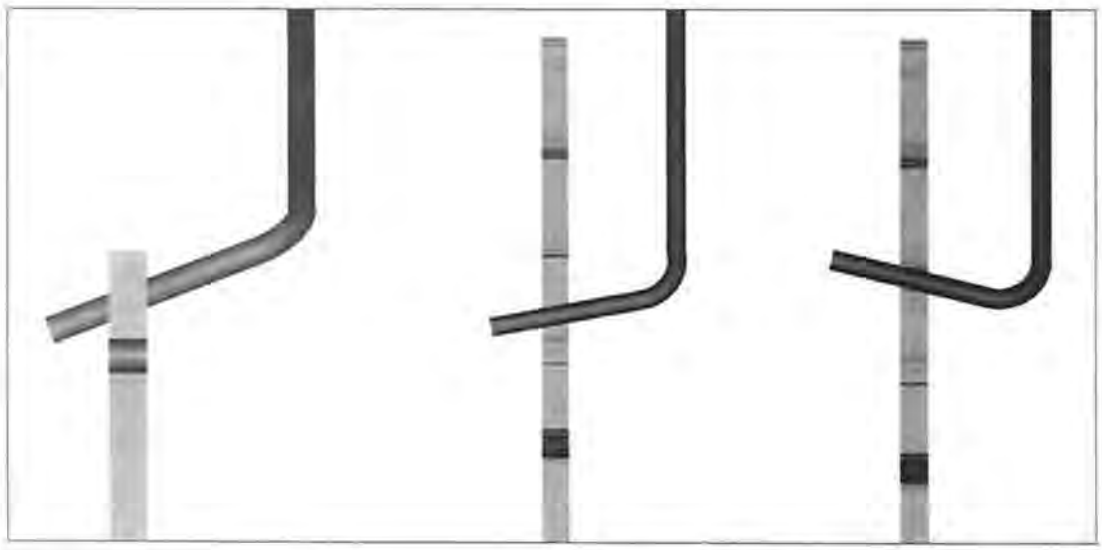


Figure 16: Incorrect attitude of maintenance lever. Not square in all directions and not centered in the notch.

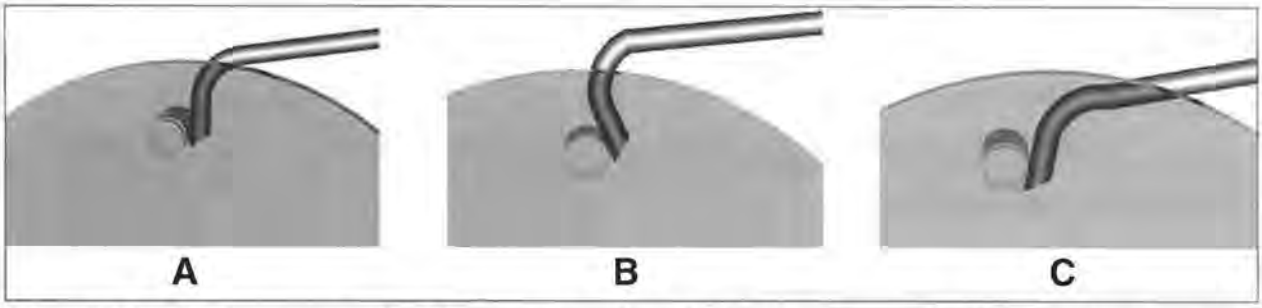


*Figure 17: **A** - Showing correct, radial alignment of stop lever. **B** - Stop lever incorrectly adjusted. This will cause the lever to be pushed out of the way resulting in a strike-on situation. **C** - Stop lever incorrectly adjusted. This will cause the stop lever to bind resulting in a stall of the movement.*

the maintenance cam (I). A little tweaking to get it in the middle is acceptable so long as it isn't over done and the lever doesn't ride the cam twisted at an angle. The maintenance lever (B), when at stop, should not touch the bottom of the notch. If it does, adjust it slightly so that it is well away but be aware that this condition may be caused by a count lever (C) being adjusted too high. (See Figures 15 & 16.)

Stop Lever (A): The stop pin should lock on the stop lever (A) but don't adjust the amount the pin dwells on the lever at this point. The lever should not be twisted or so close to the stop/warning wheel (H) that it could rub. It should contact the stop pin on the half of the pin closest to the wheel to avoid bending or breaking the pin over time. The working face of the lever should be radial from the stop/warning wheel (H) pivot. If outside the radius, the stop/warning wheel (H) will have to recoil or back up for the lever to be released. This requires more force and will drag or stall the time train. If inside radial, the stop pin will exert a lifting force on the lever and could force the lever out of the way resulting in a run-on. (See Figure 17.)



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Lift Lever (D): The lift lever (D) should be below the count lever (C) and not touching. Bend it away if it is touching. Fine tuning the lift lever (D) will come later. (See Figure 18.)

Next month "Levers" continues with "Adjustments and Clearances: Movement in Warning".

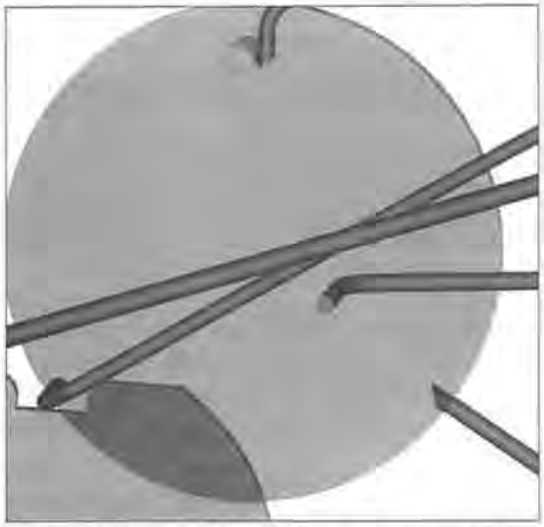


Figure 18: View of the lift lever at stop just below and not touching the count lever.

Resources and Additional Reading

1. Special *"Thank You!"* to Jerry Faier, CMC for his training, expertise, and input.
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6. Goodrich, Ward L. *The Modern Clock*. pp. 297 – 318. 9th ed., North American Watch Tool & Supply Company, 1970.
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BULLETIN BOARD

NEW REQUESTS

Bulova Watchmaster Model WT Mark II Ultrasonic Watch Cleaner
Michael Kosinenko, Mohrsville, PA, is searching for a schematic diagram for a Bulova Watchmaster Model WT Mark II Ultrasonic Watch Cleaner. This cleaner has a variable speed spin dry unit and a different heating circuit.

RESPONSES

Watch Craft Crystal Catalogs
Thomas Zito, Kalamazoo, MI, has provided copies of his Watch-Craft Crystal Catalogs for Bob Ridley, Arlington, TX.

ITEMS STILL NEEDED

Pegna Glue



George Costantino, Schenectady, NY, is trying to locate a heat reactive crystal glue he has used for years and found to be superior to all others for certain applications. It is called Pegna Glue and used to be sold through Bergeon along with a kit that included a small heater for curing it. It was widely used by high-grade manufacturers.

L&R Model 728B Clock Movement Cleaner
Greg Bourne, Omaha, NE, is looking for a repair manual for a L&R Model 728B solid state clock movement cleaner (11-quart).

New Hermes Engravograph CA300 Calligragraph Attachment
Joseph Verruni, Plymouth Meeting, PA, is seeking information and operating instructions for a Calligragraph attachment for his New Hermes Engravograph. The Engravograph was made by Richardson's, Berkley Heights, NJ.

Do you have information regarding this month's requests? Do you need information about one of this month's responses? If so, send your information or requests to:

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Technically Watches

Pocket Watches and Their Maintenance
Part 60
Repeater Watches

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Repeater watches are classified as complicated watches because of their complicated mechanisms. The repeater watch not only shows the time like a regular watch, but it chimes the time as well. The repeater mechanism is started in motion when a slide on the edge of the case is pushed to slide it to the end of its slot in the case. Small hammers in the repeater mechanism strike wire gongs to indicate the time. There are two gongs, a low pitched gong for the hours and a higher pitched gong for the minutes. The quarter hours are chimed on both gongs with a ting tang sound—one ting tang for the first quarter, two ting tangs for the second quarter, and three ting tangs for the third quarter. The mechanism can be motivated repeatedly by moving the slide on the edge of the case. This gives the watch its name REPEATER.



Figure 1

There are different classifications of repeater watches. These are as follows:

Quarter Repeater Watch. This watch repeats the hours and quarters. It is less complicated than any of the other repeaters.

Half Quarter Repeater. This watch repeats the hours, quarters, and half quarters. The half quarters (7½ minutes) are indicated by a single note on a high pitched gong.

Five Minute Repeater. This repeater chimes the hours and each 5 minutes when the slide is pushed. For example, at 5 minutes past the hour, the mechanism chimes the hour plus one time for the 5 minutes. At 10 minutes past the hour, it will chime the hour plus two times for the 10 minutes. At 15 minutes past the hour, it will chime the hour plus three times for the 15 minutes, and so on. At 55 minutes past the hour, it will chime the hour plus eleven times for the 55 minutes.

Minute Repeater. The minute repeater chimes the hours, quarters, and minutes each time the slide is pushed. For example, at 11:37 o'clock, the repeater mechanism will chime 11 times for the hours plus 2 times for the quarters, and 7 times for the minutes when the slide is pushed.

Triple Complicated Watch. This watch has a minute repeater mechanism and a chronograph mechanism as well as a perpetual calendar mechanism.

Clock Watch. The clock watch strikes the hours and quarter hours automatically like a striking clock. The mechanism can be made to strike the hours, quarters, and minutes by pushing the slide on the edge of the case.

The Minute Repeater

Most repeater watches are cased in solid gold cases. The case of this minute



Figure 2



Figure 3

View B, Figure 4 shows the spring for the minute rack. This spring holds tension against a pin on the minute rack so when the repeater mechanism is activated, the rack tail will go against a step on the minute snail. This will determine how many minutes will be chimed.

View C, Figure 4 shows the quarter rack which is situated just under the minute rack on the same post. This

repeater that is shown in Figure 1 is an 18 karat solid yellow gold hunting case. The weight of this case is 2.28 troy ounces. The case is engine turned on both front and back covers.

Figure 2 shows the dial of the repeater watch. Unfortunately, the dial is broken around the center hole and has been repaired, but the damage still shows. The seconds dial is sunk lower than the surface of the main part of the dial.

The dial does not have feet, but it has a metal ring around the edge of the dial that snaps around the outside edge of the watch movement. The dial can be removed from the movement while the movement is still in the case.

Figure 3 shows the back side of the movement while the movement is still in the case. The slide to activate the repeater mechanism is seen on the edge of the left side of the case in this illustration.

Name and Function of the Minute Repeater Parts

Figure 4 shows a view of the repeater mechanism under the dial after removing the dial. The names and descriptions of the repeater parts under the dial are as follows.

Figure 4, View A shows the minute rack. The end of this rack has fourteen ratchet teeth that work on a pallet on one of the hammers to move the hammer to chime the minutes on one of the two gongs.



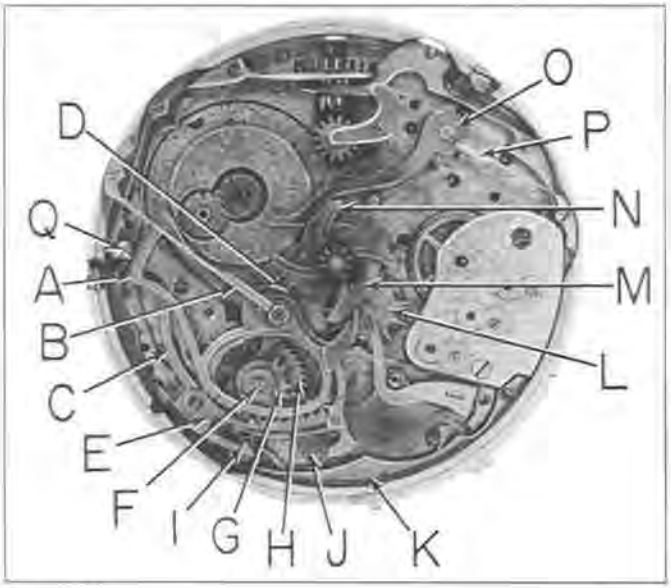


Figure 4

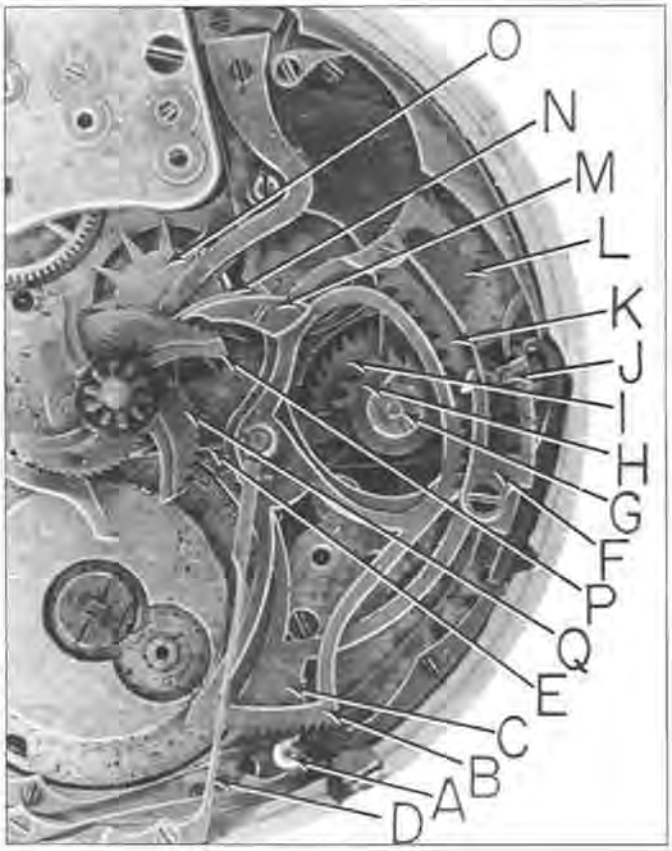


Figure 5

rack has two sets of three ratchet teeth. One of the sets of teeth works on one of the two hammers and the other set of teeth works on the other hammer. As a tooth works on one hammer, we have a "ting" sound on that gong; then, when a tooth acts on the other hammer, we get a "tang" sound on the other gong.

For the first quarter, we hear a ting-tang; for the second quarter, we hear two ting-tangs; and for the third quarter, we hear three ting-tangs.

View D, Figure 4 shows the quarter rack spring that holds tension against the rack to cause the tail of the rack to go against the quarter hour snail when the repeater mechanism is activated.

View E, Figure 4 shows the minute rack hook. This hook catches on one tooth in a set of six ratchet teeth on the minute rack to pull the rack clockwise around its post. This causes the teeth on the end of the rack to operate the hammer. The hook is fastened to the quarter rack. Tension is held against the hook by a small flat spring that is also fastened to the quarter rack.

View F, Figure 4 shows the repeating mainspring barrel arbor. This end of the arbor has a square to hold the gathering pinion for the quarter rack and the hour rack. When the slide lever is pushed to activate the repeater mechanism, the teeth on the end of the slide lever turns the repeater barrel arbor counterclockwise. This action winds the repeater mainspring a certain amount and, at the same time, the hour rack is turned to place it into position for chiming the hours. The gathering pinion for the quarter rack, at the same time, turns the quarter rack to get it into position to chime the quarter hours. View G, Figure 4 shows the gathering pinion for the quarter rack. This gathering pinion has a square center hole that fits the square on the repeater mainspring barrel arbor.

View H, Figure 4 shows the hour rack which fits onto the square of the repeater mainspring barrel arbor.

View I, Figure 4 shows the hammer arbor for the hours and quarters. Fitted freely to the arbor is the hour pallet and one of the pallets for the quarter hours. The pallets have one arm that goes against a pin on the hammer and another arm that works on the teeth of the hour and quarter hour racks to cock the hammer to cause the hammer to strike the chime.

View J, Figure 4 shows the operating lever rack. This rack goes into play when the slide is pressed to activate the repeater mechanism. The teeth on the end of this lever turn the repeater mainspring barrel arbor.

View K, Figure 4 shows the "all or nothing piece." This is a spring lever that goes into play after the mechanism has finished chiming. This piece locks the levers until the slide is pushed all the way to the end of the slot. If the slide is not pushed all the way to the end of the slot, the mechanism will not be unlocked and the chiming will not take place.

