HOROLOGICAL TIMES

February 1999

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COVER

This month's cover features "The Gem of the Packard Collection."
Photo courtesy of Alan Banbery, Patek Philippe.

President's Message

By David A. Christianson

One of the challenges that we have as an Association is our identity. AWI is well known within our own repair profession. But ... once outside our profession there is little identity. Within the jewelry industry, for instance, AWI is little or not known at all. When our Executive Director met with the Educators Forum of the Jewelers of America in Las Vegas last year, he was surprised to learn how little our colleagues knew about AWI. Our friends in the Jewelry Industry Distributors Association (JIDA) expressed surprise when they learned that AWI has a constitutional organization for industry, distributors, and manufacturers in the Industry Advisory Board. And even within our profession, little is really known about what AWI does or can do ... what it represents and what it can offer to members and non-members alike. If we are so poorly known in the jewelry profession, we are certainly unknown to the general public.

This is the challenge for AWI and more specifically for the Publicity and Public Relations Committee, which is charged with (1) seeking out ways to make AWI known to the watch and jewelry industry, the national public news media and the local members' public news media; and (2) to formulate a plan to advertise AWI's programs, schedules, services, and membership benefits to the watch and jewelry industry, which is our most direct source for new members.

This is a formidable task, yet it is an essential task ... because, if we as an association are to be effective, worthwhile and grow, we must become known ... and we must reach outside our own profession for new members and new spheres of influence. The jewelry industry, with their shop owners, managers, and sales counter personnel who provide repair services to the public, are the obvious people who can benefit from membership and training from AWI. Watch and clock collectors who are concerned with quality repair and restoration are also obvious persons who can benefit from membership, as well as technicians in the watch manufacturing, distributing, and manufacturers' servicing sectors.

It is the Publicity and Public Relations Committee's responsibility to find ways to reach these people and let them know what AWI can do for them and ... what they can do for us.

Executive Director's Message

By William J. Ewbank

There are times when it is darn hard to think of something to write. It is said that a famous New York sportswriter once observed, "It's easy to write, I just sit at my typewriter and wait until little beads of blood pop out on my forehead." Those were the good old days! Now, I sit at a computer and, once the blood starts to flow, the computer will silently stare back, frozen into an unmoving block of silicon

As those of you few dedicated insomniacs who follow my writings may have surmised, this is my annual February column, written on deadline just prior to our annual mid-year Board meeting, just after the holidays and just before the pace starts to pick up for the spring. I hate February!

Actually, I would like to reinforce some messages that appeared in our December and January issues. The AWI Education, Library and Museum Trust still needs the support of our members. As you will recall, the battery recycling program is now a year-round operation and the book acquisition program is a new idea that needs member involvement (Dec. 98). AWI and the Trust were founded for the specific purposes of advancing the trades of watchmaking and clockmaking through education. With your help we can start to put some real muscle into our student grant programs and begin the urgent task of bringing our paper library (one of the best English language collections) into the electronic and information age.

We are now facing an era of tremendous technological change and wonderful opportunities. As you will see in the thoughtful letters to the editor in this month's issue, more and more members are advocating new approaches to information sharing and learning. More members are also expressing the fear that AWI is missing the bus on the information highway. It is no coincidence that both letters were received here via e-mail. I admit we're off to a late start; but fear not, we still have some aces up our sleeve.

I have commented in the past that our members, barely six thousand of you rattling around in this enormous continent of ours, all too often lead lives of professional isolation. We now have the means to communicate and educate over the internet and through e-mail in ways that offer us a chance, for the first time, to put important technical data into your hands quicker and better than ever before. Keep your eyes on good old *Horological Times* for more announcements about the future.

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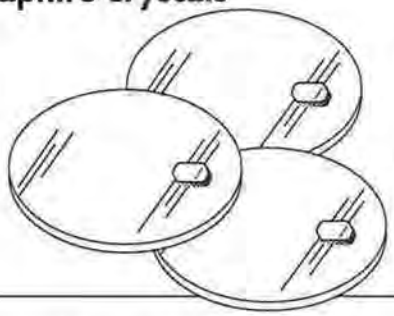

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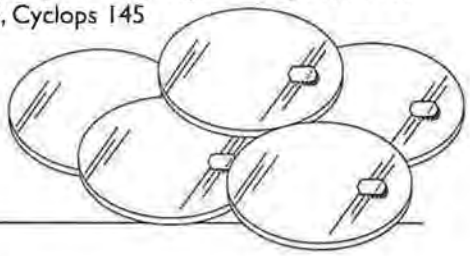

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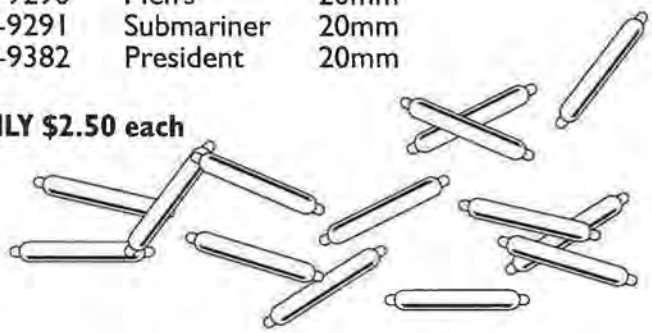

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Questions & Answers

Question

Specifically, my problem is this: how to exhaust the fumes from my cleaning fluids, especially the drying agent, so as not to have these odors permeate my one-room shop?

My first attempt at a solution was to buy an exhaust fan like one used in a bathroom. I was going to mount it in the wall and make a hood that would cover it and my cleaning bench. Unfortunately the manual for the fan says not to use with flammable chemicals. My cleaning fluid is water based so is not a concern but the drying agent although not explosive is flammable. I suppose the fan manufacturer is concerned that the vapor may be ignited by a spark caused by the electric motor as it passes through the fan. This seems highly unlikely to me but after just completing my new shop I am reluctant to take chances without first investigating other possible solutions.

This caused me to search for a fan with a sealed motor. They are available I am sure but all I have been able to locate are fans with large blades much bigger than would be necessary, as well as costing close to a thousand dollars. My bathroom fan only cost $69. Also, a fan that is too big would not only remove the fumes but also my heat in the winter and my cool air in the summer.

Perhaps that is the only option but I thought for sure that I am not the only one to have run into this problem. I have worked in or have been in seven different repair shops and not one of them had any means to exhaust the fumes. Maybe everybody just lives with it.

Is there such a thing as a non-flammable drying agent that works?

Michael Gainey, Columbus, Ohio

Answer

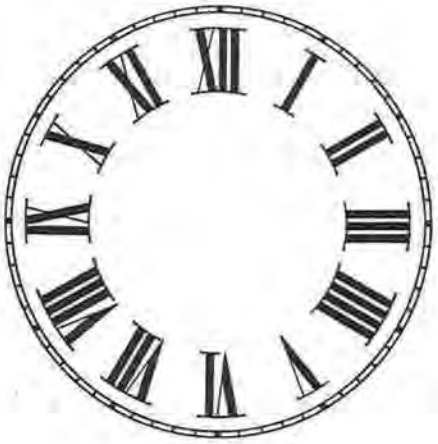
The majority of household-type ventilation fans utilize brushless, AC induction motors and do not constitute a direct ignition source. Although not certified for use in flammable vapor environments (the absence of certification releases the manufacturer from liability) these can generally be operated satisfactorily in areas (a) where such fumes are not present in copious quantities and (b) in which they are not the sole source of ventilation.

Some factors to consider when a fan is installed include: selection of a continuous duty fan with sufficient volume to exhaust the fumes efficiently, verification that the electrical wiring can handle the load, the exhaust vent location is clear of hot surfaces and power lines, and that the motor and associated ducting permit access for periodic cleaning.

Chip Lim, CMW, CMC, CMEW

Question

When writing numbers using Roman numerals, the number 4 is written "IV" but on timepieces with Roman numerals the number 4 is written "IIII". Why is that? All the other numbers are correct except the 4. Anything that you can provide will be helpful.



Tony Carter

Answer

The use of the numeral IIII instead of IV on clock and watch dials is generally considered due to aesthetics and balance rather than anything else. The IIII balances better with the VIII on the opposite side of the dial. It's not a perfect balance, but neither are the other numerals around the dial, but it is much more visually balanced than the IV.

David A. Christianson

New Items from Borel

For the latest in movements ask for our February '99 movement booklet. Lists over 490 movements in stock with prices. For your benefit we update and publish this booklet every 6 months to give you the most up-to-date listing of "in stock" movements. Includes movement sizes, thickness, functions, and hand size information. Prices shown so you can quote estimates quickly.

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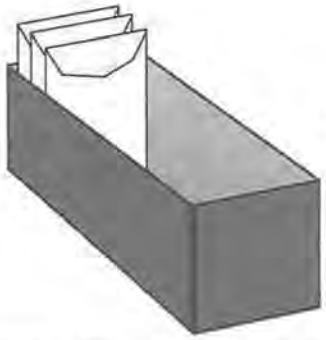

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Ask Huck

J.M. Huckabee,
CMC, FAWI, FBHI

Repair of a Broken Crutch Loop

Question

How can I repair a crutch loop that is broken? This is an older American clock and I prefer to retain the original anchor.

Answer

It's possible to make a good repair that is almost invisible. Much depends on finding a piece of brass wire of similar size.

My method is to make a silver soldered butt-splice in the region of a couple of inches from the anchor.

Cut the crutch wire at a suitable splice area and file the end square.

Take a piece of brass wire of suitable size, catch the end in a vise and stretch it. At about 20% elongation it will break. The wire will become smaller in the break region. The objective is to reduce its diameter in that area which will become the crutch loop. If area reduction is insufficient, pull, anneal, pull, etc., until the desired size is obtained. I heat in the stretch area with a small propane torch and pull with a large plier.

When a piece is of satisfactory taper it is cut to length needed and the large end filed square. Hold the two pieces in a suitable fixture for soldering. I use a pair of drill press vises on the bench top.

Prepare a very small chip of silver solder and lodge it in the joint; a little pressure from the holding fixture keeps it in place. Be sure alignment is good, and coat the area for about an inch with borax, or other suitable flux. Touch with a flame until the solder flows. The joint will be almost invisible and can be cleaned up with a bit of abrasive paper. Remember that the wire is not hard in the splice area.

Escape Wheel Topping

Question

What do you think about escape wheel topping? Is this practice recommended and how is it done?

Answer

Topping is an expedient to improve escapement operation when the wheel is out of round, has damaged teeth, etc. It is done by touching the teeth with a file or stone while being rotated in a lathe.

I will not argue against an occasion that an expedient repair must be made. But of all expedients, I dislike this technique most! Topping just trades one escapement problem for another.

If the wheel is untrue in round it may well be an arbor or pivot problem. A damaged arbor or pivot often shows up as an escapement problem.

A short tooth, if only to a small degree, can often be lengthened by peening that tooth in the wheel flat. Careful touch-up with a fine file can frequently result in a satisfactory tooth restoration.

If you elect to top the wheel, first be sure the arbor and pivots are straight, and that the wheel is supported on its own pivots.

Topping an escape wheel destroys escapement geometry. Be prepared for reworking the anchor. A strap-type anchor can be annealed in its lock-frame area for minor adjustment; of the solid type it could be a major job.

I've never been pleased with wheel topping, and would recommend avoiding the practice as a general rule.

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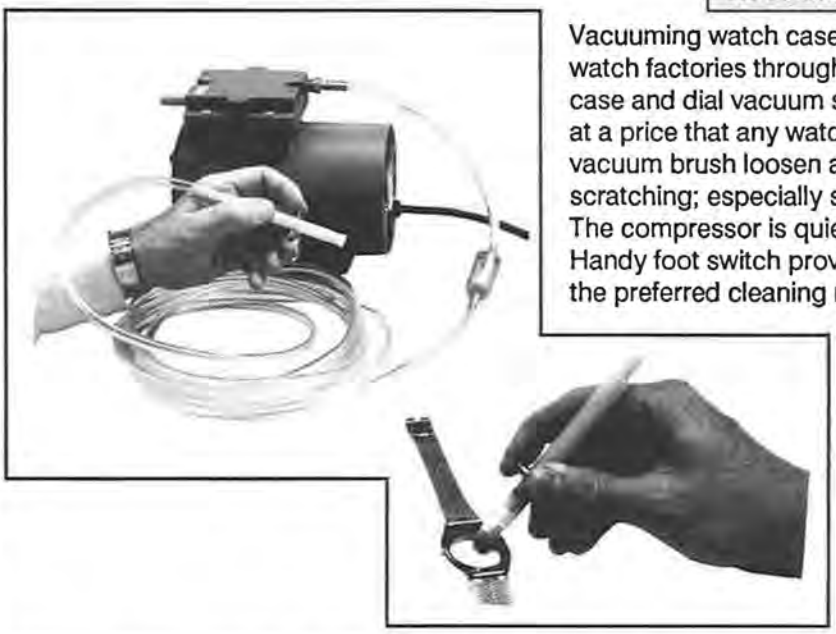

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Battery of Information

Enthusiasm Makes The Difference

Ewell D. Hartman,
CMW, FAWI

Have you had customers complain that the watch battery you installed lasted less than a year? Did you, in the interest of saving time and creating "good will," install a new battery without bothering to determine if the complaint was valid?