View L, Figure 4 shows the hour star wheel which has the hour snail attached to its under side. The snail has twelve graduated steps, one step for each hour. The star wheel has twelve teeth and is indexed by a finger on the cannon pinion positioned underneath the quarter snail. The star wheel is held in its indexed position by a pawl.

View M, Figure 4 shows the minute snail. The

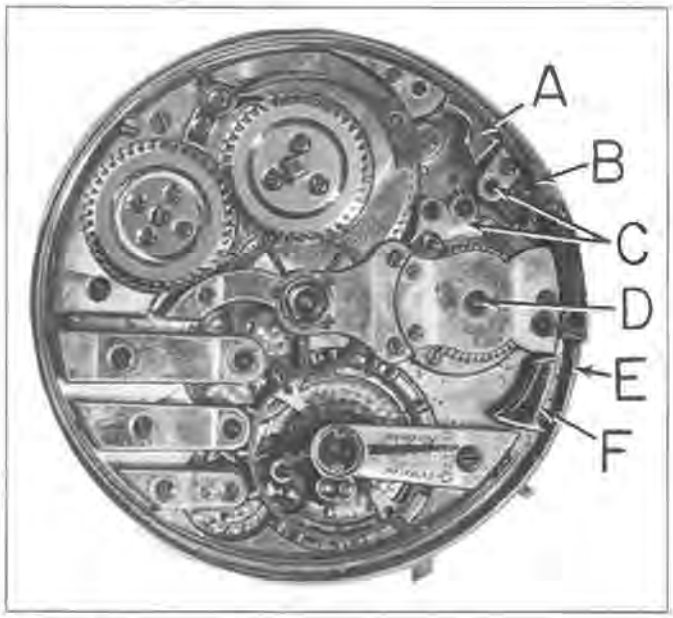


Figure 6

minute snail is a four pronged flat piece that is riveted to the cannon pinion. Each of the four prongs has fourteen steps which represent the fourteen minutes of each quarter hour. The tail of the minute rack drops on one of these steps each time the slide is pressed to activate the repeater mechanism. The lowest step is for fourteen minutes and the first step is for one minute. The end of each prong is zero minutes.

View N, Figure 4 shows the surprise piece. This piece works with the minute snail and comes into play at each quarter hour to prevent any minute from being chimed at the quarter hour. The surprise piece fits loosely around the cannon pinion just below the minute snail. The surprise piece is fastened to the quarter snail with two screws. Its turning is limited by a pin in the minute snail that works in a hole in the surprise piece. The surprise piece is activated by the flirt lever at each quarter hour.

View O, Figure 4 shows the flirt lever. The end of this lever works against the surprise piece at each quarter hour to cause the surprise piece to be activated.

View P, Figure 4 shows the flirt lever spring which holds tension on the flirt lever.

View Q, Figure 4 shows the hammer arbor that carries the pallets for the minute and quarter hour chimes.

Repeater Mechanism Parts Enlarged

Figure 5 shows a close-up view of the repeater mechanism. View A shows the hammer arbor for the minutes, View B shows the minute rack. View C shows the quarter rack, View D shows the minute rack spring, and View E shows the quarter rack spring. View F shows the minute rack hook. View G shows the repeater mainspring barrel arbor. View H shows the gathering pinion for the quarter rack. View I shows the hour rack. View J shows the hammer arbor. View K shows the quarter hour drive rack. View L shows the slide lever rack. View M shows the minute rack tail. View N shows the quarter rack tail. View O shows the hour star wheel. View P shows the surprise piece, and View Q shows the minute snail.

The Repeater Mechanism from the Upper Side of the Movement

Figure 6 shows the repeater parts that can be seen from the bridge side of the movement. View A shows the minute and quarters hammer. View B shows the minute and quarters gong. View C shows the repeater train and escapement. View D shows the repeater mainspring barrel arbor. The ratchet wheel can be seen around the edge of the barrel bridge. View E shows the hours and quarters gong, and View F shows the hours and quarters hammer.

"Repeaters" will continue.

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Modern Marquetry Cases for 17th Century London Long-Case Movements

Part 1

Dr. Simon R. Drachman

"New homes for three-hundred-year-old orphans"—modern marquetry cases for 17th century London long-case movements by William Speakman Junior and John Sedley of London.

Two 8-day early 18th century orphaned long-case movements by William Sedley of ye Strand, London and William Speakman Junior of Old Street, London have been restored and reproduction walnut marquetry bird and flower long cases made for them by a local cabinetmaker. The cutting of the all over bird and flower marquetry is of a high quality and typical of the style of the late Stuart period. Both movements have many fine features typical of London in the period 1700-1720. These include 5 nicely turned and finned pillars, good quality wheel work and nice individual features such as well filed and fettled hammer stop springs, four pillars pinned and the center latched. The dial plate matting is to a high standard on both clocks, but that on the Speakman is unusually fine. Clocks by this latter maker are relatively uncommon and the author suggests that the four sons of William Speakman may have all worked for the family firm, only signing their work under their own names after his death.

London-made long-case movements from the early 1690s onward appear to be reasonably plentiful, albeit found in a wide range of states of "conservation". Many of these have lost their cases no doubt due to rot, damp or wood-worm. Whilst others were removed from grand cases for "important makers" work to be housed therein. Unfortunately the latter practice still appears to be current. The author has seen many examples of early square dialed long-case movements, often in excellent condition complete with hands, pulleys and bell etc., looking as if they have just been taken out of a case.

At the other extreme one can find movements that are barn fresh or covered with verdigris, spiders web and a host of other things! There are a range of sources of such movements, some better than others, but all require persistence, patience and a small element of luck. Several years ago in November 1995 the author bought from Brian Olivers establishment in Hove, three 11" 8-day movements (2 of which were 17th century and one was early 18th century provincial work) and an early 8" square dialed bracket clock movement. Such things do still turn up but increasingly one has to take more care.

A large number of square dialed movements, which formerly had early arch additions, with the name in a boss in the arch are often now seen as "anonymous square dialed pieces." Why? There are several possible reasons for this, the first is that square dialed movements have a ready market with cabinet makers and enthusiasts who might be able to find or make a case for it. Secondly, if the movement had been stolen and then sold on, removing the dial arch destroys the identity of the piece. Finally, what of marriages, i.e., early movements which have been redialed? If it is a new dial, this is often relatively easy to detect with sharp edges, minimal wear on the chapter ring and they are often made from flat rolled brass. The alternative is using an old dial contemporary with the movement, such examples are often seen at auction and with practice one can also remove these from your shopping list! As with all things in life you pay your money and take your choice.

Aside from the south coast there are a variety of places where one can buy early long-



Figure 1. The 11" dial of the restored 8-day long-case movement of ca. 1700, signed "Jn. Sedley, in ye Strand, London".

case movements. These include the many clock fairs advertised both in *Clocks* magazine, the *National Press* and specialist papers such as the *Antique Trade Gazette*. There are also advertisements in *Clocks* magazine for movements for sale, i.e., Dennis Haynes of Farringdon is recommended, in the back of the *AHS* journal at odd intervals and also sometimes the *Horological Journal*.

The author has combed other sources such as the large trade fairs at Ardingley, Sandown Park and Newark. All to a certain extent have been successful, but be prepared to get up early, do a great deal of walking and have plenty of cash with you. In Surrey there are the bi-weekly trade fairs such as Kempton Park, again an early start at about 6.30 a.m., but a known place for interesting clocks to appear at reasonable prices.

Alternatively, you can join your local BHI section or the Antiquarian Horological Society, which also has local sections. These all have regular meetings and it will put you in touch with like minded individuals. Occasionally, they have mini-auctions and it is surprising what can turn up. The other obvious places are London and local auctions, but don't forget the succinct phase, Caveat Emptor! Finally, for those of you already connected to the Internet, there is a slow but steady explosion of Web sites devoted to horology, shops, organizations and internet auctions, etc.

The reasonably plentiful nature of such long-case movements even today attests well to the economic boom experienced by the capital and other major centers of commerce with the return of William and Mary of Orange in the bloodless revolution in 1689. The last quarter of the 17th century has often been described by writers as part of the golden age of English clock making. The proportions of cases, the quality of design and the high finish of the movements have to my mind rarely been surpassed since.

The clocks, which are the feature of this article, are by "John Sedley of ye Strand, London" and "William Speakman Junior of Old Street, London". Both of these long case clock movements were purchased as orphans,

The movement by Sedley dates from ca. 1700-1710 and has five well turned and finned pillars, all of which are pinned to the front plate and are typical of late 17th or early 18th century castings. The yellow brass plates are of typical London size being 5" x 7.25" and in reasonable condition, with minimal evidence of "punching up". When first purchased the movement was in a rough state and was found in an old shed according to the vendor. The price at the time was very reasonable and two 18th century brass cased lead weights also came with the movement and an old pendulum bob!

The brass dial is 11" square (see Figure 1 for restored dial on temporary seat board), and is of the solid type, typically found for London clocks. The rear dial was untouched and came complete with muck, spider webs,

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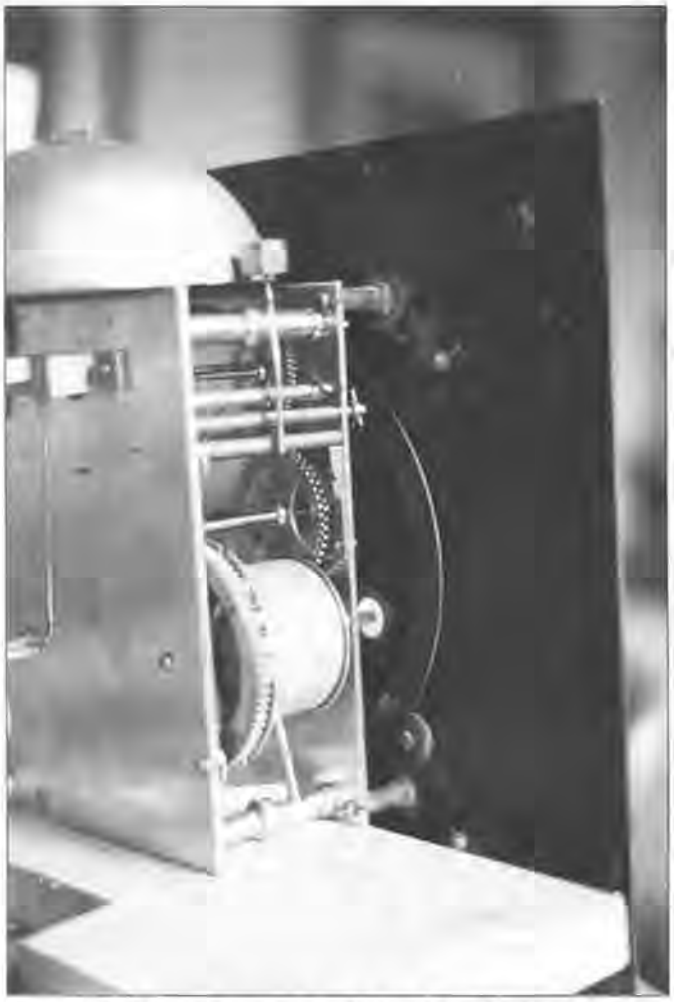


Figure 2. The striking train of the John Sedley long-case movement.

verdigris, all the patina from 3000 years. This was gently cleaned with warm soapy water and dried. The 3 brass rollers for the calendar wheel were removed with some difficulty, since the steel pins had rusted in place. These were cleaned, lacquered and fresh steel pins used to retain them.

The brass dial is of nice quality with crown and cherub spandrels (C&W No 8) in the four corners, which still retain their original square headed brass retaining bolts. The silvered brass chapter ring is of typical dimension, ca. 10.25" wide. It is divided for hours, half-hours, half-quarters and minutes, typical of the period 1700-1710. The half-hour markers are very boldly engraved and commonly seen on many long-case dials from ca. 1690-1710. These are clearly shown in Tom Robinson's excellent book and also the book on "30 hour clocks" by Darken and Hooper, and described there as "taking the form of a cross, embellished with C-scrolls, and in this form they were a prominent feature and could give the dial a busy appearance." The half-quarter makers are of the earlier style, being small Maltese crosses. The Arabic minute numerals are engraved outside the minute band as had become the norm by this period.

The dial is of good quality with the center being finely matted with ringed winding and subsidiary seconds holes. The engraving around the beveled square calendar box further enhances the appearance of the dial. The hands are copied from a clock by William Tipling, using an excellent picture in E. Edwards book, *The Grandfather Clock*, and are beautifully pierced and fretted.

The maker John Sedley has his name and address engraved either side of the 6 o'clock position on the chapter ring, "Jn. Sedley in ye Strand, London".

The movement, (see Figure 2 of the movement after restoration), had not been worked on for a while. Both trains were relatively untouched, with the steel work rusty and badly pitted, hence its overall good but dirty condition. On dismantling for cleaning it was noted that all collets (bun-shaped), wheels, arbors (nicely shaped) and pinions and anchor were original, except for the escape wheel. When first purchased this had 32 teeth! The wheel counts in the trains are given in Table 1.

A significant amount of restoration work was undertaken on this movement. The movement required re-bushing throughout due to the slop in the pivot holes. The ends of the great wheel arbors were especially bad and the rear pivot bush of the center wheel. All of the pivots were polished using standard procedures to ensure smooth running of the trains. This clock had evidently had an unhappy life with rust and verdigris all over it! Cleaning was done in a dilute solution of Dip Rust, available from Clock Spares of Derham. This is a very effective solution for removing rust and leaving a clean surface. After several dips for 24 hours followed by wire brushing, the parts came up in a very good state. Minimal pocketing or etching of the steel arbors for the hammer, warning or count-wheel detents had occurred.

Table 1. Wheel Counts for John Sedley Movement after restoration

	Tooth count	Pinion leaves
Going train		
Escape wheel	30	8
Intermediate wheel	60	8
Third wheel	64	8
Great wheel	96	—
Striking train		
Fly	—	6
Warning wheel	48	6
Hoop wheel	48	6
Pin wheel	48	6
Great wheel	78	—



Figure 3. View of hood of John Sedley reproduction walnut marquetry long-case.

The striking side operates via an inside count wheel which has a very silky-like action and requires very little effort to reset if the strike and hour become out of sequence. The hoop on the hoop-wheel was found to be broken and a new one was made up using the old one as a template in yellow brass and riveted into position. The hoop wheel had one tooth broken. A slot was cut into the wheel and a piece of yellow brass soldered into place. This was carefully shaped to the correct profile of the other teeth. A nice quality feature was the fine carving and filing on the hammer stop spring. There was no evidence on the back of the movement for a securing bracket as has been seen in other early London movements.

A replacement period bell was obtained from a clock fair and a small brass retaining nut made and fitted to secure this to the rear mounted bell stand. The old weights were cleaned but the patina left intact. The period pendulum bob was cleaned and lacquered and a new steel rod and suspension attached.

The movement was then reassembled with the striking adjusted so it warned and struck the hour as expected. The movement was put on test, but found to stop after only 15 minutes. Careful examination of the wheels revealed a high spot on a tooth on the third wheel. This was carefully filed back to give a more acceptable profile. It was also noted that there was too much drop on the pallets. This was corrected by soldering strips of clock spring onto both entry and exit faces. These were planished and then polished to correct size.

On the front plate it was noted that the cannon pinion and the minute wheel did not engage effectively. Therefore a thin brass washer was fitted over the canon pinion and under the bridge to stop the canon moving forward. At the same time a brass washer was made to fit behind the minute wheel to bring it forward to engage with the canon pinion.

The movement was then set up again on test and found to run very well except that it beats at 64 rather than 60, because of the 32 tooth escape wheel. Careful examination revealed that this wheel was not original to the movement. With this setup the clock loses 4 minutes every hour when the pendulum is of the correct length of ca. 40"! A new escape wheel was obtained and fitted and a replacement anchor made. The movement was then put

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Figure 4. Side-on view of John Sedley walnut marquetry long-case.



Figure 5. Front-on view of John Sedley walnut marquetry long-case.

on test and found to run very well.

This movement required a suitable case and I had seen at several clock fairs good examples of Tony Whitehead's cabinet work from Bristol. I phoned him up and later went down to see him in his workshops in Staple Hill. He specializes in long-case cabinet work and has an excellent selection of old and new timbers. His facilities are very comprehensive and he can hand cut veneers of any type required. Timberline of Tonbridge stocks exotic timbers, such as Kingwood Olive or Laburnham. Pictures of the completed clock are seen in Figures 3-5. If however you want to make your own case, excellent diagrams and case plans are given in the book by David Bryant.