If, in the above situations, you replaced the batteries without determining the previous installation date or without diagnosing the reason for the problem, you have lost opportunities to build your battery business and your store or shop's image.

Every battery that is installed should be marked (scratched) with the first letter of the store's name, the letter of the particular branch (if there is more than one), the initial of the person who installed the battery, and the current month and year. As an example, if a battery was installed at "Best Jewelers," at the Regency branch, by Mr. Wilson, in February, 1999, the marking on the replacement would read: BRW 299. (Our store has a practice of marking an "N" after the BRW if it is a water resistant watch and the customer preferred not to pay for a water test.)

Marking "BRW 299" may appear to be time consuming, but it is invaluable when a question or problem arises with regard to a previous installation. It gives your battery warranty program substance, it enables you to know which staff member needs further instruction if the installation was incorrect in any way, and it gives you credibility if there is a "rust" claim based on the earlier battery replacement.

If you determine from your markings that the battery did fail within your warranty period, it is important to note any special functions of the watch such as a light or voice. (If such is the case, check to be sure that the existing battery is a high-drain type.) In this situation it is important to explain to the customer that these features use a great deal of current, that the battery life is primarily dependent on the frequency of light or voice use, and that the battery cannot be guaranteed for a specific period of time.

If the watch does not have a feature that uses a high amount of current, and the battery failed prematurely, the consumption of the watch should be checked. This can be done very quickly and will indicate whether the battery is defective or the watch is in need of a new circuit board or servicing of the mechanical portion of the movement.

The consumption test can usually be performed without removing the movement from the case. After selecting the correct replacement battery, place it so that its positive side is down and touching something metallic on the back of the exposed movement (do not install it in the battery cavity at this point). To read the consumption, set the meter on "microamps," then place the black (negative) test lead on the negative part of the battery and the red (positive) test lead on the negative cell strap in the movement. It is necessary to use a meter designed for watches, as it needs to be sensitive enough to measure current down to one microampere or less. If the meter does not have a built-in capacitor, you will need to supply one of at least 220 microfarads to be connected between the two test leads.

The total consumption reading will depend on the quality, size, condition, and age of the movement. Modern quartz movements may have a consumption as low as one microamp, and generally they should not exceed three microamps; older movements may use as much as six microamps. The Rolex "Oysterquartz" may consume as much as nine microamps. Accutrons will vary by model and will use from six to ten microamps. Dan Fenwick of SWTC pointed out that some quartz chronographs will be within these perimeters only when the recording mechanism is NOT running.

If the watch does not have any features that use a great deal of current, the existing battery is the proper drain, and the consumption of the watch is satisfactory, the last check is to be sure that no part of the circuit board can touch the back of the case (this may be a problem in some thin and/or lady's watches). While this is rare, it can be remedied by insulating the movement from the back of the case with a very thin piece of plastic wrap. An example of this problem is the ETA 280-001 and 280-002 movements. The leads from the quartz capsule rise slightly above the movement and can touch the case back in a very thin dress-type lady's watch. These leads can be insulated with a drop of GS crystal cement.

You are now in a position to replace the battery that appears to have been defective, or to take the watch in for servicing or repair. In either case, your image is that of a professional watchmaker. Recently we had a customer who had been to a number of other stores and was frustrated because he was not getting a solution to his watch battery problem. We were able to answer his questions and he then said, "I can assure you that I won't go ANY place else for watch batteries in the future." We sold a battery, but more importantly, we gained a customer!

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Letters to the Editor

All letters to the editor must be signed and bear the address and telephone number of the writer. Your address and telephone number will not be published without your permission. AWI reserves the right to edit letters for length and content. All letters should be concerning the Institute and/or issues specific to the field of horology. Please send your letter via: E-mail: Bill@awi-net.org; Fax (513) 367-1414 or mail to Horological Times, *"Letters to the Editor," 701 Enterprise Drive, Harrison, OH 45030.*

Dear Editor:

As a life member of AWI, instructor, committee member, committee chairperson, member of the Board of Directors and First VP, I see that AWI is at a critical crossroads in its history and more importantly its future and the future of horology in this country.

In the beginning of this organization there was a large and plentiful supply of horologists in this country, many had been trained via the GI Bill after W.W.II and Korea. There was also a good sized manufacturing sector for watches and related horological goods that was based in the U.S. During these earlier times AWI provided a valuable source of information and educational programs through the office, bench courses, and the magazine. But as with most aspects of life, things have changed and that brings me to the point of this letter.

We no longer have an abundance of watch and clockmakers in this country, nor do we have any horological manufacturing facilities located here. Essentially, horology in this country is a service-based trade these days. Therefore we must look closely at what we plan to do in terms of these changes and how we plan to address them in a constructive manner.

One way to address these changes would be to bury our heads in the sand and pretend they don't exist. This would be fatal, not only for AWI, but the horological trade in general. If we do not support the education and training of new horologists we will continue to see the steady decline in AWI membership, and the trade, that we are currently experiencing.

Also, since all of the American-based horological companies have either folded or left the country, we lack the close tie that we once had with an important industry. These days the vast majority of horological companies are based in Switzerland and Japan, and our relationship with them is minimal at best.

So what to do about these new facts of life? Several years ago the powers to be at AWI made a decision that we should become more aggressive in terms of our educational services and how they are presented and received by the membership and industry. A new facility was built and an educational director was hired. Our new facility has been provided with much needed tools and equipment, and our education director has been well educated in terms of what is required to survive in the horological trade these days.

Why were these new ideas implemented? In a nutshell, to gather some recognition from industry. Without the support of industry it will be impossible to train new horologists. There isn't enough support from the private sector to provide for this much training and since industry has a vested interest in making sure that their products are serviced properly, they should naturally be a part of the process.

AWI's mission in this "new order of horology" is quite simple, to provide a service to horology that will benefit everyone. AWI has the distinction of being the only professional horological organization in this country and is in a unique position of being able to provide a "neutral" zone where the horological trade and industry can work together to move forward into the next century.

I urge each and every member to support AWI as it establishes this "new order of horology." Certainly some of the changes that we have experienced are not easy to understand, but this is a long-term plan and will take time to implement. So please be patient and remember that it takes a lot more effort to build a bridge than to tear it down and at this place in time, we need as many bridges as we can build.

In the future, I can see AWI as being "the gathering point" for students, horology schools, horologists and industry, a common space that can bring all the necessary people and services together.

Ron DeCorte
Toledo, Ohio

Amen, Ron. There are so many of our perceived problems that can be best addressed if AWI takes its rightful place as the center of professional horology in the United States. This means establishing a good relationship with all our colleagues in the manufacturing and distributing sectors.

William J. Ewbank
Editor-in-Chief

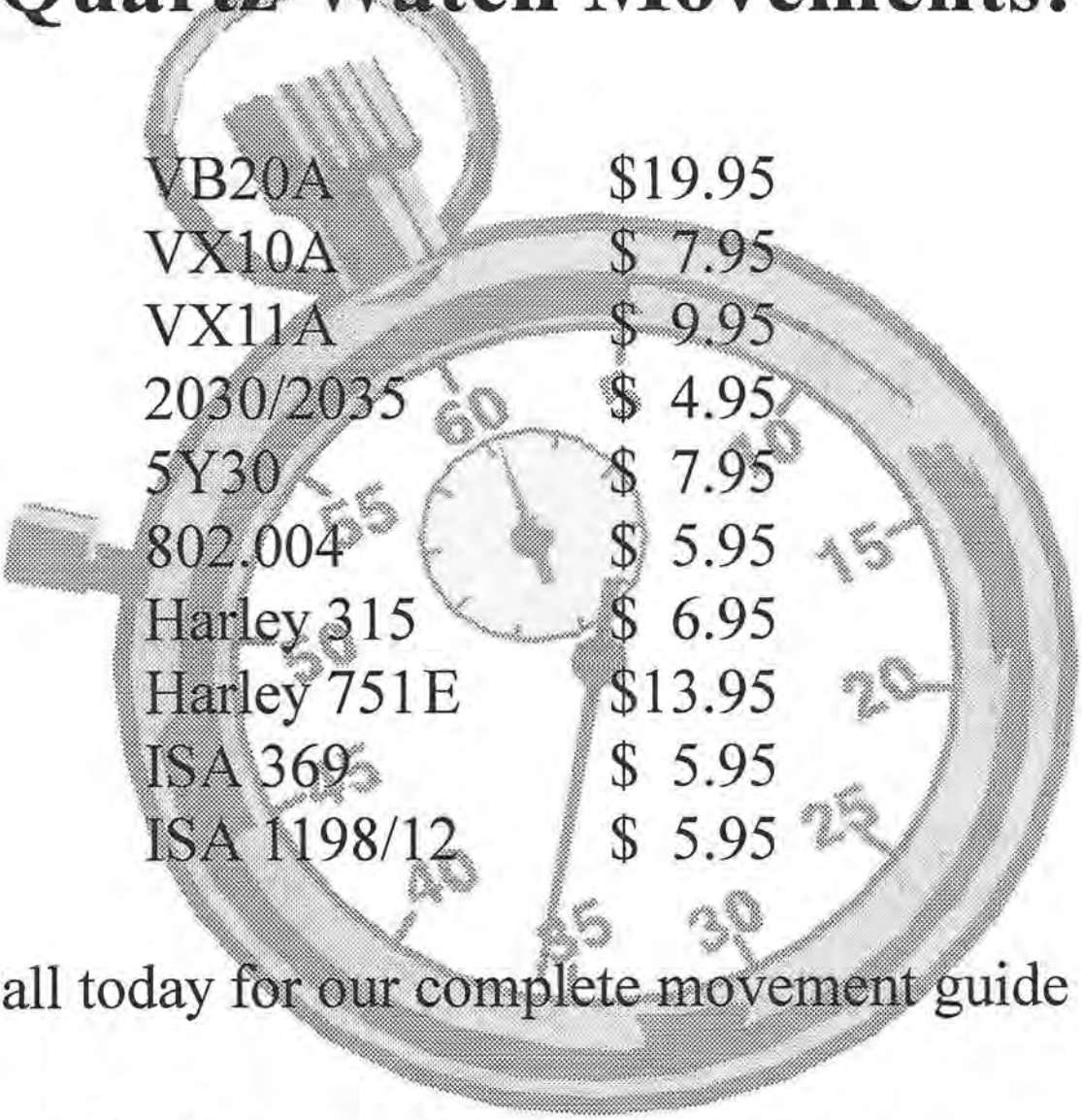
A letter from the Editor:

The cover photo for our December issue inadvertently failed to print the full title of the AWI Henry B. Fried Clock Tower. This was an oversight. No disrespect was intended to the memory of Mr. Fried.

William J. Ewbank
Editor-in-Chief

(Continued on page 21)

Quartz Watch Movements:



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"The Gem of the Packard Collection"

(Editors Note: The following article has been excerpted from The Museum of the American Watchmakers Institute, *AWI Press, Harrison, Ohio, 1993; and* The James Packard Collection of Unusual and Complicated Watches, *an exposition by Henry B. Fried, copyright 1959 by the Horological Institute of America.*

The cover of this month's *Horological Times* is dedicated to the Patek Philippe watch number 198023, an astronomical perpetual calendar equation of time minute repeater. This watch was described by the late Henry Fried as one of the most complicated ever produced by Patek Philippe and one of the most complicated watches in the world. The watch contains the perpetual calendar, a minute repeating mechanism, it rings the time on three gongs, it contains a star chart on the reverse side of the watch, the equation of time complication, the moon phases, and the time of sunrise and sunset. The movement contains 37 jewels. The case is open face, 18 karat gold.

The watch was the first watch ever to be custom built to the buyer's specifications. The purchaser, James Ward Packard, was a classic American success story, whose fascination with all things mechanical led him to become one of the country's wealthiest entrepreneurs during the early years of this century, and decades later, the most important benefactor to AWI.

From an early age, James Ward Packard would tinker with every clock in his home. He pursued his mechanical inclinations to Lehigh University, where he was the youngest mechanical engineer graduate in that institution's history. When his brother returned from a trip to Europe with a motorized tricycle, Mr. Packard proceeded to make one for himself, with improvements, an early example of "reverse engineering." Friends commissioned him to make other vehicles like it. James Packard was soon in the business of manufacturing automobiles. The famed "Packard" nameplate was the result.

Mr. Packard's wealth enabled him to indulge in his lifelong fascination with mechanical timepieces. Unlike most collectors, Mr. Packard did not necessarily search out collectibles or antiques. His passion was to acquire watches which embodied the highest technological skill and precision. His quest led him to commission the world's finest watchmakers of that time to produce timepieces to his exacting and singular specifications. When one considers that these watches were custom built and purchased with 1920 dollars, the investment in present day money was staggering!