Good features not readily seen in Tony's work include the use of cleats across the top and bottom of the door. These are generally found in early clocks and are present to stop movement of the main body of the door. The cleat is placed to stop the door bowing; however, as wood shrinks across the grain the main part of the door becomes narrower relative to the top cleat which itself shrinks away from the door.

The hood door (see Figure 3) has a pair of nicely turned walnut barley-sugar twist pillars attached to it. The pillars are tapered in form, becoming progressively thinner as they reach their capitals. The marquetry on the hood door itself reflects that seen on the trunk and base panels. The cuttings are very good and have been done by a man who spares attention to fine detail.

The top cross-grained walnut moldings of the hood are well made. The red silk backed sound fret looks very good. The top of the hood is finished with a nice piece of oak (chamfered at the edges) and secured by wrought iron nails. The cross-grained convex molding beneath the hood with marquetry on the front molding is most suitable for a clock made on the cusp of the 17th and 18th centuries.

A side view of the hood and upper section of the trunk is given in Figure 4. This reveals nicely colored walnut with side windows of about 40% the height of the hood. On the sides of the trunk can be seen two inset holly strung panels, with a further panel inset on each side of the base.

A front-on view of the clock is given in Figure 5 and it looks splendid, with very good proportions. The trunk measure ca. 12" wide and this complements the size of the dial rather well. The door has a well-made walnut cross grained d-molding around the edge and a lenticle about 2/3 of the way down to reveal the pendulum bob. The brass hinges and lock provided are good quality reproductions.

The oak trunk sides go all the way down to the bottom of the base and the walnut bun feet are located and glued to wooden doweling.

The marquetry cutting on this case on the base panel, the trunk door, under hood molding and the hood door is of a good standard and of a type generally known as "bird and flower", and many variations of this pattern are known. The cutting of the carnations and tulips is well done and the proportions of leafs to flowers is well balanced. A bird can be seen in the center of the base panel sitting amongst the flowers. This style of all over bird and flower marquetry appears to have been most popular in the period. Tom Robinson, in his excellent book on the Long Case Clock, shows several examples, as does Derek Roberts in his magnificently illustrated volume.

The case when received from Tony had been suitably aged to look rather distressed and for the unwary the effect can be deceiving. The in-house treatment he uses is rather drastic but effective. It is the finishing and of course polishing which makes a good reproduction case. The changes in atmospheric conditions which in 300 years from when a case is first made leads to the lifting of veneers and results in the original glue exuding from beneath the

veneers and standing proud at the edges and blackened with age. This of course produces an uneven surface with irregularities in marquetry, polish and surface patina. Additionally the mellowing of the color of the veneers is something that is very hard to reproduce, as of course are the various areas of wear and damage. The method described here gives a pretty good color and finish. It should be noted that John Robey has described a slightly different approach previously in *Clocks* in 1996. I give only the details, which differ from his approach, and the reader is recommended to read his work first.

It must be stressed that all the operations discussed should be done in a well-ventilated environment taking suitable safety precautions and you should be correctly dressed with eye protection. The walnut veneers as used on the case were rather dark so it is necessary to bleach out the color first. The wood is painted with nitric acid (diluted to 10%) using a paint brush. The effect is spectacular; the walnut turns a bright orange color. I leave this on for a few minutes and then neutralize with a solution of either sodium bicarbonate (NaHCO) or better still potash (KOH). The wood is rinsed with 4-5 changes of water to remove all excess alkali. Finally the wood surface is painted with an oxalic acid solution (10%) to adjust the pH of the wood back to near its original value. The wood surface is fairly well bleached out at this point; if it isn't then repeat once more. Finally, wash off any excess acid with 5-6 changes of fresh water. At all stages I prefer to keep the wood surface damp.

I prefer to do all of the above work in the open air, with overalls, plastic boots, and suitable eye protection and rubber gloves. This may sound like overkill but the effects of nitric acid burns on the skin are not recommended. All of these chemicals are hazardous and must be disposed of safely including what remains of the paint brushes. It is illegal to put hazardous waste down the domestic mains; all such waste should be stored in bottles to be disposed of properly at a latter date.

The wood is left to fully dry out for a period of up to a week before proceeding further. This procedure results in lots of fine cracking and splitting in the veneers and some minor lifting. If you want to increase this "aged surface effect," a hot air gun used carefully really works wonders. Again care is required and I strongly recommend using practice pieces of veneer rather than the case itself.

When the case is sufficiently dry, brush on a thin coat of Liberon sanding sealer to fill some of the end grain. The wood is highly porous at this stage and most of the

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sealer will be absorbed very quickly. At this point I use a worn 320 or 400 grade paper to get a smooth surface. At this stage the fun begins, and it is very worthwhile to do stain trials on small 1" or 2" square pieces followed by polishing. The coloring process is slow and at times frustrating, but with care a pretty good color can be obtained. You just need patience!

A variety of stains are available including vegetable black or even tire blacking paint. Both work in a similar manner. Cover the case with the black stains and then wipe out all the centers, leaving the color in the moldings and corners. These are the areas on an antique case where it is always darker.

French polishing has been well described previously by John Robey. It is great fun but do attend a course prior to trying it out for yourself. Distressing of the case (if you must do this!) can take many forms, but if you are going to do it at least be sensible! I have seen many cases hit with a chain in some strange places where wear would be minimal to start with. The aim is to imitate knocks and dents arising from three centuries of use. Most of these would be on the base, plinth, bun feet, around the lower parts of the pillars of the hood where the door is opened and the moldings under the hood where it slides back and forth.

The surface is then brushed with a dark stain, vegetable black or tire black. The excess of the stain is wiped off with a clean, dry cloth and the central areas wiped with a cloth dampened with oil stain thinners. This should leave all the corners and molding blackened and the marks from the distressful treatment, thereby imitating three hundred years of accumulated dirt, dust and old wax. This should be left to dry for a couple of days. See figure for picture of Speakman dial with suitably aged walnut mask around it

Finishing of the case is with garnet polish, followed by cutting back with 400-grade paper and allowing to dry for 3-4 days. The grain needs to be filled and this is best achieved by the use of several rubbers of button polish. Personally I stop at that stage, allow to dry and then cut the gloss back with flour paper wrapped around a wooden block. Finally, the case may be waxed with alternative black and yellow (or orange paste wax available here in Israel). This requires careful buffing between coats and it is best not to rush this. I like to put on a fresh coat of wax every other week and this slowly produces a good patina.

The inside surfaces of the case are given a suitable aging treatment with Vandyke brown, .880 ammonia and hot water. This is well described in John Robey's article. Take care with the ammonia; it is a lachrymator and is harmful to the eyes and respiratory system.

Finishing the hood with period glass from old frames, especially the type which is pre-float glass with imperfections and bubbles, etc., gives a very good effect. Refitting hinges and locks which can also be aged if required and also the backing silk for the fret finishes the case.

What do we know about the origins of John Sedley of London? Britten and Bailey of course give some background information. However, Loomes after many years of research gives a fuller picture in his excellent book, *The Early Clockmakers of Great Britain.*

Joseph Sedley's origins remain obscure with no definite place of birth, parental origins or details of marriages and possible children.

John Sedley (or Sidley) was born ca. 1672 and apprenticed on 1st October 1686 to Cuthbert Lee through Benjamin Marshall till 1691, freed on 29th September 1701. The master Benjamin Marshal had an important teacher, being apprenticed to Abraham Prime from August 1676 until he was freed in June 1680.

In August 1687 Cuthbert Lee ran foul of the Clock Makers Company by having more than his allowed four apprentices (excluding of course apprentices working for his journeymen) and was to be prosecuted for "undue keeping of John Sedley." Cuthbert Lee was several times in trouble for "employing foreigners and those not bred up in the trade" and his many apprenticeship movements may have been attempts at camouflaging this!

John Sedley took as Apprentices: James Wilson in January 1708/09 (freed July 1, 1723 and worked opposite St. Lawrence Church, Britten); John Hills in November 1712 (freed January 20, 1728, Bailey); Samuel Davies on March 7, 1714/15 (possibly not freed from CC); an unidentified and illegible entry for November 1716; and Michael Naylor on October 5, 1719 (also possibly not freed from CC). This means that of the four identified apprentices of John Sedley only two were granted their freedom at the end of their apprenticeships by the Clock Makers Company.

Baillie records that Sedley was still active until as late as 1732 while Loomes has no data after ca. 1720. From the evidence of this orphaned long-case clock movement we now at least know that he worked in the Strand for a period of time, but for how long and where he may have worked before are currently unknown. Loomes has previously recorded a long-case clock by him and Britten recorded a pocket watch movement. This gives us but three examples of his work, which doesn't seem much for someone who was in the trade for approximately 30 years.

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Lloyd L. Lehn, CC, Ph.D.

Dr. Lloyd Lehn retired from the Department of Defense in February 2003 after 35+ years of service. He spent 19 of those years in the Office of the Secretary of Defense as the senior staff person for the DoD Manufacturing Technology Program. He is vice-president of the northern VA guild of the Horological Association of Virginia and has been nominated to be the secretary of the HAV next year. Dr. Lehn earned his Certified Clockmaker designation from AWI in 2003. He has a BS, MS, and Ph.D. in mechanical engineering from the University of Illinois. His BS is in machine design, the MS in industrial engineering and the Ph.D. in manufacturing engineering – metal cutting. Dr. Lehn has published numerous articles in the fields of operations research & statistics, photo-elastic stress analysis, metal cutting, manufacturing technology, and horology. He has an NT Professional Certificate from Learning Tree International. He plans to run a Kuckoo Klock Hospital in northern Virginia and will continue to author horology articles, books and multi-media videos/DVDs.

Purpose

The purpose of this article is to attempt to take some of the "black art" out of wheel counting.

I am a horology hobbyist who has been studying and repairing clocks for the past several years. During the past several months I have been studying to take the Certified Clockmakers exam. I have become frustrated with the material I was able to locate on wheel counting. In general, the literature:

1) Assumed that I understood much more than I do. It's not always obvious to me that a wheel is an idler and can be ignored.

2) Assumed it was OK to drop terms from equations because it was "obvious." Not so to me.

3) Almost totally ignored the units of the variables involved. The author just performed arithmetic on numbers with little or no discussion about the units involved. My engineering education taught me that this is a very dangerous thing to do.

4) Occasionally used "magic numbers" with no reference to the units of those magic numbers or how they were derived.

Wheel counting articles are generally focused on calculating the length of a missing pendulum. An alternative to counting is to use trial and error, but that could take a lot of time. A quicker way is to sketch out the train from the center wheel to the escapement, count all the teeth involved and then make a few calculations to come up with a theoretical pendulum length. This at least gets you into the ball park from which you can proceed with trial and error to find a pendulum which will provide the correct time.

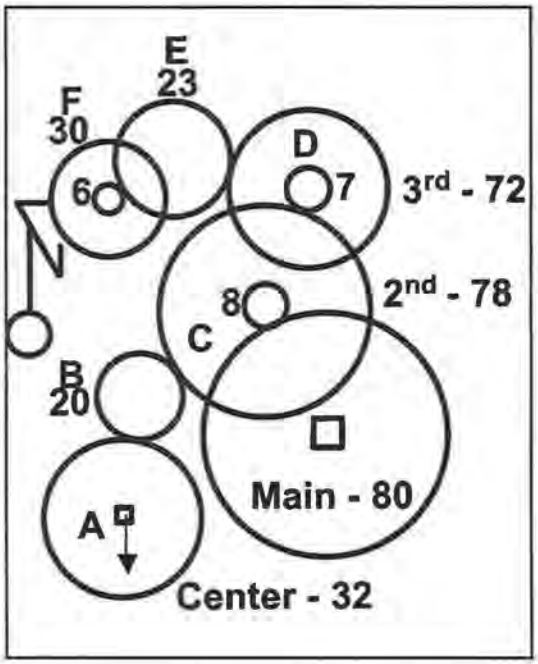
I have been frustrated by most of these articles so I decided to write my own. What better way to prepare for an exam than explaining the material to someone else?

Approach

My approach will be to:

1) Create a complex gear train that will illustrate the concepts of my approach.

2) Look at the basic equations of motion of a pendulum and establish some basic constants, while always carrying along the unit of the value involved.



3) Analyze the gear train motion using a technique where tables are used to represent equations. This provides some discipline to carrying along the units of the variables.

4) Calculate a table of constants for converting [beats/unit of time] into pendulum length for a number of situations.

5) Calculate the theoretical length of the pendulum for the illustrative gear train.

The Gear Train

I've made up a gear train (see figure below) to illustrate the method I will suggest for calculating a pendulum length. My intent was to create a train more complex than those found in the real world. Hopefully, if my technique works for this train it should work for any train.

Table 1—Gear Train Inventory

Arbor Name	Arbor Code	Teeth Gear	Leaves Pinion
Center	A	32	
Idler	B	20	
2nd	C	78	8
3rd	D	72	7
Idler	E	23	
Escape	F	30	6
Main	—	80	
Pallets and Pendulum			

What else do we know about this train?

- It has seven arbors and 10 gears/pinions.
- Three arbors—C, D, & F—have both a gear and a pinion.
- The 80 teeth on the main gear power the entire train through the pinion on Arbor C.
- The train would run down quickly were it not for the pendulum and pallets restraining the escape wheel on Arbor F. The pallets control the run down rate.
- When the pendulum is the correct length, Arbor A and the minute hand will make one revolution per hour.
- Each swing of the pendulum creates two beats: swinging to the right is one beat and then swinging back to the left is another beat.
- The escapement advances one tooth for each complete swing of the pendulum.
- Each revolution of the Arbor F produces twice the number of beats as there are teeth on the escape wheel. In this case there are (30 x 2) or 60 [beats/revolution] of Arbor F, or in a more short hand notation 60 [beats/Rf].

Overall Approach

Let's look at the entire gear train from Arbor A to Arbor F.

At A we have the revolutions of Arbor A per hour [Ra/hour]. At F we have beats per revolution of Arbor F [beats/Rf]. This is encouraging. We have both ends of the system [beats/Rf] and [Ra/hour] expressed in terms which might cancel out if analyzed one arbor after another.

We know the relationship of the relative motion between adjacent arbors because we know how many teeth are on each gear/pinion. It seems reasonable that we should be able to work this out so that we end up with [beats/hour] by canceling out all the revolutions of the arbors. Then we need to come up with some scheme to convert the [beats/hour] to the length of a pendulum.

We will do just that.

Equations and Constants

First let's look at the basic equations involved.

The period of a theoretical pendulum is given by the basic physics equation:

Eq. 1

$t_p = 2\pi (L/g)^{1/2}$

where:

t_p - period of a pendulum [sec/period] - this is the complete period or cycle. In a pendulum clock, this is the time it takes for both a tick and a tock, i.e. two beats.

π - 3.1416 - constant

L - pendulum length [feet] and

g - 32.2 ft/sec^2 - constant (varies by location)

Expressed in units of the variables, Eq. 1 becomes:

Eq. 2

[sec/period] = [?] ([ft]/[ft/sec^2])$^{1/2}$

Note: I have used square brackets, [ ] for units and will do this throughout this article.

You should also note that I have put a question mark for the units of π. Normally, π is considered a dimensionless constant. However, if one looks into the derivation Eq. 1, the term which includes the π provides the "per period" units. We will carry them along with the π.

Thus Eq. 2 becomes:

Eq. 3

[sec/period] = [1/period] ([ft]/[ft/sec^2])$^{1/2}$

But we really aren't interested in calculating t_p. This is easy to fix since we have two beats per period of the pendulum or:

Eq. 4

[sec/beat] = [sec/period] [1 period/2 beat]

or

Eq. 5

$t = t_p/2 = \pi (L/g)^{1/2}$

where t is now [sec/beat] or

[sec/beat] = [1/beat] ([ft]/[ft/sec^2])$^{1/2}$

Note: We carry along the units of $\mathbf{p}$ as [1/beat].

We still haven't reached the equation we'd like since we are interested in L.