What Henry Fried labeled "the gem of this collection of unusual timepieces" was the exhibit number 11, featured on these pages and on our cover. The watch is relatively small at 19 lignes ($1^{2}/_{3}$ inches) for the number of complications. One first notices that in addition to the usual hour and minute hands, there is a gold "sunburst" minute hand. This hand indicates the difference between mean solar time (the time which we go by) and true solar time, or the time that might be told by a sundial. The difference between the two times and their calculation is called the "Equation of Time". Because the earth does not rotate around the sun in a perfect circular path but one describing an ellipse, the length of each day is not equal. Compared to a watch which displays an average of sun time (mean solar time), actual sun noon will arrive about 14 minutes later than the watch's noon on February twelfth and about sixteen minutes earlier on November second. The proximity of the leap year affects these dates slightly. Only four days of the year do sundials and clocks agree on the time. This watch performs the task automatically.

In the position of the figure 12 is the moon phase aperture with its accurately moving moon disc on blue enamel. The indications surrounding this disc are calibrated to show the age of the moon's phase. An outer calibration on this position has a separate indicator pointing to the month of the year.

At the figure six position is another small dial with three superimposed hands, each pointing to their concentric rings of calibrated readings. The innermost ring with its small hand shows the day of the week. The middle track shows the fast moving seconds. The largest of these three hands points to the day of the month on the outer track. This is adjusted so that it will automatically compensate for uneven months or even leap years.

At the figure 9 position, the hour and minute hand points to the time of sunrise, and the little hour and minute hands at the figure 3 position indicates when, during the same day, sunset will occur. This is all calibrated specifically for the longitude and latitude of Mr. Packard's home town of Warren, Ohio!

Depressing the winding crown opens the back of the case, revealing the real charm of the watch. On an inside cover-aperture, a celestial chart is exposed, showing over 500 stars in six different sizes according to magnitude. Each of these stars is represented by a gold point of proportional size on a blue background. This heavenly scene moves daily in exact duplication of the celestial movements as they actually occur in (you guessed it!) Warren, Ohio.

This watch indicates mean solar time, true solar time, and with the star chart, sidereal time. A sidereal day is defined as the time between two consecutive passings of a meridian by a "stationary" star. The sidereal day is about four minutes faster than a mean solar day. The Packard watch has a set of gears that allow the showing of sidereal time (the sky chart), solar time (time of sunrise and sunset), and regular clock time (mean solar time). The special indications for sunrise and sunset as well as the minute repeating mechanism allows the wearer to command that it ring time to the hours, quarters, and the exact minute. For all this to be contained in a watch of this size is a tribute to the marvel of ingenuity and skill to allow each of these numerous functions to operate without interference from any other.

The inscription on the inside lid framing the celestial moving sky chart reads: "North, South, East and West" (in their positions as observed by Mr. Packard at his home in Warren, Ohio). Underneath this chart is inscribed: "Calculated for Warren, Ohio, 42 degrees, 20 minutes, No. 198023, Made for J. W. Packard, Warren, Ohio, by Patek Philippe & Co., Geneva, Switzerland, (1922)." The completed watch was delivered to Mr. Packard on April 6, 1927.

Mr. Packard did not have long to enjoy his masterpiece. He had made arrangements to will his collection to the Cleveland Museum of Art. However, while on his deathbed in 1928, he learned of the aims and ideals of the Horological Institute of America. He changed his bequest to express the wish that HIA receive the collection. This wish was honored by his executors and Mrs. Packard.

The Horological Institute of America was one of the two predecessor organizations that formed AWI in 1960. HIA and, later, AWI exhibited the Packard Collection at museums around the country for many years. For most of the duration, the collection was on loan to the Smithsonian Institution. However, during the World War II years the collection was stored at the Chicago Science Museum.

Most of the Packard Collection, including the number 11 watch, was sold in sealed bid auctions by the American Watchmakers-Clockmakers Institute. The funds raised by the auction form the corpus of the James M. Dodson Perpetuation Fund, which is administered by a Board of Trustees on behalf of the American Watchmakers-Clockmakers Institute. Interest revenue from the James M. Dodson Perpetuation Fund is devoted exclusively to, in the words of AWI's Constitution, "insure the continuation of the existence and activities of the American Watchmakers-Clockmakers Institute and to generate funds for the general purposes of the Institute as set forth in its Constitutions and Bylaws."

Thus, the private passion of one of America's industrial giants became, nearly half a century after his death, the great benefactor of AWI.

A full description of the Packard Collection, and a gallery of color photographs, is available in The Museum of the American Watchmakers Institute, *by Henry Fried, published by AWI Press. This book is on sale from the AWI Headquarters for $75.00. A limited number of copies autographed by Mr. Fried are available for $125.00. Photos courtesy of Alan Banbery, Patek Philippe.*

Technically Watches

Pocket Watches and Their Maintenance
Part 9
The Time Indicating Unit (Dial and Hands)

Archie B. Perkins,
CMW, FAWI,
FNAWCC, FBHI

The Watch Dial

Early watch dials were made of metal. The most expensive ones were made of sterling silver or gold. Some of the dials were embossed and engraved to take enamel. These dials were called champlevé dials. Dials for less expensive watches were made of brass, copper, or nickel silver.

Some watches have dials made of porcelain. The porcelain is applied to a copper disc that has dial feet hard soldered to the disc. After the porcelain is melted onto the disc, the figures are stamped or hand painted on the porcelain. Next, a clear glaze is melted over the figures to protect them.

Modern watches usually have dials of painted metal or porcelain.

Metal Dials

Figure 1 shows a metal dial with painted figures. These dials are usually made of brass with printed figures and letters. The dial shown in Figure 1 has a fancy design stamped in its center section to add to its appearance.

Modern metal dials are made flat and curved in colors that go with the watch case used.

Types of Figures Used on Metal Dials

Figure 2 shows the different types of figures used on metal dials. View A shows a section of a dial with printed figures. The figures are stamped on the dial after the dial has been plated or, in some cases, painted. Then, the dial is sprayed with lacquer to protect the figures.

Figure 2, View B shows a section of a dial which has depressed figures. Depressed figures are made in dials to allow hard enamel to

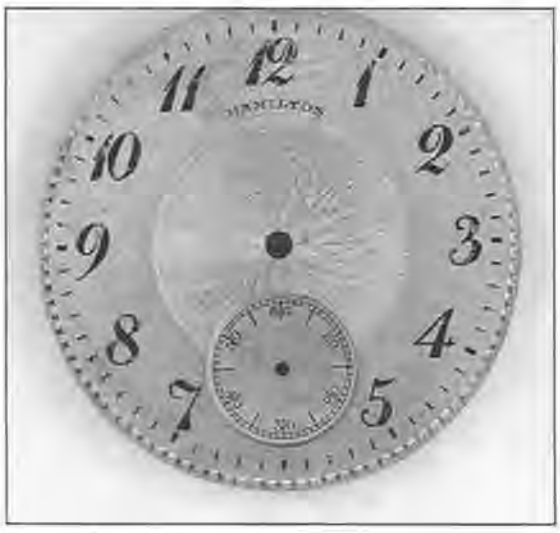


Figure 1.

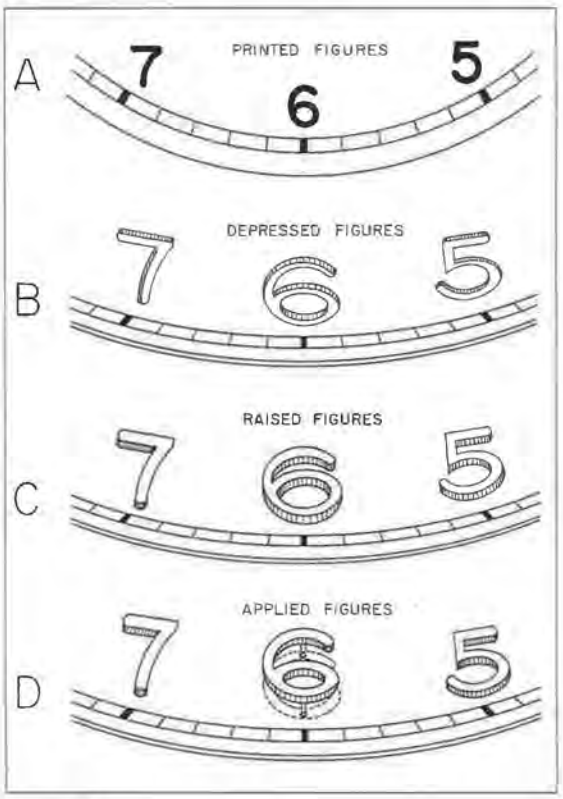


Figure 2.

be placed in the depressions to create permanent figures. The enamel is melted into the depressions with heat.

Figure 2, View C shows a dial with raised figures. The figures are raised and formed with a die from the metal in the dial plate. The figures can be raised from the back side of the dial or from the front side of the dial.

Figure 2, View D shows a dial with applied figures. The figures have feet that go through holes in the dial. The ends of the feet are burnished over on the back side of the dial to tighten the figures to the dial. The figures are usually made from a sheet of solid karat gold.

The Porcelain Dial

Figure 3 shows a porcelain dial. This particular dial is for a Waltham pocket watch and is called a single sunk dial. This is because the seconds dial is sunk down lower than the main dial. In other words, this is a two-piece dial. The seconds dial is made separately and is soft soldered in place from the back side of the dial. Figure 4 shows the solder around the seconds dial after the dial has been soldered into place. The purpose of having the sunk seconds dial is to allow more space for the seconds hand and the hour hand.

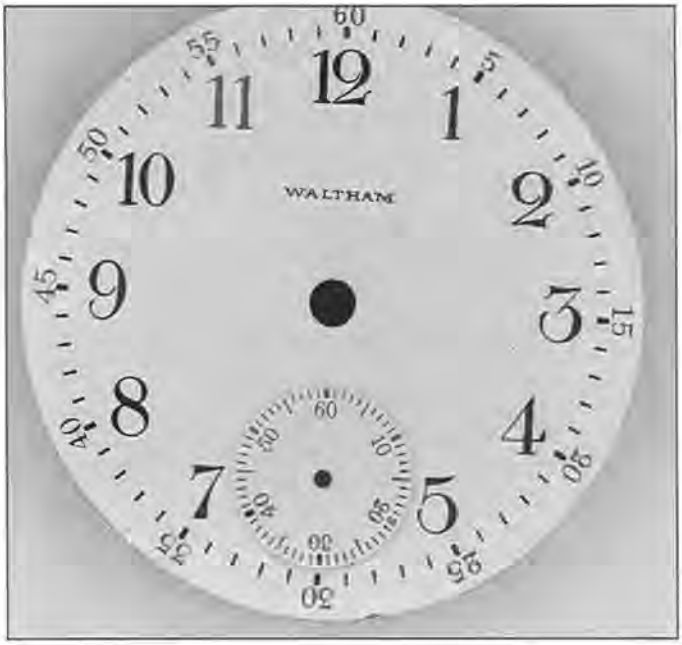


Figure 3.

The Double Sunk Dial

Figure 5 shows an Elgin double sunk railroad watch dial. This is a three-piece dial. It has the outside hour ring section, the center section, and the seconds dial section. The center section is lower than the hour ring and the seconds dial is lower than the center section. These sections are soft soldered together as shown in Figure 6. These

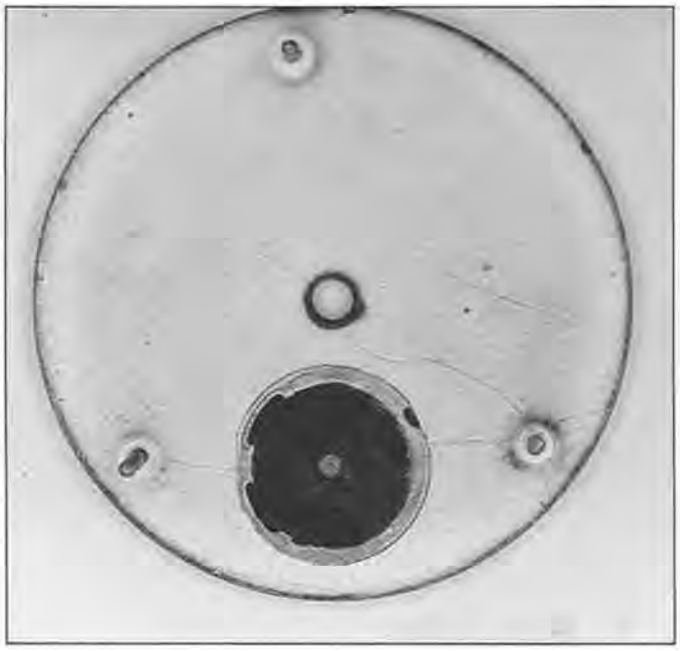


Figure 4.