Some simple algebraic manipulation results in:

Eq. 6

$$L = (t^2 g)/\mathbf{p}^2 = t^2 (g/\mathbf{p}^2)$$

which we can express in units as:

Eq. 7

$$[ft] = [sec/beat]^2 ([ft/sec^2] / [1/beat]^2$$

or

Eq. 8

$$[ft] = [sec^2/beat^2] ([ft/sec^2] [beat^2]) = [ft]$$

Eqs. 6-8 are very nice equations to have, for the elements of $(g/\mathbf{p}^2)$ are both well-known constants. The combination should be easy to calculate, provided we maintain an awareness of the units for g and $\mathbf{p}$. The first term "t^2" is expressed in [sec/beat] ^{2} or if we invert it $(1/[beats/sec]^2)$.

[beats/sec]!

[beats/sec] looks like something we should be able to get from the gear train.

Note: I have been using feet for a linear measurement. We could have used inches, mm, meters or any linear measurement. Similarly, I have been working in seconds. Minutes or hours would work just as well. I used feet and seconds simply because most people recognize the value of g as 32.2 [ft/sec^2]. However, the value of g varies from one geographic location to another. I will use 32.2. The reader can adapt to local conditions.

Gear Train Analysis

Let us now look at the relationship between the relative motion of the arbors in our gear train.

Let us assume that we have two gears X and Y working together with the following parameters:

Gear	Teeth
X	12
Y	48

If we focus at the point where they intersect, we see that for each tooth of X passing that point, exactly one tooth of Y also passes that point. When 12 teeth of X have passed the point, 12 teeth of Y will have passed the point. X will have made one complete revolution and Y will have made (12/48) or (1/4) of a revolution. This can be written as:

Eq. 9

$$Rx / Ry = 1 / (12/48) = (48/12) = t_y/t_x$$

where

Rx - revolutions of arbor X

Num	Rx	1	48
Denom	Ry	12/48	12
Num	rev x	—	t_y
Denom	rev y	t_x / t_y	t_x

The first two rows represent the numerator and denominator of Eq. 9. The next two rows represent the same equation. However, the cells contain the units of the values in the first two rows. The narrow vertical lines represent equal signs.

"So what?" you say.

As we progress through this analysis, I think you will see that this will be very useful. It will discipline us to be sure we express terms in the proper units, especially before we start canceling out terms and values.

Let's return to our gear train. We want to work from one end to the other. We could start from Arbor A or from Arbor F. However, I know that I am looking for something expressed in [beats/time unit]. By starting with F, I can put the units of beats in the numerator which is what I would like to do.

So let's look at the escapement and Arbor F.

There are 30 teeth on F and two pallets on the anchor. Thus for each beat of the anchor we have the tabular equation.

Num	2 x 30
Denom	1
Units Num	Beat
Units Denom	Rf

This last column points out that there are 60 beats for every revolution of arbor F.

Let's move on to arbor E. We will carry along what we know about arbor F in the tabular equation. The relative motion between Arbors E and F are governed by the 6 leaf pinion and the 23 tooth gear. The tabular equation expands to:

Num	2 x 30	23
Denom	1	6
Units Num	Beat	Rf
Units Denom	Rf	Re

Looking at the right column we see that F rotates (23/6) times the number of revolutions of E. That makes sense because the pinion on F has fewer teeth and will be running faster than E.

At this point we will drop the two left-hand columns strictly for space considerations. If you are doing this manually, I suggest you keep those columns.

We can add in Arbor D and we see:

2 x 30	23	72
1	6	23
Beat	Rf	Re
Rf	Re	Rd

If we now examine this a bit closer, we see that we could write that [beats/Rd] is:

[beats/Rd] = ((2x30) x 23 x 72)/(6x23)

You should note that in the units equation (rows 3 & 4) the Rf in columns 1 and 2 cancel as do the Re in columns 2 and 3. The result is [beats/Rd]. It can also be seen that the 23 in the numerator (i.e. row 1) will cancel with the denominator (i.e. row 2). One might expect that since Gear E is an idler gear. It has nothing to do with the time equation at all and we could have left it out. We've included it so that we fully understand the train.

Let's now break this chain of thought and go to the other end of the gear train with the same type of analysis. We might expect the last term in our tabular equation to look something like this since we know that arbor A turns one revolution per one hour.

1
1
Ra
hour

Now we should be able to fill in the entire table for the gear ratio equation. It will be:

2 x 30	23	**72**	78	20	**32**	**1**
1	**6**	23	**7**	78	20	**1**
beat	Rf	Re	Rd	Rc	Rb	Ra
Rf	Re	Rd	Rc	Rb	Ra	**hour**

This is a wonderful table. *All* of the Rx units terms cancel out. Arbors B, C and E are all idlers and thus their values cancel out as well. Only the bold terms remain. The solution is:

[beats/hour] = (2x30x72x32)/(6x7) = 3291

Are we done? Let's take a look.

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Calculating the Pendulum Length

Equation 6 was the equation for the length of the pendulum.

$$L = t'' (g/\pi'')$$

or in units

$$[ft] = [sec/beat]'' ([ft/sec'']) / (1/[beat]'')$$

or

$$[ft] = [1 / (beat/sec)]'' ([ft/sec'']) / (1/[beat]'')$$

"Houston. We have a problem."

We know all the numbers at this point but our units are messed up. We know the reciprocal of t in terms of [beats/hour] and we need it in [beats/sec]. Similarly, we have g expressed in ft and sec. We really would like it in terms of inches and hours.

We must convert all these numbers so that our units are consistent and in the terms we want before we make any calculations.

Perhaps there is an easier way.

The Magic Number Table

Let's look at the problem.

Converting beats per hour to beats per second should be easy. However, let's see if we can establish a generic solution for a number of options. It should work for [beats/units of time] so we can look up the constant for sec, min, or hours. Similarly it would be nice to have L expressed in either feet or inches.

The key to all of this is the constant (g/π''). We can get out of this dilemma by calculating the constant for a number of conditions. Let's take the easy one first letting g be 32.2 [ft/sec''] and π be 3.1416 [1/beat]. Our tubular equation shows:

g	32.2		3.2625
π''		(3.1416) ''	
ft/sec''	ft		ft (beat)''
(1/beat) ''	sec''	(1/beat) ''	sec''

Thus if we had our train expressed in [beats/sec] we could divide 3.2625 [ft(beats/sec)''] by the [beats/sec] squared and we would have the length of the pendulum [ft].

We can convert this constant to inches by the usual 12 [in/ft] conversion.

3.2625	12		39.15
ft beats''	in		in beat''
sec''	ft		sec''

We will make one more conversion and then let the reader work out the rest.

The conversion of [(beats/sec)''] to [(beats/min)''] requires that the terms be multiplied by 60 [sec/min] twice as follows:

3.2625	60	60	11745
ft beats''	sec	sec	ft beats''
sec''	min	min	min''

Thus we would divide 11745 [ft (beats/min) ''] by the square of our train number [beats/min] and would have the pendulum length in feet.

We can summarize this type of calculation with the values in the following table. It provides constants for three [beat/unit time] sec, min, & hours, and two [linear units] inches and feet. It should be a useful reference for the reader.

Calc Units of the Train	Desired Units of L	Constant	Units of the Constant
beats/sec	ft	3.2625	ft (beats/sec) ''
beats/sec	in	39.1509	in (beats/sec) ''
beats/min	ft	11745	ft (beats/min) ''
beats/min	in	140942	in (beats/min) ''
beats/hour	ft	42282617	ft (beats/hour) ''
beats/hour	in	507391407	in (beats/hour) ''

This table provides the generic solution to many trains expressed in English units. It is based on a value of g of 32.2 [ft/sec'']. Users should recalculate the table based on the actual value of g for their location.

The same sort of table could be created for metric units.

The pendulum length is calculated by dividing the constant by the square of the [beats/unit of time] value.

Calculating the Pendulum Length

Let's use the table to solve our problem.

Our analysis of the gear train produced the number 3291 [beats/hour].

We can now easily calculate the pendulum length [in]:

507391407	1		46.84
	(3291)''		
in beat''			in
hour	(beats/hour) ''		

At long last we find that our pendulum will be 46.84 inches long. In real life, trial and error would take over from here and the owner would have to adjust a real pendulum from here on until the length was just right.

Summary
In this article:

• We made up a gear train which had three idler gears in it. We carried them along in the analysis until they fell out naturally just from the process. We did not make prior judgment as to what stayed in and what didn't stay in.
• We utilized a tabular equation format which forced us into a discipline of carrying along the units of the variables so we did not end up with something which did not make sense.

• We calculated a table of generic constants which will enable the reader to calculate the length of a pendulum once the [beats/unit of time] is known when the equations are in English units. This is a good reference table for the reader.

• We calculated the length of the pendulum for the train I made up.

It is my hope that this article will aid others in understanding the basic concepts behind calculating the length of a pendulum based upon a wheel count. My thanks to Bill Bugert for taking the time to struggle through the analysis of the units of the equations with me. I appreciate his help.

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As A Clockmaker Turns

The Clockmaker and His Lathe According to "Old Huck" Part 2

Introduction

This second part of a series will explore methods of "chucking." This is a term for the various means of holding, or supporting, work pieces in lathe work. Chucking methods vary widely with the type of work. Choice of method is important to the ease with which the job is executed.

What Is a Chuck?

In general terms, the chuck is some form of holding device. In Figure 13, we have a large 3-jaw chuck. It is called a "universal chuck" which will hold material that is round. Work held in this device rarely runs true.

Three smaller pieces are called collets. Under best conditions, work in collets will run nominally true, but not perfect. The other collet is called a "wheel chuck." It holds very thin items, as wheels, and has about the same precision as the first three collets. Precision work must use another form of job set up.

Study Figure 14. The caption tells us that we cannot expect a collet-held piece to run perfectly true. However, in many cases we can achieve a practical accuracy.

What Can We Expect?

The test example of Figure 15 shows as distance from the collet increases, the run-out error increases. Always work as close to the collet as feasible.

How much work overhang can be tolerated? Study Figure 16. This is an example that is impractical, namely about ten diameters overhang.

As a youth, I was taught "The Five Rule": Five diameters is the maximum depth a straight hole can be drilled, and five diameters chuck overhang is the limit for lathe work. That is an excellent guide, although not absolute. Figure 17 shows the five diameter overhang.

Where Can We Work?

Near the chuck. Figure 18 shows about two diameters overhang that can be worked with great ease. Figure 19 shows cutting a center with about four diameters overhang. Workable, but would be much easier nearer the collet.

Where feasible, work close to the collet as exampled in Figure 20. That is a very



Figure 13. Chucks: three-jaw, wheel chuck, and three larger collets.

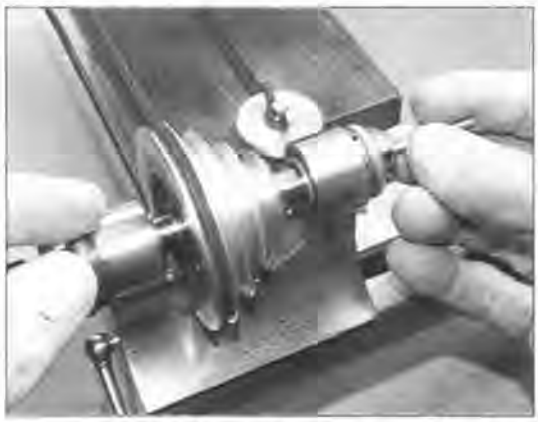


Figure 14. Chucking: All pieces must be clean. Open the collet slightly and slip the piece straight in.

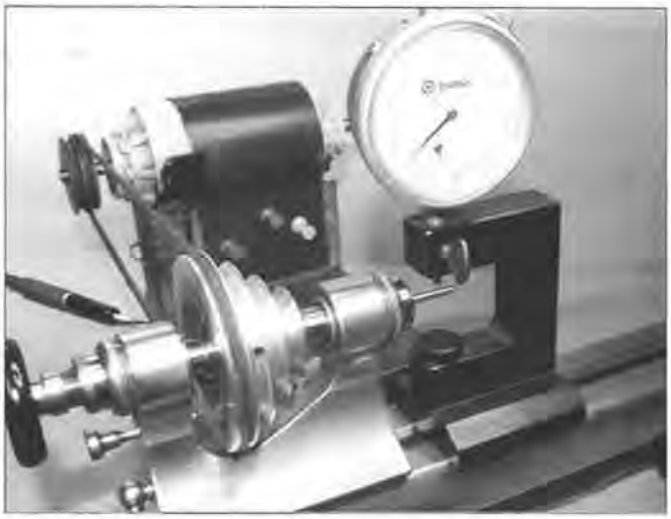


Figure 15. A dial gauge shows run-out. This shows importance of working close to the collet.

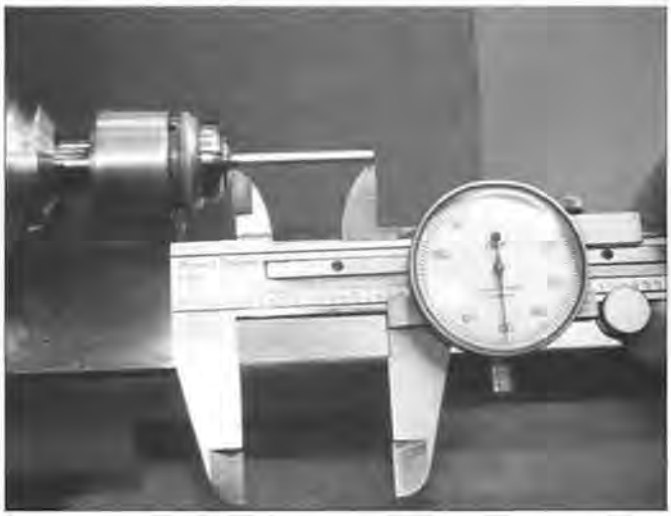


Figure 16. Ten diameters overhang: not practical without an outboard support.

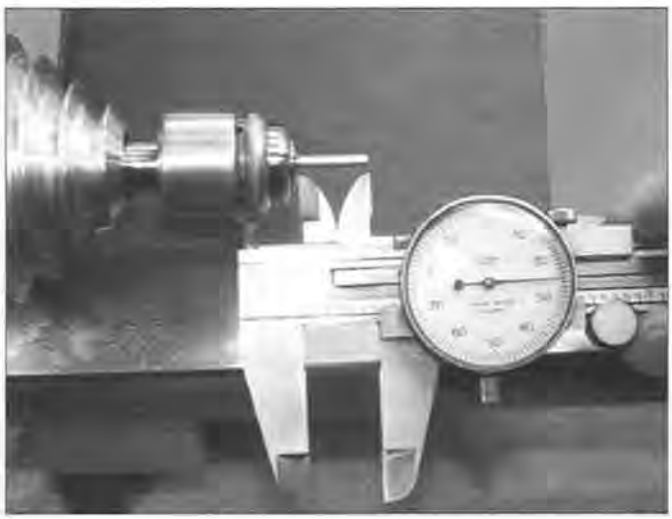


Figure 17. Five diameters overhang: This is about the practical limit to work without outboard support.

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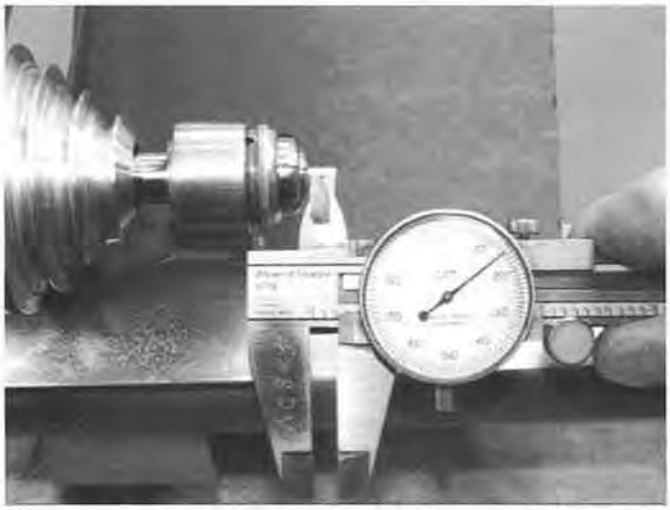


Figure 18. A little less than two diameters overhang: This may be worked with great ease.

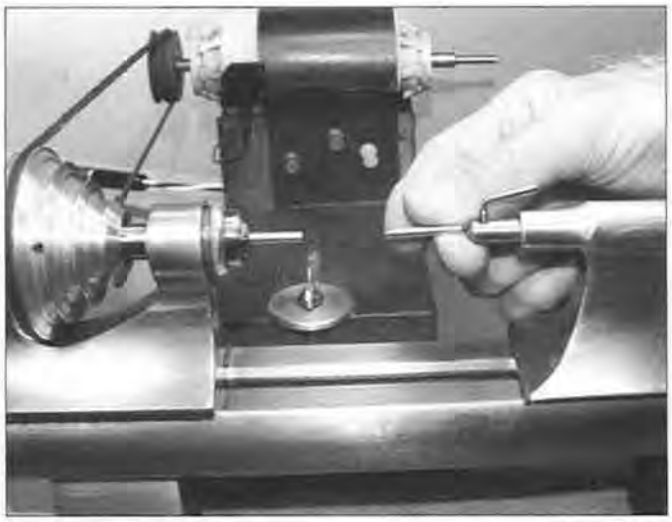


Figure 21. The point center of Figure 20 now fits into the tailstock runner.

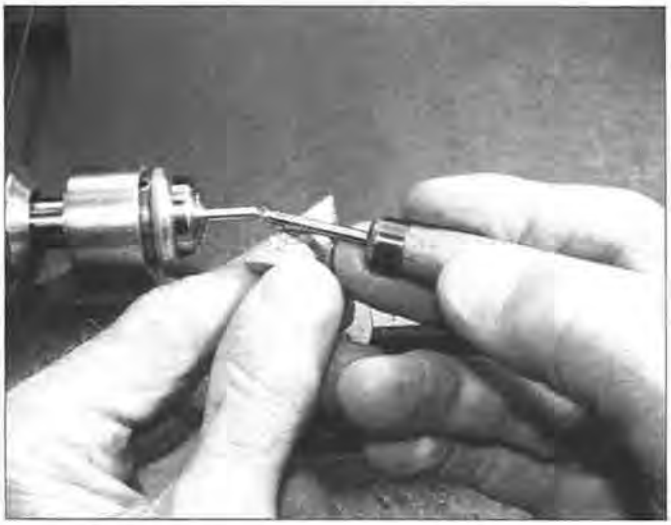


Figure 19. Cutting a cup center: Less chuck overhang will make the job easier.

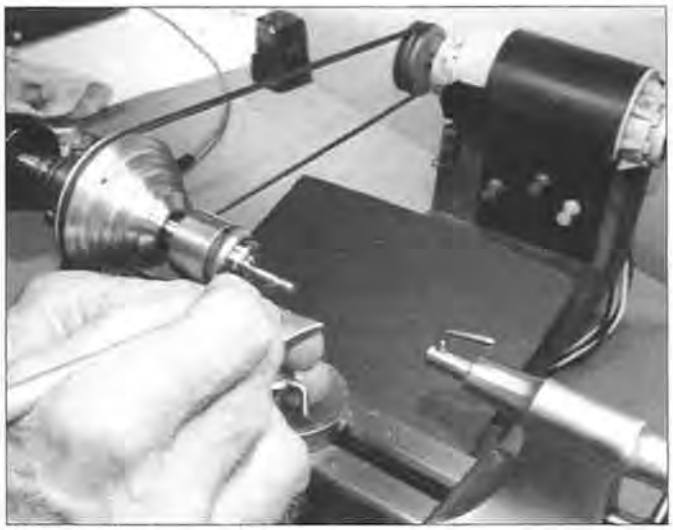


Figure 22. The cut-off tool shown in Figure 5 cuts away a short length of material.



Figure 20. Cutting a point center: Working near the collet makes the job very easy.

easy task. In Figure 21 the lathe is being prepared to support a job between centers. Later in this series I will show numerous jobs worked between centers.

How Do We Handle Small Pieces?

In Figure 22, we use the hobby knife cut-off tool to cut a piece of brass rod 1/8 inch diameter, about two diameters long. Overhang at the cut appears to be 3-4 diameters. This is a reasonable choice. However, if the cut was made closer to the collet, a faster feed-rate could be used and the job more time efficient.

The small piece of Figure 22 will receive more machine work. Let's say we will face the raw-end, and drill a through-hole. How do we handle that small piece? Very simple, cut almost free. Exchange ends and secure the small piece in your collet. And, "break-away" the handle. That is illustrated in Figure 23.



Figure 23. From Figure 22, exchange ends and break away the handle.



Figure 24. Small Drills: Work close to the collet. Rest the bit on a fingertip. Hold the pin vise lightly.

Look over Figure 24. Machine the raw end, drill the hole. Insert a suitable round broach, slack the collet, and lift your piece out on a handle.

By choice of your work methods, this lathe work is so easy that it is like "going on a paid vacation."

What Is Next?

Don't let your copy of *HT* get away. This will be a long-run series of things that have never been published in horological literature. More examples to demonstrate a lifetime of lathe skills.

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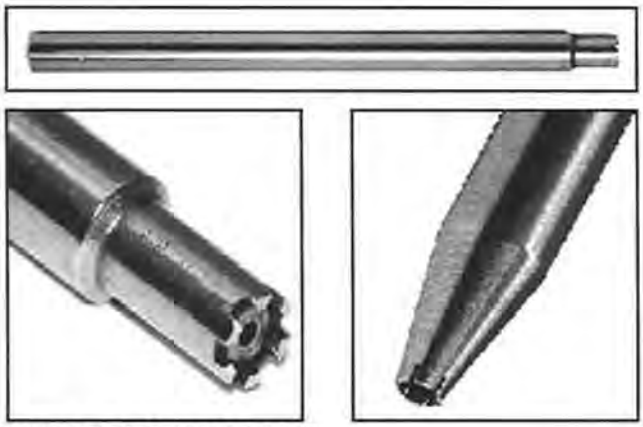
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Jack Kurdzionak, CW

From the Workshop

You Are Invited

Do you have a solution to a watch or clock repair problem that you want to share with our membership? Do you have a question about a repair problem you would like to ask? I invite you to participate in this column with your suggestions, questions, and comments. It's easy. Just e-mail me at AWI<magazine@awi-net.org> or write using the old standby known as the postal service. You can even fax me at 513-367-1414.

I will do my best to help you help the membership. By sharing your questions and suggestions all of our members can benefit from our combined knowledge and experience. The ideas, tools, techniques and products presented in this column are suggested by the author and contributing members and are not endorsed by any manufacturer, supplier, advertiser or AWI itself.

No One Said It Was Easy

A contributor to the AWI Matters chat room asked how to remove a single broken piece of steel from a watch plate while not causing any damage to other steel components in the plate that cannot be removed such as minute wheel posts and springs that are riveted to the plate. Several chemicals, including alum or vinegar, will do the job by slowly corroding the steel part and not attacking the brass. Here in our shop we use white vinegar to etch steel parts to remove them from watch plates. It is slow, but effective and does not discolor the plates themselves. That being said, the vinegar, or any chemical etching, is not selective. It removes all steel parts including the ones you don't wish to remove.

We have worked around that difficulty by dipping the entire watch plate into melted paraffin wax so that the plate is entirely coated with a thin layer of wax. Next the area around the steel part we wish to etch is carefully scraped to expose the steel. The plate is then soaked in vinegar for a few days until the steel has been removed. The wax prevents the other steel parts from etching during this tedious process. When the etching is complete, the watch plate is boiled in water to remove the wax. This is the hardest part of the job. Allow plenty of time for this process. It works, but it isn't easy.

Jack Kurdzionak

Where There's a Will, There's a Way

Member Philip Stoller wrote, "Dear Jack, I thought I would share this experience with you in hope that it may be helpful to other watchmakers. Recently, I got Seiko's relatively new Perpetual Calendar (8F32) in for a battery. This 3-volt lithium cell is #2412. When I ordered it from my supply house, a note came back from them saying that they are not selling these cells. They said these watches are required to be sent back to Seiko Watch Co. (COSERV) for the battery change. By the time I received this news, I already had a tech guide and setting instructions ordered and on the way from AWI. As a note, I feel this is one of the greatest benefits to AWI membership. Rarely it seems, a month goes by that I don't have AWI doing something for me, mailing out a tech guide, looking up a company's address and phone number, searching for material for me. This is really helpful.

Anyway, I wasn't going to give up so easily. We have two places in town that specialize in batteries, everything from watch batteries to car batteries. I checked with one of these places and the #2412 was available. After purchasing three and returning to the shop, I installed the cell and followed the setting instructions. It is somewhat involved as all the date setting is electronic and not through the stem. You will need to place the watch upside down over a mirror so you can see the date change as you make the electrical contacts. It is involved, but not impossible by any means.

I don't know if all the supply houses are refusing to sell these cells or not. After asking an industry person about it, he confirmed that Seiko is having all these watches returned for batteries. I guess they've had too many problems with them. I don't know if it is because of the watch itself or because of untrained people changing the batteries. The one I changed seems to be working fine."

After reading Philip's letter, I made a call to Seiko Watch Co. (800-722-4452) at their New Jersey facility to check on the availability of these

cells. The material clerk there said that they do sell #1612 cells for the lady's perpetual model and the #2412 for the gent's model. Even though material dealers may no longer be supplying these cells, they are available from Seiko Watch Co. and some independent resellers of batteries. Call Seiko Watch Co. for prices and shipping charges. For further information to help with the installation of these cells, please refer to the December 2001 issue of *Horological Times*. If you don't have a copy, please call AWCI for a photocopy of the article.

Jack Kurdzionak

Keeping in Shape

Member Steve Settle wrote, "A Customer brought in a vintage quartz watch in a 14 Karat case that needed, among other things, a new case tube. In the dim well of my memory I remembered a bench tip from the late "Jingle Joe" Crooks which was published many years ago in the *HT*. Joe had said, that when replacing a case tube in a lightweight or thin case, it was always good practice to remove the crystal and movement (of course!), and leave the case back on. The addition of the case back prevents any distortion or bending of the case. This is even more important with today's gold cases that are about the thickness of two sheets of watch tissue. This might not be possible in every 'case' (pun intended), but you will need to exercise caution."

AWI-ELM Trust Annual Battery Contest

Send your used watch batteries to the AWI-ELM Charitable Trust before July 28, 2003 to have them counted in this year's weigh-in. Please be sure to include the name of the Affiliate Chapter you want your batteries credited to for the weigh-in contest. At this time we are asking for *silver* batteries only. We have not been able to find a buyer for the lithium, mercury or alkaline cells.

The Trust uses the funds raised from these donations to help support the Library, Museum and other educational needs of AWI members. Mailing pouches are available from AWI. If you are planning to attend this year's annual meeting you may bring your batteries with you but if you are flying please think about sending them ahead as the airports may not allow them on the plane.

Mark A. Baker
ELM Trustee

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Book Review

Robert D. Porter, CMW



Clock Design and Construction by Laurie Penman, Published by the American Watchmakers-Clockmakers Institute, 701 Enterprise Drive Harrison, OH 45030. ISBN 0 918845 19 X.

This popular and sought-after book has been out of print for some time. Fortunately, it has just been reprinted by The American Watchmakers-Clockmakers Institute.

This 2002 edition is a 7" x 11", 144-page, hardcover book that offers the reader the benefit of the author's lifetime of experience as an engineer and teacher of clock making and repair. Mr. Penman is currently serving as clockmaking instructor for AWCI.

Clock Design and Construction seeks to show the design of clocks, methods of making the various parts, and some of the calculations that are commonly used. This book begins with a useful glossary of words and their definitions related to the art of horology. The glossary is followed by seven chapters that discuss clock design and the related practical work involved with creating a clock from "scratch." A bibliography and an index complete the book.

Part One: Aspects of Clock Design

Part one discusses the various aspects of clock design as it relates to floor, mantle, wall and portable clocks. The author helps to sort out the many ways that can be used to design and power the type of clock movement the reader may want to build. The many example calculations and illustrations clearly explain the how and why of clock design.

Part 1-A, Practical

The second section of part one deals with the power source for the clock, and explains how to determine the dimensions of a mainspring barrel, an arbor, and a constant-force fusee.

Part Two, Trains

Part two examines the timekeeping train from the power source to the escape wheel. The module system of gear design is clearly explained. Several illustrations depict the gearing layout and the resultant force vectors to be considered when designing a clock, as well as how to reduce pivot friction.

Part 2-A, Practical

The topics discussed at length in this section include: arbors; case-hardening; heat treating and quenching; finishing pivots; making the square on a barrel arbor; lantern pinions; and wheel and pinion dimensions.

Part Three, Escapements

Part three is a concise explanation of the common escapements in approximately historical order beginning with the crown wheel and foliot; crown wheel with pendulum; dead-beat verges; the recoil anchor escapement; bent strip anchor; tic-tac; Brocot; and platform escapements.

Part 3-A, Practical

Part 3-A explains how to calculate the gear train and number of teeth required for the crown wheel of the verge escapement. A practical method of marking out the divisions of the crown wheel is illustrated. Fabricating the verge for the crown wheel is also explained and illustrated. Other topics include the fabrication, adjustment or repair of knife edges and seating; suspensions; impulse faces; hardening; mounting of the anchor to its arbor; the bent strip anchor; the dead-beat anchor; as well as Brocot and platform escapements.

Part Four, Plates, Posts and Pillars

This chapter explores and explains the supporting structure of a clock movement – the plates, posts and pillars as used in ancient, modern and clock tower movements. The advantages and/or disadvantages of each type of structure are discussed in detail.

Part 4-A, Practical

Comprehensive construction information regarding pillar and post fastenings – riveting, pinning, latching and threaded connectors is offered and illustrated in this section of the book. A useful table of typical pillar dimensions and tooth modules will help the reader to select the pillar dimensions for any clock he or she may wish to build. Other topics of discussion include the turning and drilling of pillars; planting the train; turning posts; fixing pillars; fastenings; fitting support bridges; the minute wheel and post; fitting the arbors; clearance; polishing; finishing the plates; scraping; burnishing; assembly and final polish; setting up; putting in beat; recoil and deadbeat faults, and platform adjustment.

Part Five, Pendulums

Just about everything you ever wanted to know about pendulums is included in this chapter. The lore of the pendulum is clearly explained and illustrated with mathematics, charts and graphs galore to help you design and make a pendulum for your clock. Topics include: timekeeping; temperature compensation; Harrison's grid-iron pendulum; mercury compensation; Graham compensation; bi-metal and barometric compensation; displacement; weight of bob; suspensions; regulator cocks, and suspension springs; knife edges and crutches.

Part 5-A, Practical

This section of the book begins with a discussion of the basic pendulum consisting of a suspension, rod and bob. The methods and materials to be used to make the various components is also explained and illustrated. The author discusses shop safety; how to spin a shell bob; mounting rating nuts; the Brocot pendulum adjustment mechanism; weight trays; regulator suspensions; crutches; the Harrison grid-iron, as well as the trapezoidal pendulum.

Part Six, Striking

Topics in part six include: count striking, rack striking; calculating the strike train; hammers; the rack pivoting point; rack spring and tail; lifting piece; bells and gongs; the fly, and starting and stopping the striking train.

Part 6-A, Practical

Part 6-A is made up of useful and practical information about barrels; count wheel/locking plate; common plate; toothed count wheel; mounting the count wheel; making a hoop wheel; levers; racks; cutting the rack teeth; making the snail; gathering pallet; the drop; warning piece; final adjustments; pipes and posts; drilling small holes for taper pins; the fly; hammer wheels and stops; bells and gongs; hammers; rack springs; hammer spring; half hour striking; strike on passing.

Part Seven, Dial Design and Making

Mr. Penman explains and illustrates the important elements that should be considered when designing and making a dial for your clock. Should you use a painted dial, silvered dial, an engraved dial or other materials for your clock dial? What type of numerals should you use? How should you divide the dial? How do you blue or black the hands for your clock? These questions are all answered in part seven.

A bibliography of recommended reading and a useful index complete this book.

Clock Design & Construction is one of the best books this reviewer has read about designing and making clocks. Anyone who aspires to make or repair clocks should have a copy – it is highly recommended.

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John F. Kurdzionak

Affiliate Chapter Report

In today's business environment, providing a good product, good service, and doing so at a reasonable and competitive price, (and doing so better than the competition does it) is important to any businesses' success. Most people know these facts as consumers. Nobody would tolerate poor service or quality, or expensive, unreasonable prices, in his purchases or business dealings. As a consumer, these facts are obvious to you. But they should be obvious in your watch and clock repair businesses as well. Are they?