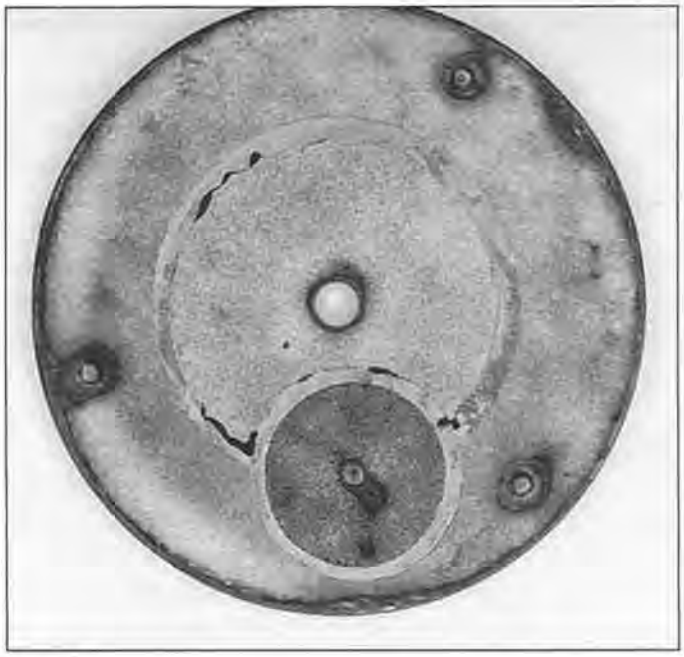


Figure 6.

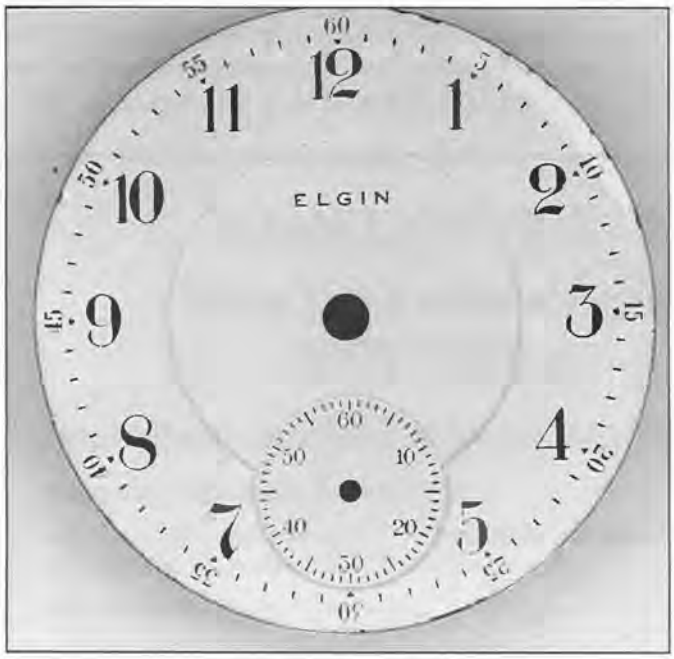


Figure 5.

dials usually have the minute marks numbered at each hour mark so it is easier to read the number of minutes past an hour.

The Montgomery Dial

Some of the railroad watch dials have all of the minute marks numbered from one to sixty. This dial is called a Montgomery dial. This makes it easy to read any number of minutes past an hour.

Methods Used to Attach a Dial to the Movement

Several methods have been used to attach the dial to the movement. Figure 7 shows two commonly used methods. View A shows an early method that was commonly used on antique watches. In this method, a cross hole was drilled in the dial feet which allowed the dial to be attached to the movement with taper pins placed through the holes in the feet.

Figure 7, View B shows the most common method used to attach the dial to the movement of early American and modern watch movements. This method uses a set screw that goes through the edge of the movement into the dial foot that extends through a hole in the lower plate of the watch. This method is probably the most used method of attaching a dial to its movement.

Another method employed in Swiss watches to hold a dial onto the movement is shown in Figure 8. This method uses a dial key screw. View A shows the key screw in an open position. When the key screw is turned in a counterclockwise direction, as shown by the arrow, the key will go in the slot in the dial foot and lock the dial foot into its hole.

Figure 8, View B shows the dial key screw in a locked position on the dial foot. The more the key is turned counterclockwise on the foot, the tighter the dial is pulled against the lower plate. This action is due to the pitch on the thread of the key. The key is turned clockwise, as shown by the arrow, to unlock the key from the dial foot. The pitch of the screw on the key allows the dial to be freed from the lower plate as the key is turned clockwise.

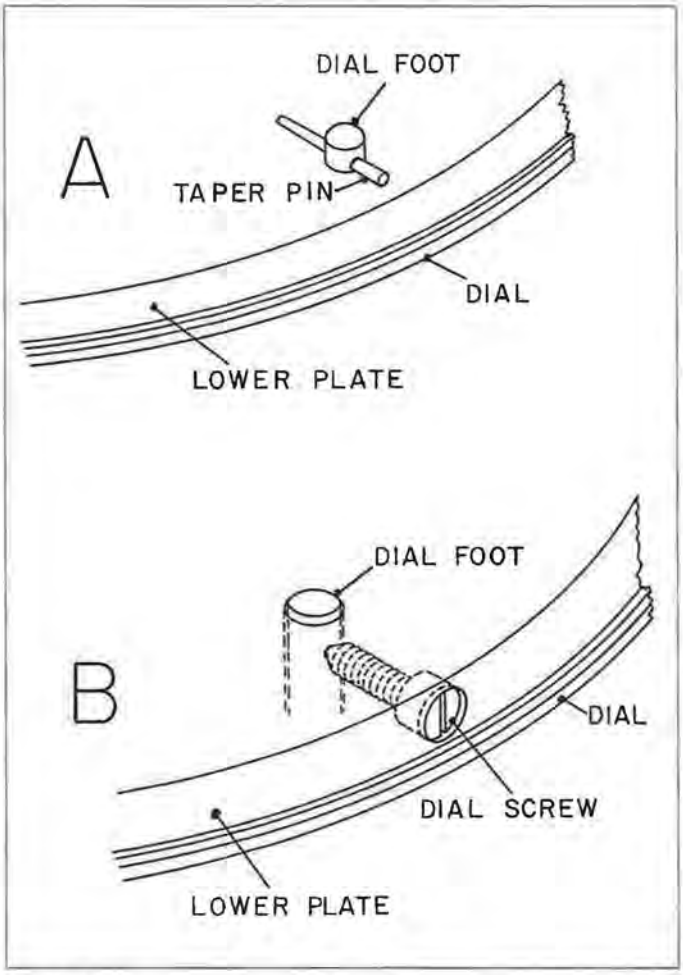


Figure 7.

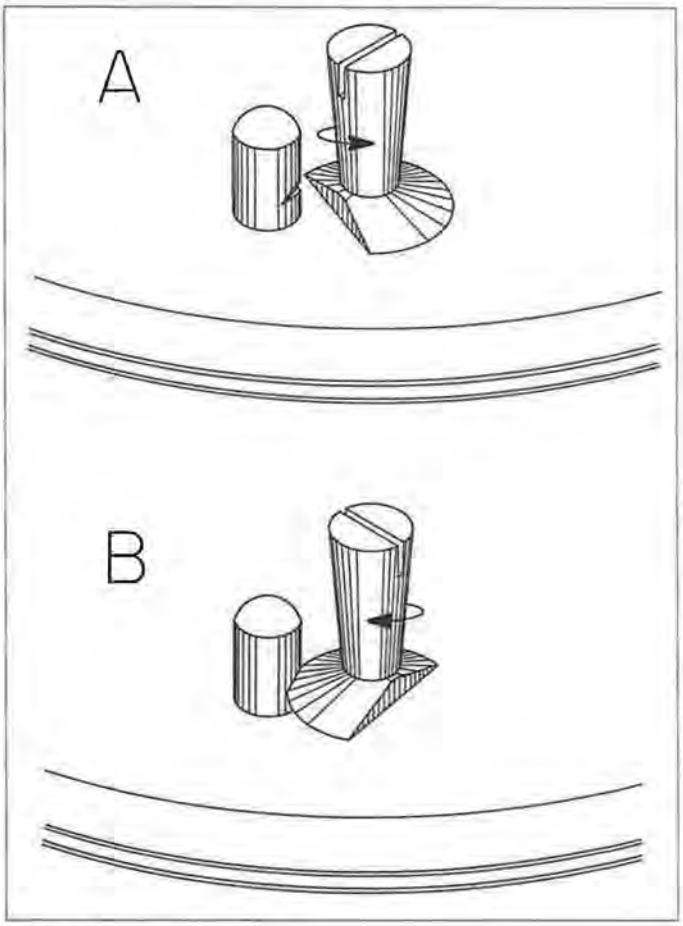


Figure 8.

Some other methods that have been used to hold dials onto watch movements are shown in Figure 9. View A shows a method that uses threaded dial feet and threaded nuts. This method is desirable when there is a need to remove and replace the dial without removing the watch from the center ring of the case. Care must be used in tightening these nuts because the threads are very fragile.

Figure 9, View B shows a spring-type friction nut being used on the dial feet to hold the dial on the movement. This nut is similar to a hairspring collet.

Figure 9, View C shows a split spring-type friction sleeve mounted in the watch plate that the dial foot frictions into to hold the dial on the movement.

Figure 10 shows two additional methods of holding a dial on the watch movement. View A shows a spring clip being used in a groove or slots cut in the dial feet. The spring sleeve can be adjusted by flattening the spring or by curving the spring more.

Figure 10, View B shows how a metal dial without feet can be mounted on a watch movement with screws. The dial is drilled for two or three screws and the holes are countersunk for beveled flat headed screws. Then, the dial is placed in the exact proper position while the posi-

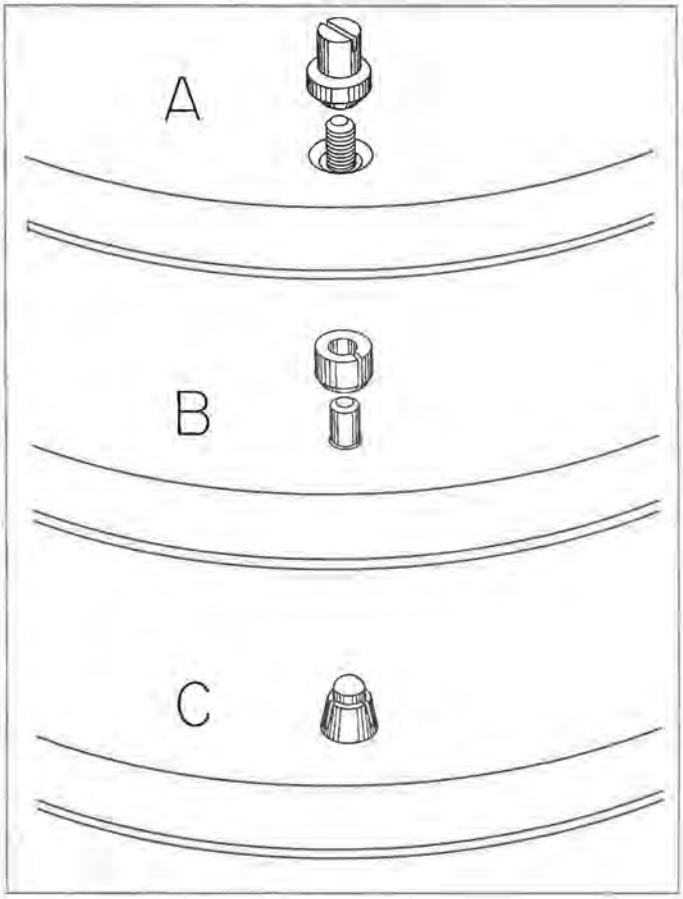


Figure 9.

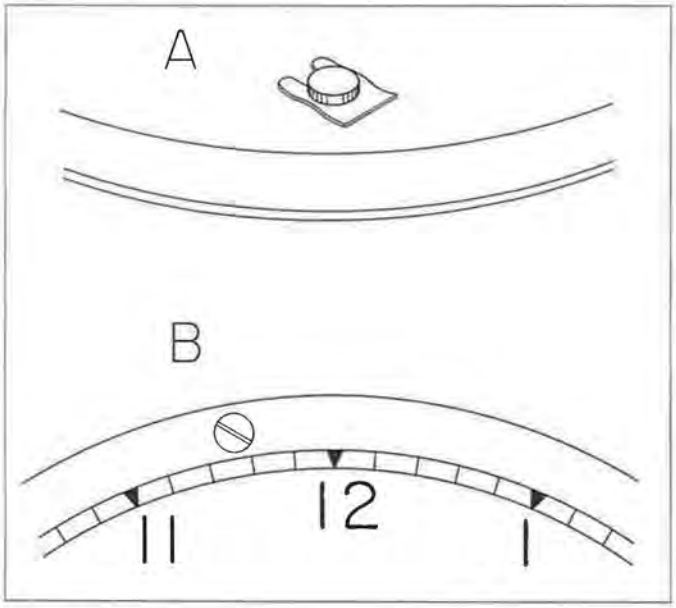


Figure 10.

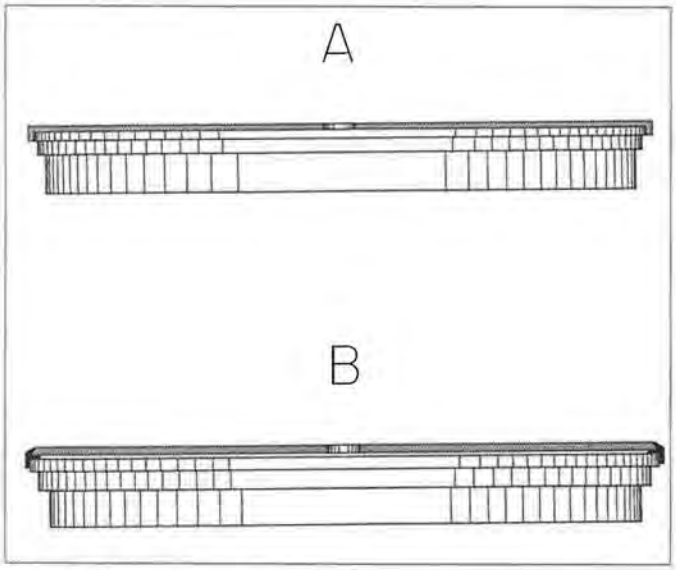


Figure 11.

tions for the screws are marked on the watch plate. Next, the holes are drilled in the watch plate and threaded for the dial screws. *Note: This method should only be used on low- to ordinary-grade watches and should not be considered for better grade watches.*

Snap-On Metal Dial

Figure 11 shows two types of snap-on metal dials. The dial in View A is formed with a lip around its outside edge that fits around the outside edge of the lower plate on the dial side. The dial fits with a snap fit on the lower plate. A notch is made in the edge of the dial at the 12 position that fits over a pin in the edge of the lower plate at the proper place to line up the dial correctly.

Figure 11, View B shows another method of snap-

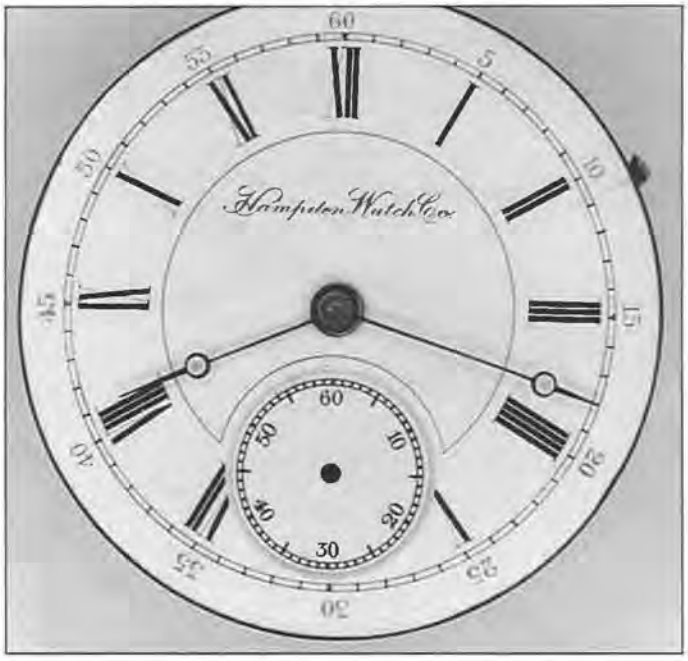


Figure 12.

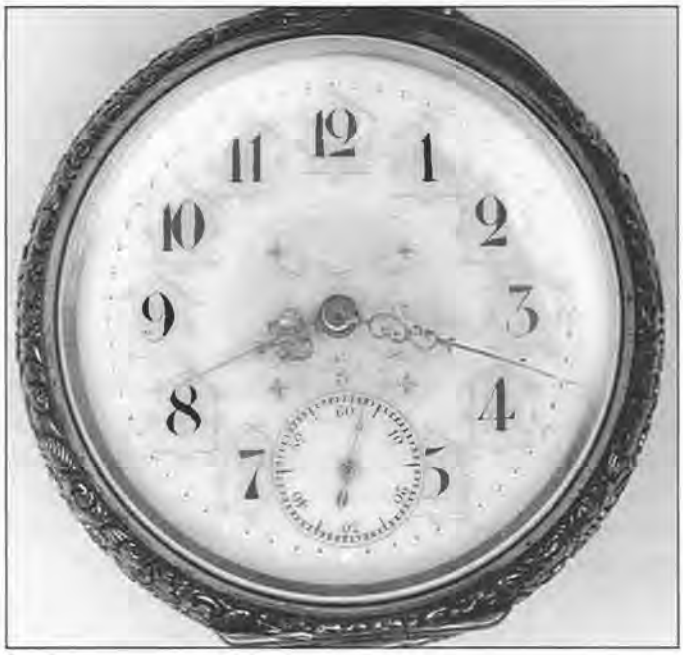


Figure 13.

ping the dial onto the watch plate. In this method, the dial is set into a brass bezel and the brass bezel snaps over the edge of the movement. A pin is used in the edge of the movement and a slot in the edge of the dial to align the dial.

The Hands of a Watch

The style and boldness of hands used on a watch should be compatible with the style and boldness of the figures on the dial.

Figure 12 shows a Hampden Watch Company dial that has Roman numerals. This is a double sunk dial. The

Figure 14.

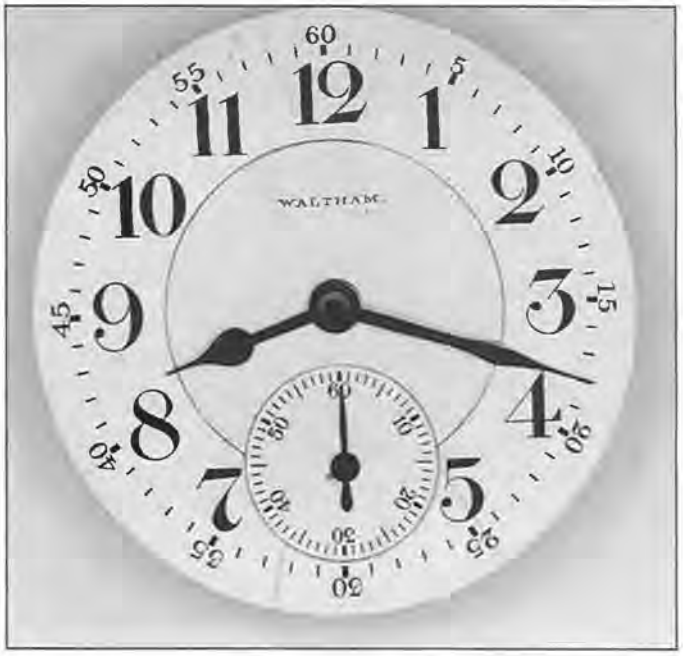


Figure 15.

numerals are somewhat bold but are quite slender in appearance. The hands used are light moon-style hands which go very well with the dial.

Figure 13 shows a watch with a fancy porcelain dial which requires fancy hands. The hands used are gilt Louis XV hands that go well with the gilt design on the dial.

Figure 14 shows a Rockford double sunk railroad watch dial with medium bold figures. The hands are medium bold railroad style. The hour hand is a spade hand and the minute hand is a whip-style hand. These hands go well with the dial.

Figure 15 shows a Waltham double sunk railroad dial with bold figures. The hands are railroad-type hands that are extra bold. The hands are almost too bold for the figures but still go well with the dial.

Figure 16 shows a South Bend railroad watch dial with extra bold figures. This dial is also a 24-hour dial as shown by the extra figures. The hands are light railroad hands which are not bold enough for the boldness of the dial but are still acceptable. These hands would go better with the Waltham dial in Figure 15 and the heavy hands on the Waltham dial would go better on the bold South Bend dial in Figure 16.

Length of Hands

The length of the hands is important. The second hand should reach to the outside edge of the seconds marks. The hour hand should reach to the inside edge of the figures and the minute hand should reach to the outside edge of the minute marks.

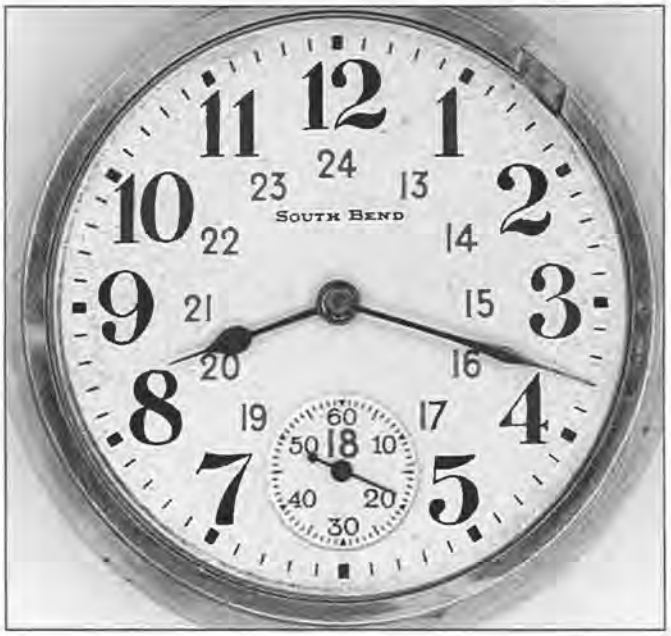


Figure 16.

The width of the ends of the minute hand and second hand should be the same width as the seconds and minute marks.

"Pocket Watches and Their Maintenance" will continue.

Bibliography

Fried, Henry B. *Bench Practices for Watch Repairers*. Denver, CO: Roberts Publishing Co., 1954, pp. 103-105, 229-246.

Fried, Henry B. *The Watch Repairers Manual*. New York: D. Van Nostrand Co. Inc., 1949, pp. 40-47.

Jendritzki, H. "The Swiss Watch Repairer's Manual," *Swiss Watch and Jewelry Journal*. Lausanne, Switzerland, 1953, pp. 23-35.

Levin, Louis and Samuel. *Practical Benchwork for Horologists*. Los Angeles, CA: Louis Levin and Son, 1950, pp. 132-140.

Perkins, Archie B. "Watch Hands and Dials," *Horological Times*. Cincinnati, Ohio, May, 1980, pp. 36-41.

Perkins, Archie B. "Fitting Watch Hands," *Horological Times*. Cincinnati, Ohio, June, 1980, pp. 18-21, 64.

Letters to the Editor

(Continued from page 10)

Dear Editor:

I've been a member for a long time and am finding that AWI is not keeping up with the technology available. In the past, I've made some recommendations and have been humoured by the editors rather than taken seriously (ie. Changing the covers to what they are now, representative of our profession). Another example is through the medium of e-mail. I asked why the membership had not been advised or been allowed to be involved in the FTC's redefinition of timepieces?

I would like to suggest some other items that may help this organization survive in the 21st century.

1. Become more interactive online and try to get the membership to become part of the on-line chat community. Allow the membership to communicate with each other. I'm a member of several on-line specialty groups and postings are active and serve our interests well.

2. Allow for sending tech specs through the net. I'm not sure about the mentioned copyright restrictions but making schematics available on-line would eliminate the lag in getting this data through the mail.

3. The lending library list of books and videos should be on-line. You can't borrow what you don't know is there.

4. Maybe the *HT* should dump the "Letters to the Editor" and use the space to introduce us to what is new out there. We need to know about new technology. Did you know that the market out here is being flooded with imitation Breitlings that have faked out some experts? Did you know there are imitation Seiko's? How about the Citizen Solar watches? You published an article on Seiko Kinetics years after these watches were in the market.

The sad truth is that most of us are out here trying to make a living on piecework and, if possible, retail sales. Otherwise we would all be vying to participate in the AWI's growth and well being. AWI has been a great organization in the past. It taught me a lot. I would hate to see it disappear (this is what I read between the lines – I hope I am very wrong). Please do not take these comments and suggestions lightheartedly.

Yours in horology.

Sergio Lotenschtein
Honolulu, Hawaii

Whoa Sergio! Rumors of our demise have been greatly exaggerated. As it so happens, I agree with you on the main thrust of your message. And please be assured, we don't take your comments lightheartedly. A lot of what you have commented on are items under discussion. As you have noted with approval, we did change the magazine covers and some of the content and features. When this step was taken a year ago; it was considered a daring act. In some quarters, a certain editor was compared with Benedict Arnold. In only a few short months, it looks like the magazine's new look has met with a lot of approval.

We are also recommending to the Board of Directors that AWI take a more proactive stance as a true trade association working as an advocate on behalf of our members with our colleagues in the manufacturing and retail sectors. If the Board approves, we will begin that journey.

Your other comments are all in line with other input that we have received and reflect our own realization that much is yet to be done. Have patience with us. We still expect good things to happen.

William J. Ewbank
Editor-in-Chief

Jack Kurdzionak

From the Workshop

Crystals

Crystal replacement is one of the most frequent repairs made to a watch. By virtue of its position and function, it is exposed more frequently to damage than almost any other part of a watch. It must be clear enough to view the dial, strong enough not to break when exposed to impact, high enough to clear the hands, and secure enough to keep out dust and/or water from the interior of the watch case. Precious little has been written to guide the watchmaker when he replaces a crystal even though it is one of the most common of all repairs. A properly fit crystal will perform just as well as a factory original in function as well as appearance. A poorly fit one can give a good visual appearance but will allow water and dust to enter an otherwise sealed case. The worst replacement is a poorly fit crystal which is not esthetically appealing and also does not protect the watch movement. Crystal fitting is not magic but it does require some special techniques to do a skillful job. Let's examine a few of the more common crystals and their replacement techniques.