Consumers doing business with watch or clock repair shops want a good product (with regard to repairs) and good, fast service; and, they want reasonable and competitive prices as well. Providing these above-mentioned things to watch or clock repair customers is of vital importance to the survival and expansion of any watch and clock repair business. The shop must do what it does (the repair of timepieces) and do it well, and quickly, at a price consumers are willing to pay.

Poor quality repairs, slow service (regardless of quality), or otherwise poor results (and a reputation for any of the above) will limit the numbers of customers willing to do business with a shop. Put simply, if quality is poor or service is slow, few people will do business there. This is universally true in business. If quality and reputation are excellent, but it takes over a year to complete a repair, although the repair quality is admirable, this is nevertheless "slower-than-slow" service, and business will still suffer as a result. There is a balance that must be found.

For the self-employed watchmaker or clockmaker, finding that balance takes time, practice, and the experience gained from being in business. In seeking that balance, recall that trying to repair too many things for too many people (or stepping outside one's area of proficiency or expertise on timepiece repairs), in my opinion, serves not only to compromise quality, but also to fill one's bench drawers and shop shelving with a backlog. The attempted repair of such items cannot be done well or efficiently, and takes one away from repairing the items at which he's proficient. Worse yet, it also occupies (steals) much, or most of, one's personal time and a good deal of his emotional energy as well. This is not good business practice for a shop, and will rob any watch or clockmaker of not only profits from his labors, but also of precious, irreplaceable time on the Earth.

In seeking a "balance," complicating the matter is the issue of pricing. Even if a watchmaker is "Superman," who can repair anything, and who provides super quality and super fast service, if his rates are "Superman" as well, (prices too high for the public's liking), he will still have fewer customers because of the perception that he's overpriced.

Of course most people aren't Supermen, but regardless of what timepieces one attempts to repair or his skill at doing them, prices that are too ***low*** might overwhelm him with work as well...more than can be physically or mentally handled by anyone. He will then become one of the many watchmakers or clockmakers who has a "6-month backlog" that never diminishes. He's always working nights and weekends because he's not earning enough dollars per hour during the workweek to pay the bills. Thus, he never has time for anything, or anyone, else because he's always working overtime at the bench. The 6-month backlog is always "6 months." Our hypothetical watchmaker cannot escape from this endless cycle. He always works but never puts a dent in the pile of jobs awaiting repair.

Therefore, finding "the balance" that leads to superb customer service while earning profits for the watchmaker is of prime importance, but as illustrated above, finding that balance is subject to many variables. It is not as easy as it appears it should be. In fact it's not easy at all, and is actually fairly complicated. To paraphrase a line from *Profitable Watch and Clock Repair* by Jack Kurdzionak: "If watchmaking was easy or highly profitable, there would be a watchmaker or two in every town."

For the self-employed person, earning a good living from watchmaking or clockmaking and profiting from his labors is ***not*** easy, unless the self-

employed watchmaker or clockmaker ***makes*** it easier on himself, and ***makes*** it profitable, by taking steps to invest in himself, and in his shop.

As has been illustrated, learning what to repair (and what to avoid), assessing one's strengths and weaknesses, and finding one's niche in a certain part of the repair market are vital to the success of a watchmaker or clockmaker, but are learned only from experience. And learning how much to charge (for a given level of fixed expenses, desired salary and benefits, and for the given number of hours one chooses to work in a week) is more difficult to ascertain and comes only with ***much*** experience.

There's no "secret formula" for quickly finding the balance that will lead to that success...it will take time and experience. But with that passing of time and the gaining of that experience, "the balance" will "find YOU."

In the meantime, steps can be taken to make a watch or clock shop, and its owner, better and more efficient at what they do. The result is that the public will receive better repairs faster, and the watchmaker or clockmaker will profit while doing so. The watchmaker or clockmaker will also get many of his nights and weekends back, and that 6-month backlog of work will disappear.

Next time, we'll touch on a few issues that will allow the watchmaker or clockmaker to "work smarter, not harder," in his search of "the balance."

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AWI Board Voting Results

The Board of Directors has unanimously approved the motion to accept the list of candidates for directors presented by the Nominating Committee for the Board of Directors.

The Board of Directors accept the nominations of the following seven candidates. All have met the Constitutional requirements for serving as a director.

Charles A. Atchison
Alice Carpenter
Jim Door
Glenn Gardner
Wesley Grau
Roland Iverson
James Zimmerman

The following motions have been unanimously approved by the Board of Directors.

Motion (1) from the Certification and Education committees: MOTION (1) to change the bylaws Article IV - CERTIFICATION Sec. 2 by removing lines (e) Certified Master Electronic Watch Technician and (f) Certified Master Electronic Watchmaker, and replacing them with (e) Associate Watch Technician and (f) Certified Watch Technician.

Explanation for change: With the dissolution of the two current AWI certifications, "Certified Master Electronic Watch Technician", and the "Certified Master Electronic Watchmaker" the skills required for both of these former certifications will be applied to the two new disciplines, AWT and CWT. AWI will continue to recognize these former certifications but would no longer administer these exams. Over the last several months the Education Committee and Certification Subcommittees have been engaged in a discussion of the Certification programs for the Watch element of AWI. It has been observed that too many changes have occurred in the Watch trade, which were not reflected in our current programs. The Certification Subcommittee went to work studying this situation and developed a different approach to meet these circumstances and provide for: (1.) The watch profession's need for an educated basic on-the-spot (point of sale) worker, (2.) A more definitive relationship and completeness between the title and the worker's abilities, (3.) Easier membership acquisition of certified titles with an opportunity to grow, (4.) Our fully Certified Watchmaker will be competent in BOTH quartz and mechanical work which is what is needed today, and (5.) With the demands for restoration, our Master's certification will show that level of competency, just to list a few. After final debates, we all agreed that the proposal was an excellent one, which will give AWI's certificates more clarity and acceptance in the marketplace and with our many European and American Watch Companies. There are details to be worked out and logistics to be finalized but these do NOT detract from the quality of the proposal. Our Committees ask that you review the above proposal and approve it for the use of our fellow members so that we may bring AWI one-step closer to its mission statement of being the "premier educational institution."

Motion (2) from the Certification and Education Committees:

MOTION (2) to establish a document titled "Rules Governing Certification" which will include the Certification operations process and Certification appeal process.

Rules Governing Certification
Certification operations process:

1. The individual members of the Certification Committee will each be responsible for the preparation of all watch/clock movements needed for the exams that they are grading. These movements will be prepared in advance, and in sufficient quantity, and then returned to AWI for distribution as needed.

2. Regionalized testing would be employed for the CC, CMC, AWT, CWT, CW, and CMW examinations via our facility in Harrison Ohio, and qualified REC schools or Industry facilities. Examinations will be scheduled on an as-need basis when there is sufficient request to justify the expenditure.

3. Qualified REC schools will be allowed to administer the CC, AWT and CWT exam upon official request for their students, but the exams will always be returned to the Certification Committee for grading.

4. In all other cases exams will be administered by a qualified member or appointee of the Certification Committee.

5. The AWT, CWT, CW, and CC exams will be scheduled simultaneous, and at a mutual location, with a time frame of 2 - 3 days for completion.

6. The CMW and CMC exams will be scheduled simultaneous, and only at AWI (due to the level of machinery and tools required), with a time frame of 5 - 6 days for completion.

7. All written certification examinations will be open book.

8. Each watch/clock (or movement) and the written portion of each exam will be graded individually and require a minimum passing grade of 75%.

9. Failure to achieve a minimum passing grade of 75% on any individual aspect of an exam will require the Examinee to retake that portion within 1 year, or to retake the entire exam after 1 year.

10. The AWI Certification Committee reserves the exclusive right to appoint and/or enlist qualified moderators for any and all certification examinations.

11. Immediately upon AWI Board approval of any changes to this document, all AWI watch certification examinations will be suspended (a period not to exceed 180 days) allowing appropriate time for the Education Director, Education Committee, and Certification Committee to update examination parameters accordingly.

Certification appeal process:

These Certification Appeal Rules (the "Rules") shall govern the process for any individual wishing to appeal a failing grade on any part of an AWI Certification Exam. All individuals taking AWI Certification Exams have previously agreed

as a condition of taking the exam that this appeals process is the exclusive means by which to seek review of a failing grade. Moreover, all individuals have agreed that this appeals process shall be final and binding upon the individual and AWI.

1. Notice of Appeal. Any individual wishing to appeal a failing grade on any part of the AWI Certification Exam must file a written Notice of Appeal with the AWI Executive Director within thirty (30) days of receipt of his or her Certification Exam result. The form of the Notice of Appeal is available at AWI's headquarter office by calling (513) 367-9800. The Notice of Appeal must be filled out, signed and received at AWI's headquarters within the thirty (30) day deadline in order to be effective.

2. Certification Committee Review. Upon receipt of the Notice of Appeal, the Executive Director shall submit an appeals packet to the Certification Committee for review. The package shall contain the Certification Exam, but shall not disclose the identity of the individual seeking appeal. Within ninety (90) days of the receipt of the Notice of Appeal by AWI, the Certification Committee shall review the Certification Exam and vote on whether to uphold or overturn the failing grade. All votes shall be by the majority vote of the Certification Committee, but the member of the Certification Committee that originally graded the Certification Exam shall not participate in the voting. The individual shall be promptly notified of the results of the Certification Committee's vote.

3. Executive Committee Review. If any member of the Certification Committee dissents to the Certification Committee's decision to uphold a failing grade, then the individual appealing the failing grade shall be granted a further right to appeal the Certification Committee's decision to the AWI Executive Board. The notice from AWI informing the individual of the Certification Committee's vote in upholding the failing grade shall also notify the individual if he or she has the right to appeal that decision to the AWI Executive Committee. If the individual is given that right, he or she must exercise it within thirty (30) days of receiving the results of the Certification Committee's vote by sending a written notice to the AWI Executive Director requesting the appeal to the Executive Committee. The Executive Committee shall consider the appeal within ninety (90) days of the receipt of the notice by the Executive Director. The Executive Committee shall uphold the failing grade or overturn it by majority vote. The individual appealing the failing grade shall be promptly notified of the Executive Committee's action once it is taken.

4. Binding Decision. Except as noted in Section 3 above, all decisions of the Certification Committee in upholding or overturning a failing grade shall be final and binding upon AWI and the individual appealing the failing grade. In the event that the individual appealing the failing grade is given a right to appeal to the Executive Committee, then the action of the Executive Committee in upholding or overturning the final grade shall be final and binding upon AWI and the individual appealing the failing grade.

Rules governing certification:

1. Certified Clockmaker: The practical work requires the examinee to diagnose, overhaul, and repair one modern German Westminster chime spring-driven mantel type clock. The diagnostic portion requires the examinee to determine if he/she must make any of the following repairs: Repair or replace power spring(s), Rebush bearing(s), Replace broken teeth and/or pins in wheels, Correct and repair damaged levers and springs in the striking mechanism, Synchronize the striking sequence, Straighten bent wheel teeth and/or pivots, Polish pivots and pinions, Replace the suspension spring, Adjust the hands, Adjust the escapement, Complete any other repairs deemed necessary to put the clock in a condition that it would perform satisfactorily for the customer. Lathe Work: The examinee will be required to repivot and replace two teeth in a clock wheel furnished by AWI. The examinee will complete a written and practical examination.

2. Certified Master Clockmaker: Must pass the exam for and serve at least two years in the grade of Certified Clockmaker. Note: Those with at least five years of verifiable professional bench experience may take the upgrade at any time following successful completion of the Certified Clockmaker exam. Lathe Work: The examinee will have a choice between these two projects, either make a two-wheel and one-pinion gear train or make a rack and snail striking mechanism. The Gear Train Project: The examinee will be required to cut two wheels and pinions and upright them as a partial train between two plates with pillars. The Rack & Snail Project: The examinee will be required from one given measurement to calculate, lay out, and construct an operable rack and snail strike mechanism. The examinee will complete a written and practical examination.

3. Associate Watch Technician: (AWT). This certificate discipline will require a person to be competent in the types of basic watch service that are frequently performed on-the-spot at the point of sales: For example, changing batteries, adjusting a watch bracelet, replacing a bracelet or strap, replacing a gasket, identifying simple problems, identifying basic types of watch movements (such as quartz, mechanical, solar, kinetic), etc. This certificate discipline will be granted via correspondence course and/or participation in an appropriate AWI bench course(s). There are no prerequisites.

4. Certified Watch Technician: (CWT). This certification will require a person to be competent in the skills required for at-the-bench service of a basic modern quartz or mechanical watch: troubleshooting, cleaning and oiling, water resistance, replacing movements and/or movement components, etc. This certification will be granted when passing scores are obtained on an AWI certification examination. There are no prerequisites.

5. Certified Watchmaker: This certification will require a person to be competent in the skills required for at-the-bench service of a basic modern quartz or mechanical watch: troubleshooting, cleaning and oiling, water resistance, replacing movements and/or movement components, etc. This person will also be required to possess the abilities to accomplish complex troubleshooting, replace a specific part (such as a balance staff), adjust an escapement, replace a damaged jewel, adjust a hairspring, set-up (coordinate) a complex calendar mechanism, adjust a modern mechanical chronograph mechanism, etc. This certification will be granted when the examinee has passed an AWI certification examination, written and practical. There are no prerequisites.

6. Certified Master Watchmaker: In addition to the requirements of the Certified Watchmaker, this person will be required to possess the abilities to identify complicated watch movements and their parts, fabricate replacement parts (such as staffs, stems, springs, levers), re-pivot a watch pinion, vibrate a hairspring, etc. This certification will be granted when the examinee has passed an AWI examination, written and practical. And only after this person has held the title of CW for a minimum of two (2) years, or has six (6) years of verifiable professional bench experience.



Laurie Penman

Education Update

We are already well into April, and the last couple of months have been very busy as we prepared explanations of our educational programs and ambitions for the ELM Trust's quarterly (i.e., spring edition) newsletter created by Gary Richards. That is not all that has been going on of course.

The winter evening classes have finished and the spring session began April 30th . Changes have been made to the clock repairing classes, watch repairing and the clockmaking ones.

In fact, they are more in the nature of extensions than changes. All of the classes are still scheduled as a session of ten evenings from 5.30 p.m. to 8.30 p.m., but we have contacted local High School Career and Guidance Counselors as a means of bringing the professions of clockmaking and watchmaking to the attention of young men and women on the verge of making decisions about their professional careers.

The purpose of the classes is to give the students insight into the work and study involved, as well as to the rewards of the profession. Gary and I prepared fliers, letters and small announcements for the school notice boards and invited the career and guidance counselors to a morning meeting and tour of AWI, complete with refreshments, so that we could show them what we do here. The response to our invitation was less than what we had hoped for, but those who did attend got a very deep insight into what we are doing at AWI and the ELM Trust, what we intend to do in the future, and how they can help promote the professions of clock and watchmaking to their students. I must say that the counselors' enthusiasm and appreciation for our profession and their interest in our profession as a career opportunity for their students was very exciting. We parted with the feeling that we all had a very successful and enlightening morning. A second meeting and tour for the career and guidance counselors was held on April 22nd.

Clockmaking now has a simpler program for new attendees. There is a timepiece employing wheels and pinions that may be bought (to save time) or one based on David Lindow's Banjo clock movement. The latter is supplied complete, but totally unfinished. Unlike the regulator project, which continues into this session, the level of skills and the demands of time are not so great and well within students' ability to finish during the session. The banjo is an attractive clock and we hope that this class will be popular.

Evening classes now take place on Monday and Wednesday evenings, but in the event that attendance is too great for the existing scheduled days, AWI is prepared to add another evening class to its schedule. Clock repairing courses have been scheduled to run in sessions of five days throughout the spring, summer and early fall. There are eleven weeks in all and these classes may be taken separately (making your choice of classes that are of particular interest to you) or as a complete program starting from the absolute basics and the setting up of a workshop and clientele to the remaking of escapements and the replanting of repaired gear trains.

Any groups that are interested in one or more of these classes to be run in their own venues outside of Ohio, are encouraged to contact Nancy Wellmann. Nancy will be happy to give you all of the information you need pertaining to requirements for the venue, the needs of the instructor and the costs involved, which, of course, is less expensive than having to drive to Harrison and staying overnight at a hotel.

We see these out-of-state classes as being a very useful and practical way to provide our members with additional training and information regarding the management of their own businesses. Each class stays closely focused on the stated aims of the course. However, the courses and instruction will also be somewhat flexible, meaning that problems that do not fit within the course's classification will also be addressed. These classes are designed to be practical and fun at the same time, so there is always time to stray outside the strict structure of the class.