Round Mineral Glass

These crystals seem to be the most common ones used in today's watch market. They range in size from about 12 mm to 36 mm and vary in thickness from 1 mm to 3 mm. They are glass and will scratch and break. They are generally cemented into the bezel or forced into a plastic "I" gasket that lines the bezel. Before replacing any crystal, it is imperative to clean the bezel to remove all traces of old cement, dirt, and chemical film. Old adhesives can be removed by carefully heating the bezel with a heat gun of the type used to remove paint. Avoid scraping the bezel with a sharp metal instrument as this can damage the crystal seat. Measure the bezel to the nearest .1 mm and choose a crystal of that size or .1 mm smaller so that it fits into the crystal seat without binding. Too large and the crystal will not seat properly in the bezel. Too small, and the crystal may not cover the seat in the bezel. Wipe the bezel seat and the crystal with a swab moistened with denatured alcohol before applying a fillet of clear ultraviolet (UV) crystal cement to the seat. The crystal can be gently pushed into the cemented bezel using a bit of Rodico stuck to the crystal's surface as a handle. The Rodico can be left on the crystal while the cement is cured and removed later. Check for air bubbles in the cement. If there are any, remove the crystal and clean it and the bezel again. Air bubbles will leave passageways for water and dust to enter the case. Place the bezel and crystal under an ultraviolet lamp for a few minutes and the crystal will be cemented into the bezel as good as new. Denatured alcohol can be used to clean uncured cement from the crystal and bezel.

Masked Crystals and Water Resistance

Some special glass crystals are trimmed at the edge with coloring material applied to the lower side of the crystal. These are known as masked crystals. They can be installed with the same UV cement and lamp as clear crystals. They just take a bit longer to cure and they should be exposed to the UV lamp from both sides. Overexposure to the UV lamp does not seem to do any harm to the cement so if a bezel and crystal is left under the lamp for say 30 or more minutes, no harm is done. In fact, there is a special UV cement available from Seiko (S-314) through our advertisers that should be used for water resistant cases that are tested for more

than 30 meters or 3 ATM. This cement is a very slow curing and Seiko's instructions indicate a curing time of 60-plus minutes.

Gaskets

Many round crystals are now secured in place with a plastic ring known as an "I" gasket. Do not reuse these "I" gaskets when replacing crystals even if they present a good appearance. They do not make a good water resistant seal when they are reused. Purchase a set of them from your material supplier and fit a new one every time you replace a crystal. They are sold in sizes to fit most bezels. Their OD fits the bezel and their ID fits the replacement crystal. The crystal should fit snugly when forced into the "I" gasket with a crystal press. Our BB crystal press does a very nice job pressing in the crystal when equipped with a white plastic die now available in sets. In the absence of these plastic dies, a small flat piece of wood may be used to press on the crystal. In any case do not use a metal die to push on a glass crystal. It is almost sure to break when pressed with a metal die.

Sapphire Crystals

Even though they are extremely scratch resistant (mohs 9) and more difficult to break than glass, they do occasionally break and must be replaced. They are available as genuine material from various watch companies and now are being sold generically by material houses. They are installed using the same techniques outlined above for glass. That is UV cement and "I" gaskets as appropriate. Sapphire crystals are considerably more expensive than glass so do not be surprised when purchasing them.

Round sapphire crystals make excellent substitutes for glass crystals for discerning customers who are tired of replacing scratched glass on their costly brand name watches. Customers who continually scratch glass watch crystals might be willing to pay a premium for a sapphire crystal installed in place of glass. These crystals will last indefinitely without scratching. That is sure to please the owner of the watch.

Jack Kurdzionak

A Practical Course in Clock Repair

Compensated Pendulums

John P. Kenyon, CMC

All metals expand and contract under the influence of temperature change. When exposed to heat, a metal pendulum rod will expand to such an extent that the clock will lose time, and when exposed to cold it will contract and cause it to gain time. To correct for this error, compensated pendulums have been designed to take advantage of the difference in the coefficient of expansion of different metals to insure that the distance between the suspension point and the center of oscillation is constant when a clock is subjected to a temperature change.

The mercury-compensated pendulum, invented by George Graham in 1730, is the most common type used on regulator clocks. As illustrated in Figure 1, the bob incorporates two glass jars containing pure mercury, supported by a platform above the regulating nut on the pendulum rod. With an increase in temperature, the columns of mercury (A) expand upward to compensate for the expansion of the steel pendulum rod (B) downward. A decrease in temperature will cause the columns of mercury to contract downward and compensate for the contraction of the steel pendulum rod upward, to insure that the center of oscillation of the bob stays at the proper distance from the suspension point. The mercury is held in two glass jars because mercury responds a little slower to temperature changes than steel and by placing the mercury into two jars, a faster response is obtained. It is necessary to compensate for the slight error caused by the coefficient of expansion of the glass containers.

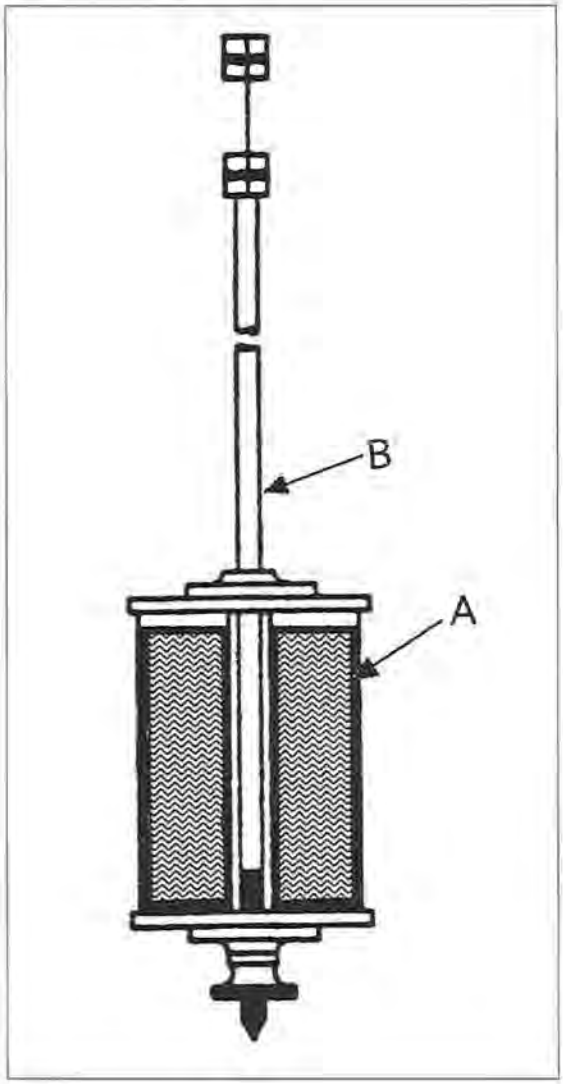
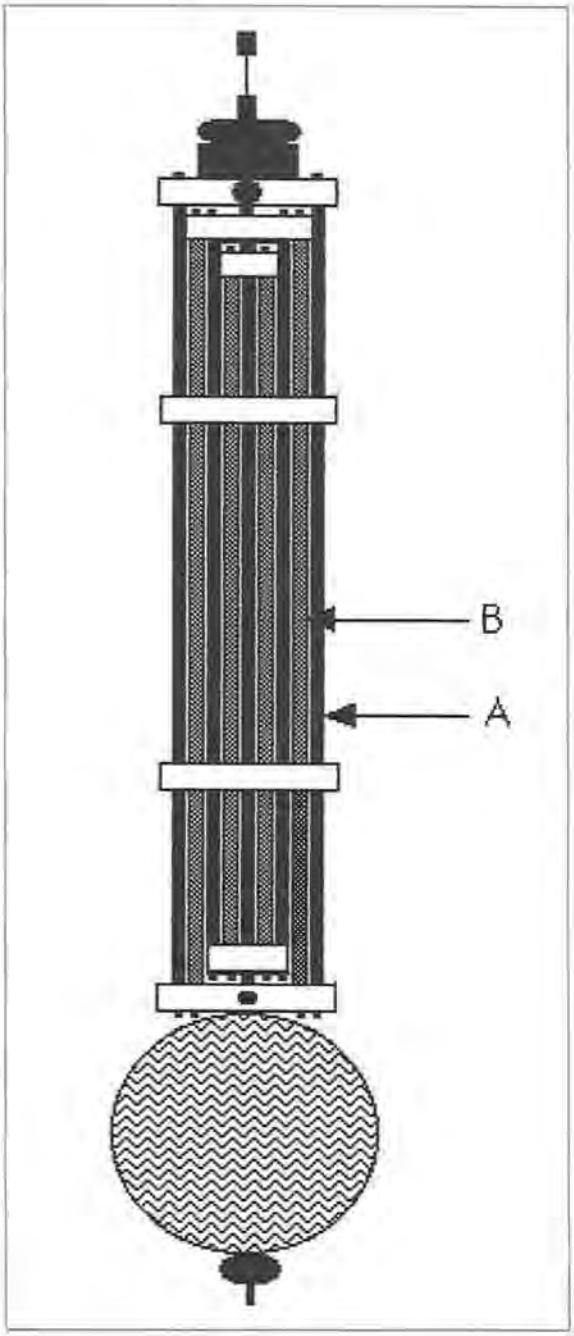


Figure 1. Mercury-Compensated Pendulum

The coefficient of expansion of a steel rod is 0.000015 cm per centimeter (0.000006 inch per inch) for each degree Fahrenheit of temperature change. The coefficient of expansion of pure mercury (a fluid) is 0.00025 cm per centimeter (0.0001 inch per inch) for each degree Fahrenheit of temperature change, or about 16 times that of steel. A common steel pendulum rod used on regulator clocks 109.22 cm (43 inches) long will expand 0.00163 cm (0.00025 inches) per degree of temperature change. If the mercury could be held in a container that had a 0 coefficient of expansion, a column of mercury of 6.52 cm (2.56 inches) would compensate for the expansion of the rod. When glass jars are used to

Figure 2. Gridiron Pendulum



hold the mercury, the expansion reduces to about 5.8 times that of steel. This increases the length of the column of mercury required to about 18.79 cm (7.4 inches).

Two jars, with an inside diameter of 5.08 cm (2 inches), hold a volume of mercury weighing about 5.44 kilograms (12 pounds). A similar style of pendulum utilizes zinc and steel to insure that the distance between the suspension point and the center of oscillation is constant at alternating temperatures.

Nickel-steel alloys with extremely small coefficients of expansion are used to reduce temperature error in another style of pendulum rod. Invar, a trade name for an alloy made from 34 parts of nickel and 64 parts of steel, has a coefficient of expansion of 0.0000017 cm (0.0000007 inch) for each degree Fahrenheit of temperature change. The expansion coefficient can be varied with other proportions of nickel and steel. No compensation is used with an Invar pendulum rod on an ordinary regulator clock, but on some precision clocks an Invar pendulum rod may be compensated with a short brass tube placed on the regulating nut to support the bob. The length of the brass tube is first calculated using the coefficient of expansion for brass, and then further adjusted by bench test. Elinvar is another trade name of an alloy used for this style of pendulum rod. It is made from nickel, iron, chromium, manganese, tungsten, and carbon and has an extremely small coefficient of expansion.

A gridiron pendulum is illustrated in Figure 2. It usually consists of five steel rods (A) and four brass rods (B) alternately arranged so that the downward expansion of the steel rods is equalized by the upward expansion of the brass rods. Some clocks have imitation gridiron pendulums for appearance only and are not compensating. There are also imitation mercury pendulums.

A word of caution: Mercury is a volatile toxic element. It should not be handled without proper protective gear. Check with your local environmental protection and/or health agency for instructions on proper use and disposal of this material.

Sargent & Greenleaf Timelock Movements

Style R & Style S

David A. Christianson, CMW, CMEW

With this article we'll continue our look at timelocks, but first we'll want to correct and update some information published in the June, 1991, issue of the Horological Times.

The last of the standard timelock movements used by Sargent & Greenleaf of Nicholasville, KY, are the Style "R" and the Style "S" models. Both movements are used in both vault and safe timelock cases similar to the one in Figure 1. The timelock cases vary depending on the size and type of unlocking mechanism employed, but the movements used are the same.

Both movements are Swiss made. The

Figure 1.

Figure 2. The Rehlor style "R" timelock movement circa 1971.

Style "R" was manufactured by Rehlor in 1971 (Figure 2); the Style "S" was produced by Sonceboz in the late 1980s (Figure 3). Both movements are identical except for different platform escapements. Both movements have available an arrangement on their third wheels that can make them "backwindable." In our example the Rehlor Style "R" movement is "backwindable" with its third wheel clutch (Figure 4). Our Sonceboz Style "S" (Figure 5) has a standard third wheel that makes it "non-backwindable," although the third wheel clutch is available for this movement also. (Also known as resettable and non-resettable.)

The "backwindable" feature of these two Swiss movements is an advantage over other timelock movements. The clutch on the third wheel (Figure 6) allows the user to "backwind" or turn the winding arbor backwards in order to remove an overwind on the mainspring. In other words, if the user mistakenly sets (or winds) the movement to open in 20 hours and then realizes that it needs to open in 18 hours, he merely winds

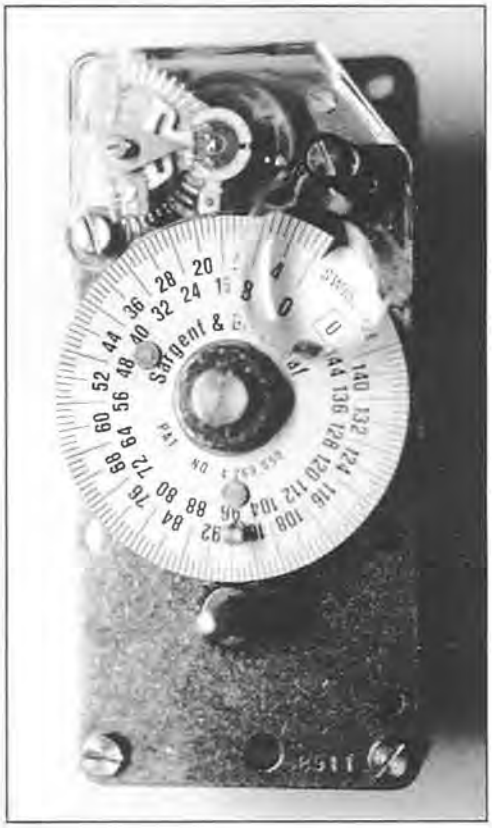


Figure 3. The Sonceboz style "S" timelock movement circa 1980.

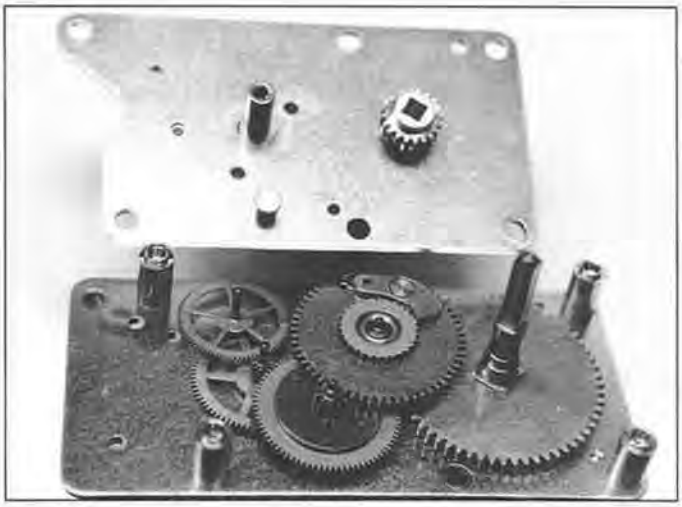


Figure 4. Style "R" movement with "backwindable" (resettable) third wheel clutch.

Figure 5. Style "S" movement with "non-backwindable" (non-resettable) third wheel clutch.

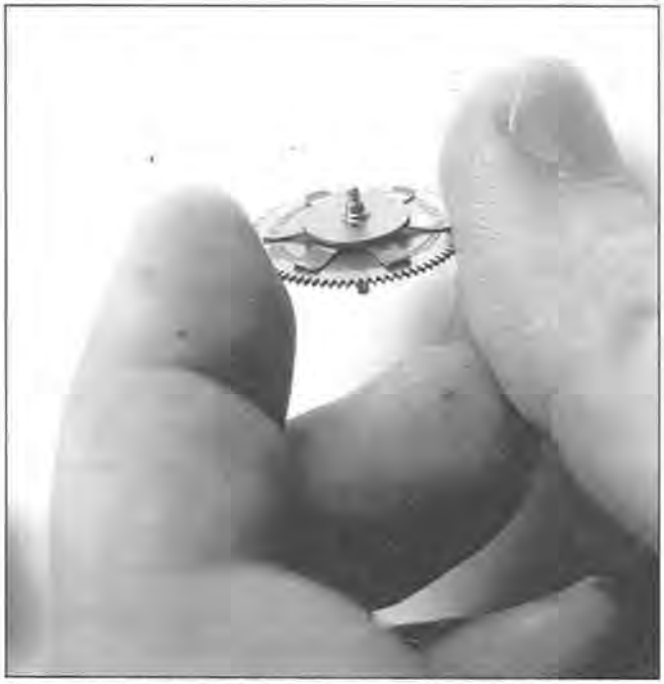


Figure 6. "Backwindable" third wheel, available in either the Style "S" or the Style "R".

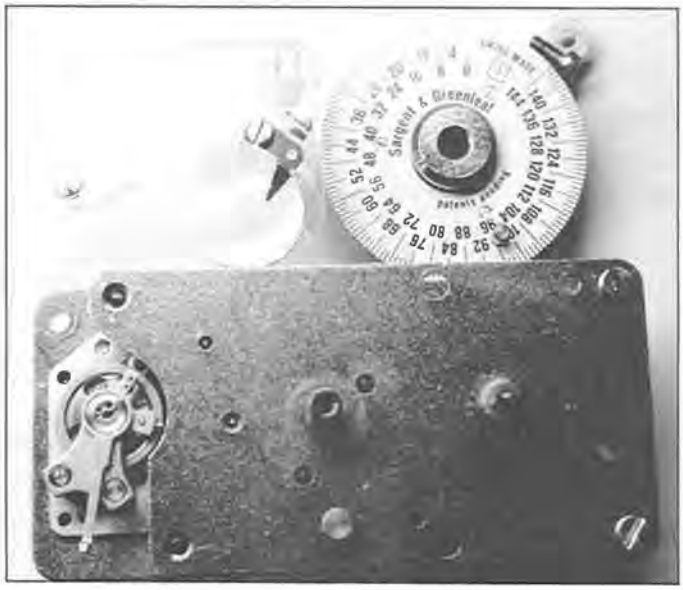


Figure 7.

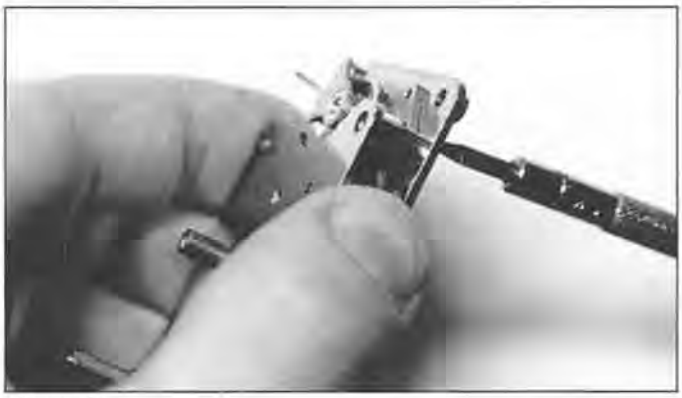


Figure 8.

the mainspring arbor backwards or "backwinds" the movement to indicate 18 hours instead of 20.

Disassembly Procedures

Disassembly is the same for both types of these models:

1. Remove the two screws on the clear plastic escapement cover and remove the cover. The dial pointer will come off with the cover (Figure 7).
2. Remove the dial screw and dial (or display wheel) (Figure 7).
3. Loosen the platform escapement mounting screws (located on the back of the lower movement plate) one half-turn each (Figure 8).
4. Hold back the main train of wheels with your thumb while holding the movement between your thumb and forefinger.
5. Remove the platform mounting screws and slide out the platform escapement.
6. Let the movement train run down by controlling the speed release with your thumb braking on the fifth wheel (Figures 4 & 5). Note these trains have five train wheels not counting the escape wheel.
7. Remove the mainspring by removing the three mounting screws. Holding the winding arbor in a bench key, rotate the barrel clockwise to disengage the inner terminal of the spring from the winding arbor.
8. All five train wheels can now be removed and inspected for any wear or possible damage to pivots, teeth, or pinions.
9. Remove the mainspring from the barrel.
10. Remove the balance from the platform for cleaning. Both movement types have "shock proof" balance jewel assemblies which must be disassembled for inspection, cleaning, and pegging.

Cleaning Procedures

The cleaning procedures on these movements follow standard acceptable watch cleaning practices with

Figure 9.

two very **notable exceptions**.

1. If the movement has the unique third wheel clutch, it **must not** be cleaned ultrasonically. This wheel, which makes the movement "backwindable" or resettable, **must be removed and "dry cleaned" only in order for the friction clutch to function properly.** If cleaned ultrasonically, the wheel will function for a while and then suddenly allow the movement to rapidly unwind.

2. The plastic mainspring barrel of the Style "S" model **must not** be cleaned ultrasonically. The barrels can deteriorate in the ultrasonic solutions (Figure 11).

Care must be taken to completely disassemble these movements and thoroughly peg all pivot holes.

The wheel teeth, pinion leaves and pivots should be passed through pithwood to remove any lingering contamination that is not always readily visible. Don't forget to clean and wipe dry the mainspring.

Reassembly Procedures

Reassembly is quite straightforward and will not present any surprises. A quality watch lubricant should be

used on the balance and escape wheel pivots. Three or four escape wheel teeth should be lightly oiled with watch lubricant also. The pallet fork pivots need not be lubricated. The rest of the train should be lubricated with a light clock oil; the mainspring lubed with a light clock mainspring grease. Lubricate the ratchet wheel click with a touch of mainspring grease, also, but **do not** lubricate the pressure spring on the third wheel (friction wheel clutch) (Figure 6).

Reserve Power

Setting up the reserve power on these new models of Sargent & Greenleaf is different than most other timelock movements.

With the dial removed and all power released from the movement, replace the dial and position it so that the indicator points to zero. Wind the movement so that the dial indicates about 18 hours (Figure 9). Remove the dial and reposition it so that it indicates zero hours. When the movement runs down (i.e., the dial pin stops the movement from running down any further as in Figure 10), the movement will still have a reserve wind on the mainspring of several hours. This will provide enough kinetic energy to: (1) start the movement once an initial wind is put on the movement, and (2) trip the unlocking mechanism of the timelock mechanism in order to allow unlocking of the safe or vault door.

Comparison Study of the Two Movement Types

A quick look at the two movements reveals two pieces that are the same size and design yet entirely different. The Style "R" (Figure 2) has a different regulator arm. The Style "S" model (Figure 3) uses a microscrew adjustment on its regulator. The Style "R" has a brass mainspring barrel (Figure 12); the newer Style "S" uses plastic (Figure 11).

Looking on the inside we see the perforated wheels of the "S" model (Figure 5), but the most interesting feature is the third wheel in the Style "R" model (Figure 4). Figure 6 shows the lower side of this third wheel. The pressure springs allow this wheel to slip if the movement needs to be wound backward to correct an overwind. This special third wheel is available in both models, but our example of the Style "S" uses a standard third wheel.

To Remove an Overwind

If the movements are accidentally wound further than the desired opening time, the vault will open later than

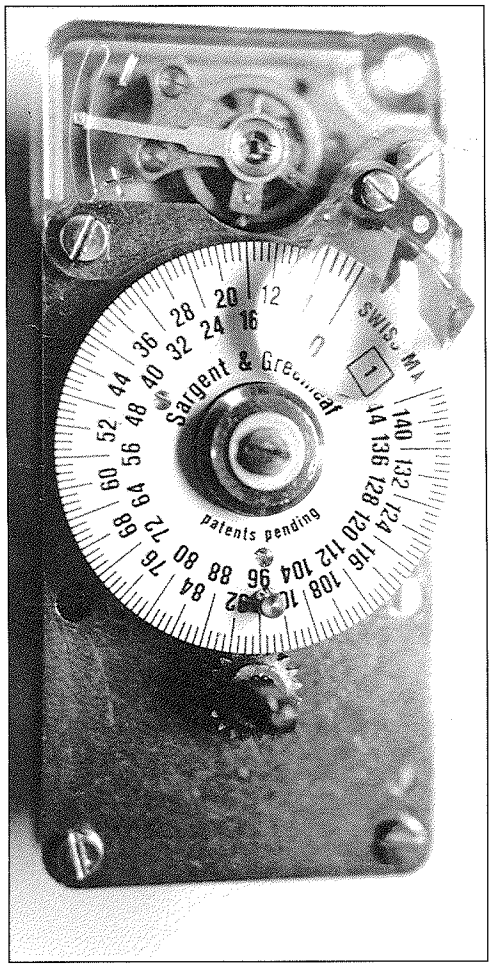


Figure 10.

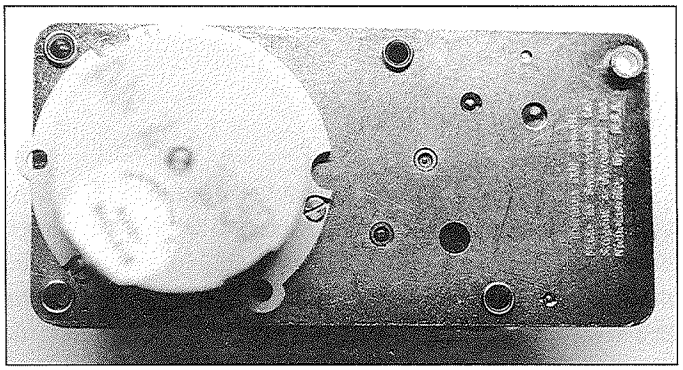


Figure 11. Plastic mainspring barrel of the Style "S".