Don't forget that you may contact AWI via e-mail or the telephone for information and possible solutions to problems that you may come across in the normal course of clock repairing. Judging from the increasing number of telephone calls that I am receiving these days, that message is apparently getting through, but it never does any harm to repeat it. There is a wealth of information at AWI's headquarters here in Harrison, Ohio, and we want to encourage you to take advantage of it. For more information, call 1-866-367-2924 x 303 or e-mail Nancy at nwellmann@awi-net.org.

EDUCATION

Bench Courses

To schedule a Bench Course in your area please contact AWI for complete information. A list of available Bench Courses is printed here for your convenience. To register for Bench Courses, please mail, phone, fax or e-mail your registration and payment information to: **American Watchmakers-Clockmakers Institute, 701 Enterprise Drive, Harrison, OH 45030-1696; Toll Free 1-866-367-2924, Phone (513)367-9800, Fax (513) 367-1414, E-mail: educate@awi-net.org** PLEASE NOTE: Registrations are limited and will be selected by the earliest date received. Please include a check or charge card number (Visa, Mastercard, Discover or American Express), card expiration date, signature and phone number. All registration fee checks and charges are processed immediately upon receipt. ***DEADLINE FOR REGISTRATION IS 30 DAYS BEFORE THE SCHEDULED DATE OF THE COURSE.*** • Indicates Bench Courses held in conjunction with a convention or purchased by an AWI Affiliate Chapter. For more information on these specific courses, please refer to the contact information provided for each class.

DATE	CLASS	INSTRUCTOR	LOCATION	FEE
MAY 2003				
3-4	Clock Escapement	Jerry Faier	Boston, MA	$250.00
JUNE 2003				
14-15	Cuckoo Clock Repair	Rick Dunnuck	Madison, WI	$250.00
21-22	Beginning Lathe	Robert Porter	Philadelphia, PA	$250.00
SEPTEMBER 2003				
6-7	Beginning Lathe	Robert Porter	Minneapolis, MN	$250.00
20-21	Clock Escapement	Jerry Faier	St. Louis, MO	$250.00
OCTOBER 2003				
11-12	Cuckoo Clock Repair	Rick Dunnuck	Baltimore, MD	$250.00
18-19	Basic Pocket Watch Repair	Alice Carpenter	Nashville, TN	$250.00
NOVEMBER 2003				
8-9	Beginning Lathe	Robert Porter	Dallas, TX	$250.00

AWI BENCH COURSES

Advanced Clock Repair

Beginning Lathe

Clock Case Repair

Clock Escapements

Cuckoo Clock Repair

ETA Products

Filing & Flat Polishing

400-Day Clock Repair

Hairspring Vibrating

Introduction to American Pocket Watches

Introduction to Clock Repair

Introduction to Quartz Watch Repair

Lathe Program

Mechanical Watch Repair

Micro Lathe Operations

Mechanical Chronograph

Organize Your Work Habits for Success

Platform Escapements

Repair of the Atmos Clock

Repair of the Bulova Accutron

Seiko Kinetic Quartz Watch Repair

Sequential Chime

Servicing ETA Quartz Chronographs

Striking Clocks

A Study of the Deadbeat Escapement

Swiss Auto Quartz

Horological Times Contributors' Guide

The *Horological Times* is the official publication of the American Watchmakers-Clockmakers Institute. Published monthly, each issue contains features written by recognized experts dealing with the techniques of servicing and repairing watches, clocks, and jewelry; the uses of shop tools and equipment; and the functional characteristics of mechanical, electronic, and antique timepieces. Additional monthly editorial copy includes book reviews, workshop tips and industry news.

Suppliers from throughout the industry advertise monthly in *Horological Times*. This, combined with a large classified ad section, provides a great resource for all horologists.

Who is this guide for?

This guide is for anyone who would like to publish their work in the *Horological Times*.

What type of material do we want in the HT?

Horological Times is pleased to consider material relating to any aspect of horology or allied subjects which may be of interest to the readership. Both practical and theoretical articles are welcomed, as are reviews of equipment, books, etc.

Writing Style

Horological Times is aimed at both professional horologists and novices with a wide range of skills and interests. Good use of photos and illustrations is particularly appreciated.

Length

Articles of any length will be considered. Even very short articles are welcome. Note that long articles may be split into installments and the author will be contacted if this is necessary.

Helpful Hints for Taking Pictures

- Black and white glossy pictures reproduce better than pictures with a matt or color finish. A 35 mm color slide is preferred for magazine cover photos.
- A 35 mm camera with a set of extension tubes, or a macro lens will make close-up picture taking much easier.
- Plenty of light on the subject you are photographing is important to capturing the image you want for your article. Steady the camera against something solid to help prevent a blurred image.
- A fairly fast film, such as Kodak Tri-X, with a "speed" of ASA 400 is a good all-around film. Faster ASA films such as 800 tend to lose detail and are grainy. Slower films capture more detail, but also require a longer exposuretime under the same lighting conditions - which may result in a blurred image unless the camera is held rock steady.
- Camera shop owners are a great source of useful information about cameras, film, and picture taking. There are many good photography books available at your local library as well. Good luck with your picture taking!

Rejections

New and established writers are encouraged to contribute to the *Horological Times*. Material may be rejected if it needs further development or if the subject matter is not of sufficient interest to the readership. Material which may jeopardize the interests of the Institute or its members will normally be rejected. The *Horological Times* Advisory Committee and Staff will be as helpful as possible and will give feedback on why an article has been rejected, although the right to reject material without giving a reason is reserved.

Review Process

All material received will be reviewed by the *Horological Times* Advisory Committee prior to publication. The editor will acknowledge receipt of material submitted for publication within one week of its submission. The article will then be sent to the *HT* Advisory Committee for the review process. All reviews will be completed within two weeks of receipt. All correspondence regarding the review process will be shared with all committee members and the editor in order to facilitate discussion if necessary. If the review process results in a tie vote of *HT* committee members, the final decision to publish/reject an article will be a joint decision between the editor, *HT* Advisory Committee Chairperson and the AWI Executive Director.

Editing

Horological Times reserves the right to make editorial changes to the material submitted. This may be to improve clarity, or for technical reasons relating to the layout of *Horological Times*.

Author's fee

Horological Times pays all authors. Pay is based on article content, length and illustrations. Executive Board Messages, Letters to the Editor, Affiliate Chapter Reports, Industry News, etc., are not paid submissions.

How to submit material

Please submit your article electronically in any format readable by Microsoft Office 2002. Text and illustrations should be sent as separate files – please do not merge illustrations into the text. Photos and bitmaps should be provided as a TIFF or JPEG of sufficient resolution to provide 300dpi at the size likely to be printed. Photos should be as clear and as uncluttered as possible. Diagrams should be in a format readable by Adobe Photoshop 7.0. All submissions should be accompanied by a hard copy.

Copyright issues

Horological Times copyrights all material printed. Writers can retain the copyright but should grant certain rights to the Institute. As a minimum you grant the Institute the right to publish your article once, in paper form, to a maximum print run of 5500. You may also grant further rights to the Institute, and we would strongly encourage you to do so. In that way you will make a further contribution to the horological community. These additional rights are: to reproduce your article, or parts of it, in paper form for the purposes of training and education; to publish your article, or an extract from it, on the Institute's website; to allow your article to be made available in computer-readable form (such as a CD); to reprint your article at any future time without seeking permission or making further payment. If you have concerns about copyright issues you are encouraged to seek legal advice.

Your legal obligations

In order to protect the Institute from legal action, the authors must make sure they have appropriate legal ownership of the material submitted for publication. Normally this is automatic for material you have written yourself (unless you have already given the copyright to someone else). Be careful with other people's material which you incorporate into your submission, for example diagrams and photographs. The authors of that material must give you permission to use it in your article, and they must agree to the rights you grant the Institute.

Publication date

It is not normally possible to guarantee the publication of an article in any given month. This is because the amount of editorial work varies. Some articles need to be reviewed, and some may need editorial changes. The editor may also wish to contact the author to discuss the article. The editor is always pleased to discuss publication dates.

Submissions

Please send your submissions to: *Horological Times*, 701 Enterprise Drive, Harrison, OH 45030; E-mail: dbaas@awi-net.org
Phone 1-866-367-2924 ext. 307 or 513-367-9800

New Members

Arkansas
Venditti, Andrew F.—Star City, AR

California
Grimmick, Hank—San Ramon, CA
Koski, Karl R.—Goleta, CA
Pampos, Luis J.—San Bruno, CA
Patel, Prakash—Pasadena, CA*
Scott, John E.—Eureka, CA

Florida
Bachmann, William R.—Margate, FL*
Wallace, Oren R.—Hollywood, FL

Georgia
Colyer, William—Valdosta, GA
Forrester, David—Buford, GA
Johnston, Richard—Atlanta, GA
Murray, David—Tucker, GA

Iowa
Bentley, Ronald J.—Cedar Rapids, IA

Maryland
Kim, Peter—Bethesda, MD

Michigan
Carter, Holly M.—Spring Lake, MI

Minnesota
Gaulke, David—Crosslake, MN
Peterson, Jan—Saint Paul, MN
Tuerk, Jim E.—Saint Paul, MN

Mississippi
Sowell, Dale—Senatobia, MS*

Missouri
Hamilton, Gary—Ballwin, MO

Montana
Scheer, Tim—Bozeman, MT

Nebraska
Murphy, Bob—Omaha, NE

New Jersey
Felberbauer, Manfred—Secaucus, NJ
Weissman, Barry—West Windsor, NJ

New Mexico
Van Getz, Ralph III—Albuquerque, NM
O'Rear, Joel R.—Tucumcari, NM*

New York
Adamowicz, Alex—Hampton Bays, NY
Chow, John—Flushing, NY
Incorvia, Philip—Port Jefferson, NY
Kotsopoulos, Alkis—New York, NY*

North Dakota
Miller, Wayne L.—Grand Forks, ND

Ohio
Garber, Michael A.—Bradford, OH
Thomason, Brandon L.—Fairfield, OH

Oklahoma
True, Karren—Okmulgee, OK

Oregon
Nien Quoc Luu—Salem, OR
Oakes, William—Beaverton, OR
Rousseau, Warren—Grants Pass, OR
Woolsey, Charles—Harrisburg, OR

Pennsylvania
Brown, Robert C.—Birdsboro, PA

Tennessee
Abbott, John D.—Memphis, TN

Texas
Geers, Jerry—Midland, TX
Isham, Mark—Fort Worth, TX
Norris, Bruce—Garland, TX
Wyrick, Stephen—San Antonio, TX

Utah
Logsdon, H. Lane—Salt Lake City, UT

Virginia
Lehman, Jack—Portsmouth, VA
Mangold, Helmut G.—Amherst, VA

Washington
Chien, Danny—Redmond, WA

Canada
Siu, Frankie—Coquitlam, British Columbia
Reed, Ken—Pickering, Ontario

International
Arevalo, Roberto Jr.—Makati City, Metro Manila, Philippines
Wong, Tommy K.M.—Baguio Villa, Pokfulam, Hong Kong

***AWI welcomes back these individuals who have chosen to reinstate their membership.**

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"The times they are a changin'"

AWI's 43rd Annual Meeting — July 31– August 3, 2003

"The times they are a-changin'" and Bob Dylan isn't the only one a-noticin'. AWI's President Jack Kurdzionak began the Mid-Year Meeting in February with a reference to the popular Bob Dylan song.

President Kurdzionak invites you to join him, the AWI Board of Directors, Affiliate Chapter representatives, six excellent experts in horology, and other horologists from near and far, for the AWI 43rd Annual Meeting. Meet with us July 31– August 3, 2003 at the Hilton Greater Cincinnati Airport, 7373 Turfway Road, Florence, KY 41042-1356. For reservations call 1-800-HILTONS or call the hotel direct at 859-371-4400. **Deadline for hotel reservations is July 11, 2003.**

Thursday, July 31, 2003

9:00 a.m. - Noon	Research & Education Council (REC) Hilton Conference Room II
Noon - 1:30 p.m.	Lunch on your own
1:30 p.m.- 5:00 p.m.	The Chronometer Club Business & Technical Forum (Members & Applicants only) Hilton Conference Room II
3:00 p.m. - 6:00 p.m.	Registration Hilton Greater Cincinnati Airport
6:30 p.m. - 7:30 p.m.	New Member Reception Hosted by Membership Committee
7:30 p.m. - 10:00 p.m.	Affiliates' Orientation and Round Table Reception

Friday, August 1, 2003

TBA	Cooking Class (spouse program) Jungle Jim's International Market
8:00 a.m. - 9:00 a.m.	Registration Hilton Greater Cincinnati Airport
8:00 a.m. - Noon	Affiliate Chapter Meeting Keynote Speaker: TBA
10:00 a.m. - Noon	J.M. Dodson Perpetuation Fund Meeting
10:00 a.m. - Noon	Industry Advisory Board (IAB) Meeting
Noon - 1:30 p.m.	Lunch on your own
1:30 p.m. - 5:30 p.m.	AWI Board of Directors Meeting
6:15 p.m.	Bus leaves for ELM Trust Dinner Gruen - Time Hill

Saturday, August 2, 2003

(Note: No Board Meeting on Saturday)

8:00 a.m. - 9:00 a.m.	Registration
8:00 a.m. - 9:30 a.m.	
Dr. Matthew Clark	*Watch Patents*
Laurie Penman	*TBA*
Scott Chou	*Seiko Perpetual Calendar*
9:45 a.m. - 11:15 a.m.	
Charles Cleves	*Rolex Watches*
Jerry Faier	*TBA*
Greg McCreight	*Modern Technology for Clock Repair*
10:00 a.m. - 3:00 p.m.	Trade Fair
11:30 a.m. - 1:30 p.m.	Luncheon Buffet
1:30 p.m. - 3:00 p.m.	
Greg McCreight	*Modern Technology for Clock Repair*
Laurie Penman	*TBA*
Scott Chou	*Seiko Perpetual Calendar*
3:15 p.m. - 4:45 p.m.	
Dr. Matthew Clark	*Watch Patents*
Charles Cleves	*Rolex Watches*
Jerry Faier	*TBA*
6:00 p.m. - 7:00 p.m.	President's Reception
7:00 p.m. - 10:00 p.m.	Dinner Buffet & Awards Program

Sunday, August 3, 2003

8:00 a.m. - 9:00 a.m.	Grand Cafe Breakfast Buffet
9:00 a.m. - Noon	AWI Board of Directors Meeting

"The times they are a changin"

AWI's 43rd Annual Meeting — July 31– August 3, 2003

Registration Deadline: July 1, 2003

(Please type or print all information requested)

Name:_____ AWI Member No.:_____

Company/Affiliate Chapter:_____

City:_____ State/Province _____ Zip/Postal Code _____

Phone:_____ Fax:_____

E-mail:_____

Spouse's Name:_____ Guest's Name:_____

Child #1: _____ Age: _____

Child #2: _____ Age: _____

Child #3: _____ Age: _____

Registration Fees	Received by July 1	After July 1
Weekend Package*		
AWI Member	_____ @ $205.00	_____ @ $255.00
Spouse/Guest	_____ @ $100.00	_____ @ $150.00
Children (under 12)	_____ @ $ 45.00	_____ @ $ 95.00
Saturday Package**		
AWI Member	_____ @ $165.00	_____ @ $215.00
Spouse/Guest	_____ @ $ 65.00	_____ @ $115.00
Education Package***		
AWI Member	_____ @ $125.00	_____ @ $175.00

Friday Cooking Class for Spouses _____ @ $ 65.00
Jungle Jim's International Market
Minimum 30 attendees to hold class. (Send no money at this time.
Just mark the number of people attending. Payment is due at registration.)

Friday Night ELM Trust Dinner _____ @ $ 60.00
Gruen - Time Hill

***Weekend Package Includes:** Thursday: Round Table Reception; Friday: Affiliates and Board Meetings; Saturday: Technical Presentations, Luncheon, & Dinner/Awards Program; Sunday: Breakfast Buffet

****Saturday Package Includes:** Saturday: Technical Presentations, Luncheon & Dinner/Awards Program

*****Education Package Includes:** Saturday: Technical Presentations & Luncheon

Note: Program changes will be announced as they occur.

❑ Check ❑ American Express ❑ Discover ❑ MasterCard ❑ Visa

Name on Card _____

Account # _____ Expiration Date _____ Signature _____

Please make checks payable to AWI. All fees must be paid in advance; credit cards will be processed upon receipt. Payment in U.S. Funds, drawn on a U.S. Financial Institution. No refunds for cancellations after June 30, 2003.

AWI's 43rd Annual Meeting
701 Enterprise Drive Harrison, OH 45030
Toll Free 1-866-367-2924, ext. 301 Fax: 513-367-1414 E-mail: orders@awi-net.org

AWI'S 43RD ANNUAL MEETING
JULY 31– AUGUST 3, 2003
VENDOR REGISTRATION
DOOR PRIZE – ELM TRUST DONATION

AWI would like to invite your participation in the AWI 43rd Annual Meeting at the Hilton Greater Cincinnati Airport in Cincinnati, Ohio. Exhibitors may reserve a table for $225 for Saturday, August 2, 2003 from 10 a.m. to 3:00 p.m. This will also entitle two people to have lunch with the convention attendees. Deadline for vendor registration is July 1st.

Company Name_____

Address_____

City _____ State _____ Zip _____

Phone _____ Fax_____

E-Mail_____

❑ Please reserve a table for us to exhibit during the AWI 43rd Annual Meeting. The following people will be attending:

Name _____ Title _____

Name _____ Title _____

❑ A door prize will be sent to AWI for the drawings held during the Trade Fair and at the close of the convention. This entitles our company to be listed as a convention sponsor.

The generous financial support of persons interested in preserving the past and building the future of horology augments the AWI-ELM Charitable Trust. Your donation will contribute to the education of the next generation of watchmakers and clockmakers or to maintaining the historical record of the craft.

Please accept this donation of $_____ to the AWI-ELM Charitable Trust

Payment Method:

❑ Check ❑ American Express ❑ Discover ❑ MasterCard ❑ Visa Total _____

Name on Card _____

Account # _____ Expiration Date _____ Signature _____

The American Watchmakers-Clockmakers Institute is now offering

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Health Insurance for Individuals & Groups with $15 Generic prescription drug copay, $10 Vision Benefit, $5 Million per person limit

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Life Insurance

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Vision - $15 copay for exam and $15 copay for lenses!
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*Programs are not available in all states. Plans may vary by state.

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Industry News

Cas-Ker Appointed Schohl Crystal Cutter Distributor

The Cas-Ker Company has been appointed the distributor of the Schohl Crystal Cutter. The Schohl Crystal Cutter makes crystals in any shape from blank pieces of mineral glass. It can duplicate any flat watch crystal pattern and can cut complex shapes so that even the most delicate watches can be fitted in minutes.

The machine is easy to use, you don't have to be a watchmaker or have special skills to start making watch crystals right away. The entire crystal cutting process takes from 7 - 10 minutes and costs about $2.00 for each crystal. This affordable, American-made machine retails for $975.00.

For purchasing or additional information, please contact the Cas-Ker Company at 800-487-0408.



China Watch, Jewelry & Gift Fair 2003

The China Watch, Jewelry & Gift Fair 2003, originally scheduled for April 25-28, 2003, will be held June 25-28, 2003. The Fair will be held at the China Hi-tech Fair Exhibition Center.

For more information visit their web site: www.szwatchfair.com

Rechargeable Watch Movement Allows for More Bells and Whistles

Dakota Watch Company is the sole U.S. manufacturer of a new technology that is revolutionizing the watch industry. This ground breaking mechanism, REQ (Rechargeable Electromagnetic Quartz) movement, lets the company design a not-so-everyday quartz wristwatch with more functions than ever before, all without ever changing the battery?

"New electromagnetic technology has now allowed us to design a watch that should never need a battery replacement," said Co-President of Dakota Watch Company and watch designer Martin Cooper, "A watch battery normally has a limited life span, but the Dakota REQ is different, it can be recharged as often as necessary through induction charging."

Every REQ comes with a charger stand, which transmits power to the watch movement without using wires. Depending on the different functions and how often they are used, a full charge can last up to one year. Charging an REQ is as easy as charging a cell phone.

The Dakota REQ not only changes the way the watch runs, but also lets more complicated applications take place within the movement. Dakota Watch Company has used this technology to create two new innovative products. These watches offer multiple functions such as a LED flashlight and vibrating alarm never seen before in any timepiece.

"We realized the main problem with more "bells and whistles" is the drain on the battery, thus causing the need for constant battery replacements. We also realized this would be a non-issue with the REQ. Prior to REQ, you could not have a powerful dial flashlight as in the Dakota Torch, or a practical vibrating alarm like the Dakota Vibe on a watch," Cooper said.

Reinventing fire, the Dakota Torch is the first ever-rechargeable LED flashlight quartz watch. The watch has six LED's that illuminate the face of the watch for 20 seconds and with a second push of the button is bright enough to use as a flashlight. Whereas, the Dakota Vibe is an ani-digi watch that can be set to vibrate up to eight times at any given time for silent reminders throughout the day.

The Dakota Torch and Dakota Vibe have made a powerful entrance into the market this winter, gaining the REQ line both national and international attention.

"The public's opinion of the Torch and Vibe has been outstanding. Customers coming to my store crave products that are unique. The new REQs are definitely one of a kind but they still offer practical functions within the movements. Both watches use the REQ movement to go beyond the call of a typical quartz watch," said Tina Gunter, Area Supervisor of Dakota Watch Co. in Chicago.

Dakota Watch Company offers 23 styles of the Dakota REQ that retail between $150 and $275. Every Dakota REQ comes with a charger stand and a 10-year warranty. The watches are available at most Dakota Watch Company locations and the company's web site, www.dakotawatchco.com.

To order a catalog or find out more about the product please contact Mandy at 1-800-829-6066, ext. 330 or e-mail marketing@dakotawatch.com.

Dakota Watch Company was founded in 1945 in Cincinnati Ohio, and has grown into a watch manufacturer and retail company with over 200 store locations in regional malls across America.

Tourneau Returns to the Intricate World of Complicated Timepieces with the Introduction of its New Horologie Collection

Tourneau, the world's largest watch store, as recognized by Guinness World Records, is returning to its century-old roots by expanding its line of fine timekeeping products to include its newest collection of complicated watches, the Horologie Collection. This distinguished, Swiss made collection is comprised of four new gents' timepieces all featuring specialized, high-quality movements and hand assembled, multi-level dials. Watches from Tourneau's Horologie Collection are currently available at all Tourneau stores across the country.

The signature timepiece in Tourneau's Horologie Collection is a special, limited edition chronograph called Gotham, a name that invokes not only the spirit of the city in which it was designed but the deco look of this Swiss made watch. The handsome stainless steel Gotham features a four level, hand decorated deco-style dial with an antique silvered guilloche center surrounded by a dense, high luster field of black anthracite. Applied silvered Roman hour markers are compressed to fit into the dial space in which they appear. Two silver and black chronograph subdials are displayed at the three and nine positions in addition to a date window at the six, in place of









the Roman hour markers. The outer edge of the main dial is also marked with a Tachymeter scale. These aesthetic details are rounded out with a black Louisiana alligator strap featuring a custom, stainless steel deployment clasp. Other notable features include an anti-reflective sapphire crystal, a screw down crown and a sapphire crystal exhibition case back, which allows the wearer to view the sophisticated, Swiss made, bi-compax Dubois/Deproz complication housed inside. This intricate complication utilizes a 25-jewel hand decorated, automatic, mechanical movement that ensures the accuracy and precision of this striking timepiece. The Limited Edition Gotham is limited to 100 pieces and retails for $2,850.

Joining the Limited Edition Gotham is the Gotham Chronograph. Also in stainless steel on a black Louisiana alligator strap with a custom deployment clasp, this chronograph houses a complex 25-jewel Valjoux Swiss movement. Its sleek midnight blue and dark silver tone dial is also comprised of four hand assembled layers and features three chronograph subdials, applied Roman hour markers, a date window and a Tachymeter scale. Additional features include an anti-reflective sapphire crystal, a screw down steel case back and a screw down crown. The Gotham Chronograph is available at retail for $2,450.

Tourneau's SportGraph completes the offerings in the company's new Horologie Collection. Available with a silver tone or black dial, the SportGraph is an automatic, stainless steel chronograph also featuring a 25-jewel Valjoux Swiss movement. The dial boasts three chronograph subdials, bold Arabic numerals, contrasting luminescent hands, a Tachymeter scale, and a day/date window. Utilizing an anti-reflective sapphire crystal, a screw down exhibition case back and a screw down crown, the SportGraph is available on a black crocodile strap with a custom deployment clasp for $1,895.

Since Tourneau's establishment in 1900, the family-owned and operated business has always been committed to providing the best customer service and finest selection of quality products. In the last ten years, it has continued to expand its reach across the country, opening retail stores with the Tourneau name throughout America. To date, the company has both Tourneau and Tourneau Watch Gear stores located in the country's most exclusive shopping districts, including New York, Florida, New Jersey, Georgia, Texas, Illinois, California and Nevada.

Tag Heuer Merges Liquidmetal Alloys and Groundbreaking Precision, Creating a New High-Performance Timepiece

Liquidmetal Technologies, the leading developer and manufacturer of amorphous alloys, announced that TAG Heuer, the fourth brand in luxury watch making, is featuring high-performance Liquidmetal® alloy as the casing of a new special edition, state-of-the-art digital movement timepiece. The internationally renowned luxury brand watchmaker is presenting the new product during the BASEL 2003 World Watch & Jewelry Show that opened today in Basel, Switzerland.



"This merger of new material technology and legendary quality validates the superior strength, finish and performance characteristics of our revolutionary alloys," said Liquidmetal Technologies' president and CEO John Kang. "We are delighted that TAG Heuer has chosen this prestigious watch and the renowned BASEL Show to introduce Liquidmetal alloys into their product line and showcase our attributes before the world's watch and jewelry industry."

The chronograph timepiece was unveiled at BASEL as the Microtimer Concept Watch. Built upon TAG Heuer's international reputation for precision, endurance and technological innovation, it is fitted with the first Swiss electronic movement accurate to 1/1000th of a second and other complex electronics tailored to reflect the performance-driven technology of Formula One motor racing.

According to TAG Heuer officials, the selection of Liquidmetal alloys for the Microtimer exemplifies the exacting standards of technological innovation and performance established in 1860 by the watchmaker's founder, Edouard Heuer. Liquidmetal alloys are 2.5 times the strength and twice the hardness of commonly used titanium alloys, making them ideal for luxury watches and jewelry. Their properties translate into a watchcase that is both scratch and dent resistant, while at the same time provides a high gloss that can be polished to a luxurious jeweler's finish. The unparalleled ability of Liquidmetal alloys to be cast into precision net-shape parts offers additional opportunities and advantages for their application in unique and sophisticated jewelry designs. Liquidmetal Technologies began product development efforts with TAG Heuer, and its parent company, LVMH (Möet Hennessy Louis Vuitton), in 2002.

JA New York Prepares for Brilliant Summer Event

JA New York, the jewelry industry's most prestigious event, is making sure New York is the place for buyers and designers to be this summer. According to Drew Lawsky, show director, JA New York, "The JA New York Summer show has everything you need to help grow your jewelry business from vast selections, to informative business seminars to networking events. We expect more than 13,000 industry professionals in attendance and merchandise from more than 1,900 exhibitors on display."

New dates and hours for the JA New York Summer show are Sunday, July 27 from 9:30 AM - 6:00 PM; Monday, July 28 and Tuesday, July 29 from 10:00 AM - 6:00 PM and Wednesday, July 30 from 10:00 AM to 3:00 PM.

Buyers looking for the next big ideas in the business won't want to miss the International Jewelry Design Guild's "Design Collections 2003," featuring more than 60 of the industry's top designers, as well as the New Designer Section and New Product Gallery.

Concours d'Elegance, a showcase of the finest watches, clocks and winding boxes from around the world, sponsored by the American Watch Guild, Watch & Clock Review and American Time, will return with an even bigger pavilion and a new surprise exhibition.

Other popular special sections include the Platinum Pavilion, Showcase of Style, Antique & Estate Jewelry, Place Vendôme, American Time's Watch & Clock Section, the Gift Gallery, AGTA's Colored Stone Section, DDC's Diamond Bourse, the Bench Jeweler's Marketplace and many international pavilions. Jewelry from every corner of the world will be on display, including Italy, Spain, Turkey, Germany, United Kingdom, Cyprus, Israel, India, Thailand, Hong Kong, Japan, Singapore, Poland, Pakistan, Taiwan, Brazil, and Belgium.

JA New York's Red Carpet Tour, a guided trip around this summer's show floor will reveal the jewels worn at celebrity award ceremonies and the inside stories of how the pieces got to the silver screen.

Attendees of JA New York's Educational Program will leave with much more than great merchandise and new business contacts. The educational experience at the summer show will include programs from Jewelers of America and Joyce Jonas' Antique & Estate Jewelry seminars with another series of timely topics and experts to keep buyers on top of industry trends and forecasts.

In addition, GIA's Career Fair 2003 will be held on Friday, July 25 from 9:00 AM to 3:00 PM with recruiting from 10:00 AM - 2:30 PM.

The JA New York Show continues after dark with summer fun and networking events for industry colleagues. Among the events to choose from are: JA New York and National Jeweler's dance party at the 1940s style Copacabana on Monday, July 28 from 6:30 PM to 10:30 PM, for industry networking with great food, cocktails and dancing. Nightly events include NYSJA's Awards Dinner in conjunction with the National Jeweler Hall of Fame Dinner at the Ritz Carlton New York in Battery Park on Saturday, July 26 with the reception at 7:00 PM and dinner at 8:00 PM; WJA's Dinner & Silent Auction at Pier 60 on Sunday, July 27 with the auction at 6:30 PM and dinner at 8:00 PM, Indian Diamond & Colorstone Association's Gala at the Marriott Marquis on Monday, July 28 at 6:30, and the American Gem Society's Circle of Distinction Dinner at the Rainbow Room at Rockefeller Center on Tuesday, July 29 with cocktails at 6:30 PM and dinner at 7:30 PM.

Readers interested in the latest information on exhibits, seminars and events at the JA New York Summer Show 2003, can visit the show web site: http://www.ja-newyork.com or by calling (800) 650-1591.

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COMMITTEE VOLUNTEERS WANTED

Immediately following the AWI Board of Directors annual meeting, the President of AWI will appoint committee members for fiscal year 2003-2004. AWI relies heavily on its committees to establish and implement goals for the year. If you have time and talent to spare, consider volunteering to serve. The committees listed below are those which are currently established in either the AWI Constitution or Bylaws. To familiarize yourself with the committees' goals and objectives, see *Horological Times*, November 2002, pp. 42-45. If you are interested in volunteering for a position on one or more committees, please call Jim Lubic at 1-866-367-2924 ext. 310 or e-mail *jlubic@awi-net.org*

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Protect your reputation and investments with a Ceres Tester

CERES



CERES CZeckpoint Diamond Tester

The Ceres CZeckpoint separates all known simulants (except moissanite) from diamonds and has been the easy answer for the vast majority of retail jewelers when they were faced with the decision of which diamond tester to buy. Why? Because it works reliably for years. The CZeckpoint has proven itself to work flawlessly, whenever needed.

590.785 Ceres CZeckpoint..... 119^{00}

- Unprecedented Limited Lifetime Warranty.
- Next generation XL digital electronics.
- Fastest warm up time - less than 10 seconds.
- Durable spring loaded XL tip.
- Exclusive metal warning buzzer.
- Superior Surface Mount Technology (SMT).
- Audible and visual diamond indicator.
- Includes rechargeable nicad batteries and AC adapter/charger.

Made in USA

CERES Secure II Moissanite Tester

With the introduction of synthetic moissanite, thermal testers alone can no longer protect you from fraud by simulated diamonds, since they can now be fooled. "Secure II" protects you from the latest simulant. To confirm it's a diamond, first use your thermal tester to eliminate the potential of all other simulants, then simply touch the stone to the Ceres Secure II.

- Superior Surface Mount Technology (SMT).
- Retractable, spring loaded, durable tip.
- Audible beep and visual yellow light indicates synthetic moissanite...if not, it's a diamond.
- Metal warning buzzer alert when touching mounting.
- Immediate recovery - no waiting between tests.

590.788 CERES Secure II Moissanite Tester ..... 118^{95}



Made in USA

- Loose stone holder in built-in compartment.
- Unprecedented Lifetime Limited Warranty.
- AC plug-in only.



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