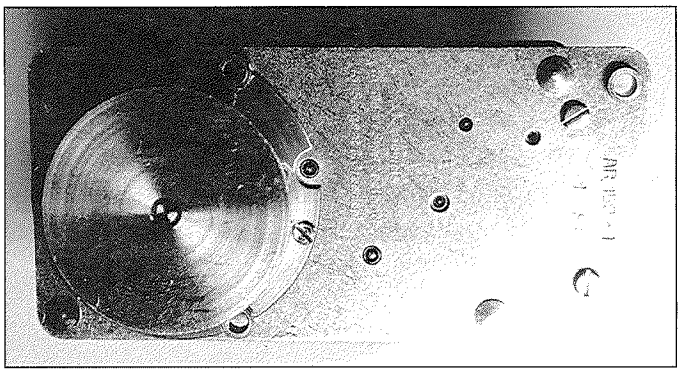


Figure 12. Brass mainspring barrel of the Style "R" movement; although later production used plastic, also.

wanted. If this is going to be a problem, this overwind must be removed before the vault is locked up for the night.

1. With the Standard Third Wheel

To remove an overwind, simply hold back the main train of wheels with your thumb and index finger. Remove the platform escapement and allow the train to run down by braking your thumb against the fifth wheel (as when releasing power) until the dial pin stops any further release of power (dial indicating less than zero) (Figure 10). Replace the platform escapement and wind.

2. With the "Backwindable" or Resettable Third Wheel

"Backwind" or turn the winding arbor backwards, below the desired opening time. If the movement is not running or the balance motion is sluggish, disassemble, and service the movement. If the balance motion is good, rewind the winding arbor to the proper opening time.

3. If You Don't Know if the Movement is Resettable or Not

If you are not certain that the movement you have is backwindable, use procedure 1 above just to be safe. There is no way to tell if it's backwindable just by looking. Some movements have a #1 in a square box on the dial to tell you it is "backwindable" (Figure 2). Some have a #0 in a box on the dial to tell you the movement is not "backwindable" (Figure 3). But many are not marked so you have to disassemble the movement in order to tell which third wheel you have.

Servicing the "Backwindable" Third Wheel

The "backwindable" third wheel (Figure 6) must ***never*** be cleaned in an ultrasonic bath. It ***must be removed and dry cleaned***. If it has been cleaned in a liquid solution, it must be disassembled, hand cleaned in solvent, thoroughly rinsed in rinse solution, rinsed in alcohol, dried, reassembled, and then readjusted to retain its original torque. Any trace of oil or cleaning solution will render this wheel useless because once a force from the mainspring is applied, the wheel will immediately slip, causing the mainspring to completely release and allow the safe or vault combination to be opened immediately.

1999 ETA Improvement Courses Combine Innovation and Tradition

For the watch industry, continuing education and training remain as vital as ever. For nearly 40 years, ETA S.A. Fabrique d'Ebauches has been doing its part in this crucial area, running widely successful improvement courses both in Switzerland and abroad. In 1998, for instance, no fewer than 1,100 watchmakers and repairers attended technical seminars at the ETA Training Centre in Grenchen while some 3,000 watch repairers worldwide received advanced training from ETA's team of three instructors and local technical representatives. Horological expertise must obviously be updated regularly to keep pace with ceaseless technological developments in the design of both mechanical and quartz watches. In this way, too, the quality of ETA customer service continues to improve, thereby consolidating the enviable reputation of Swiss time products the world over.

The ETA 1998 Improvement Course Program
Structure has remained essentially the same as last year's:

- introduction to quartz technology (A 1)
- maintenance of mechanical calibres (A 7)
- specialist course on mechanical and quartz chronographs (A 3)
- understanding special upmarket products (A 6)
- product familiarization for beginners and marketing, sales and office personnel (D 1)
- course on new products (A 2) including all designs introduced during 1998, such as the ETA 205.911 "Autoquartz" and the ETA 251.471 woman's quartz chronograph calibres as well as the compact E 01 and E 03 quartz movements.

ETA seminars are run by company instructors in five languages: English, French, German, Italian, and Spanish. Locally recruited instructors also provide training in Portuguese, Greek, and the Scandinavian languages. The course program structure is designed to enable trainees to advance step by step, from basic introduction to the ETA product range to practical familiarization with simple and later with more complex mechanical and quartz movements. The certificates issued to trainees at the end of their course thus feature a bronze, a silver, or a gold stamp corresponding to the level of the one- to five-day course they have just completed.

ETA seminars may also, on request, be tailored to the specific requirements of groups of trainees, using the latest types of teaching aids such as video presentations and interactive CD ROMs.

ETA training activities extend beyond practicing watch repairers to the nearly 140 horological trade schools all over the world who are regularly supplied with sample movements, technical literature, teaching aids, and counseling directly by the Training Centre. These schools' teaching staff are furthermore regularly invited to attend retraining and new product familiarization courses where the latest technological advances are demonstrated and explained. Over the years, this policy has proven extremely positive by forging close links with training institutions the world over, thus sharpening ETA's awareness of the particular requirements of young watch-industry trainees and of those who instruct them in the basics of their future trade, particularly with respect to the practical demands of manufacturing firms and repair shops.

For further information, please get in touch with:

ETA SA Fabriques d'Ebauches
Training Center
Bahnhofstrasse 9
CH-2540 Grenchen

Tel. (0041) 032 655 26 21
Fax (0041) 032 655 71 74
e-mail: etaformation@eta.ch

ETA TECHNICAL TRAINING 1999

Designation	Type of course	Participants	Duration	1999 Dates	Language	Place
A 1	**Basic course** (whole range of ETA quartz products, except for the chronographs)	**Watchmakers & Repairers** (who would like to learn the basic knowledge of the quartz products)	3 ½ days	11. - 14. October	English	ETA Grenchen
A2	**Up-dating course** (on Autoquartz and latest ETA products)	**Watchmakers & Repairers** (who wish to discover the new products launched during the year)	2 ½ days	15. - 17. November	English	ETA Grenchen
A 3	**Specialization course** (on ETA mechanical and quartz chronographs)	**Watchmakers & Repairers** (who followed a basic course and wish a specialization course on chronographs)	4 days	16. - 19. August	English	ETA Grenchen
A 5	**Individualized course** (for technical and administration personnel, organized on request)	*** Watchmakers & Repairers** *** Sales and administration personnel**	Variable (according to programme)	As requested (min. number of participants for the organization of a course: 5)	English	As requested
A 6	**«Exclusive» course on special products** (on Elégance, perpetual calendars and Autoquartz)	**Watchmakers & Repairers** (mastering the service of mechanical and quartz products and wishing a specialization course on «special products»)	3 ½ days	14. - 17. June	English	ETA Grenchen
A 7	**Course on mechanical watches** (On the whole range of ETA mechanical products, without chronographs)	**Watchmakers & Repairers** (who wish to refresh their knowledges on the servicing of mechanical watches)	3 ½ days	25. - 28. October	English	ETA Grenchen
D 1	**Technical training seminar** (product knowledge on mechanical and quartz watches)	**Sales and Administration personnal**	1 days	on request	English	ETA Grenchen

Enrolment, information and course programmes: ETA SA Training Centre, Bahnhofstrasse 9, CH-2540 Grenchen
(tel.: 032 / 655'71'11 fax: 032 / 655'71'74)

Dennis Warner

Affiliate Chapter Report

Many of our affiliate chapters run successful projects. I have asked them to share these with you so you may adapt them for your organization. Bruce Clemens, president of the "Ozarks Area Timekeepers Guild" in Missouri, has submitted the following:

To the working clock/watchmaker, ongoing training is an invaluable resource. AWI provides this resource admirably with both the onsite training facility and the traveling bench courses. Affiliate chapters can host bench courses, and our Ozarks Area Timekeepers Guild has done so in the past, and will continue to offer courses as funding and interest permit. One of the challenges of hosting a bench course in a locale where members come from a large region of the country to attend (we draw horologists from at least five states) is that the cost of the bench course dramatically escalates when you factor in travel and lodging expenses for those who must come a long way and stay for a weekend.

Early in 1998 our Guild members established a scholarship fund to allow the Guild to sponsor students who would like to attend the bench courses we host but may be challenged financially. We set up some basic guidelines regarding the disbursement of funds, and set it up so that our Guild Board of Directors oversees the disbursement, along with input from a representative from our local NAWCC chapter as well. We immediately decided that we wanted the scholarship to be available to anyone the directors deemed worthy, even if that person didn't belong to our local Guild. Hence the inclusion of an outside volunteer from NAWCC.

We also chose to name the scholarship fund in memory of one of our Guild's founding members, watchmaker Jack Skidmore. Mr. Skidmore passed away two years ago, and we felt that placing his name on the Scholarship fund would be a fitting tribute to a man who was so generous in the sharing of his knowledge and wisdom. With that the Jack Skidmore Memorial Scholarship Fund was underway. Next, fundraising began. Several personnel from Cornerstone Jewelry, a fine Springfield, Missouri retail jeweler, are members of our Guild. Upon learning of the Scholarship fund, Cornerstone's owner, who had worked with Mr. Skidmore on many occasions, immediately pledged a corporate contribution. Next we set up a contribution jar and ran off some signage on a home computer, and took it all to the next NAWCC meeting. There OATG representatives made a short

Jack and Louise Skidmore in 1992.

presentation explaining the fund, and the NAWCC members responded generously. We soon had enough money to finance a student to attend our next bench course, Roy Hovey's Introduction to the Watchmaker's Lathe.

With the help of the director of the Oklahoma State University Watch and Clockmaking school in Okmulgee, Oklahoma, an interested student was found who wouldn't otherwise have been able to take the course. We were pleased to have a small part to play in the training of an aspiring horologist, and as the ongoing fundraising efforts continue, we proudly feel that the fund has already been a success.

I encourage all affiliate chapters to consider starting a scholarship fund, as it can be done easily and the money can come from many lucrative sources. Individual contributions add up, and jewelry stores that are serious about watch repair may be pleased to help. Also guild members can donate surplus materials to go to a fundraising table at the next NAWCC mart.

Jane Currier works on a project during "The Introduction to the Lathe Program" course held in St. Louis, MO, on October 24-25, 1998.

In a small way, your Guild or Affiliate Chapter can have a large impact on the education of young watch and clockmakers of the future.

Bruce Clemens

I thank Bruce for this letter and presenting the idea to the members of OATG that they approved and put into action. Every chapter has a person like Jack Skidmore who was always there to mentor the hobbyist, collector, or professional. All who knew "Uncle Jack" admired his skills at the bench and in dealing with people. He was a watchmaker who was not active in AWI but lived by the AWI Code of Ethics and had a willingness to help anyone who was genuinely interested in horology. He had many friends across America through his membership in NAWCC. Jack was a past president of the Ozark Chapter and attended many regional and national meetings. When I moved to Missouri from Maryland in 1991 he was the first watchmaker I met. I was surprised and thankful for his help and friendship and being my mentor for five years. All of us will miss him and are proud that in a small way we can remember and recognize him by participating in the "Jack Skidmore Memorial Scholarship Fund."

Dennis Warner

Repeater, Petite and Grande Sonnerie Clocks

Carriage Clocks, Part 40

Leo A. Jaroslaw

Introduction

In Part 39 we completed the repeat system. Now we will go on to the alarm system. This system in both the Badolette and the Drocourt clocks is basically similar, as it is in most other carriage clocks. It differs only in design of components and/or placement of parts. The principles are similar. As I proceed, I'll point out the differences.

Alarm System Description and Operation

The alarm control assembly (Figures 40.1 and 40.2) is comprised of the alarm control arbor (57), the main alarm wheel (59), the alarm control pin (60), the notched collar (62), the balance bar (65), and the stop/start pin (67). This assembly is located on the front plate below the motion work (Figure 40.1). The hour wheel drives it through an intermediate wheel (not numbered). The main alarm wheel is freely rotating on its arbor. There is a difference here between the two clocks. The Drocourt has the wheel mounted on the alarm control arbor (57), which can also be called the alarm set arbor (84), (Figure 40.3) at its other end. It is also free to move up and down. A square is milled just above the free-range area of the arbor. The notch collar is fitted and pinned to that square. It therefore rotates with the arbor (57/84). The alarm control pin (60) is attached to the upper surface of the alarm control wheel (59). As the wheel turns the pin rides under the notched collar.

The Badolette system is configured somewhat differently. The alarm control arbor on this clock is a separate arbor or post, not directly part of the alarm set arbor (84) as in the Drocourt. It is mounted as an assembly together with the alarm set ratchet (71). See detail in the lower right corner of Figure 40.2. The alarm set arbor (84) (not shown in this figure) is attached to and drives the alarm set wheel (70). Both the set ratchet assembly and the set wheel are supported and held in position by a heart-shaped alarm arbor bridge (74).

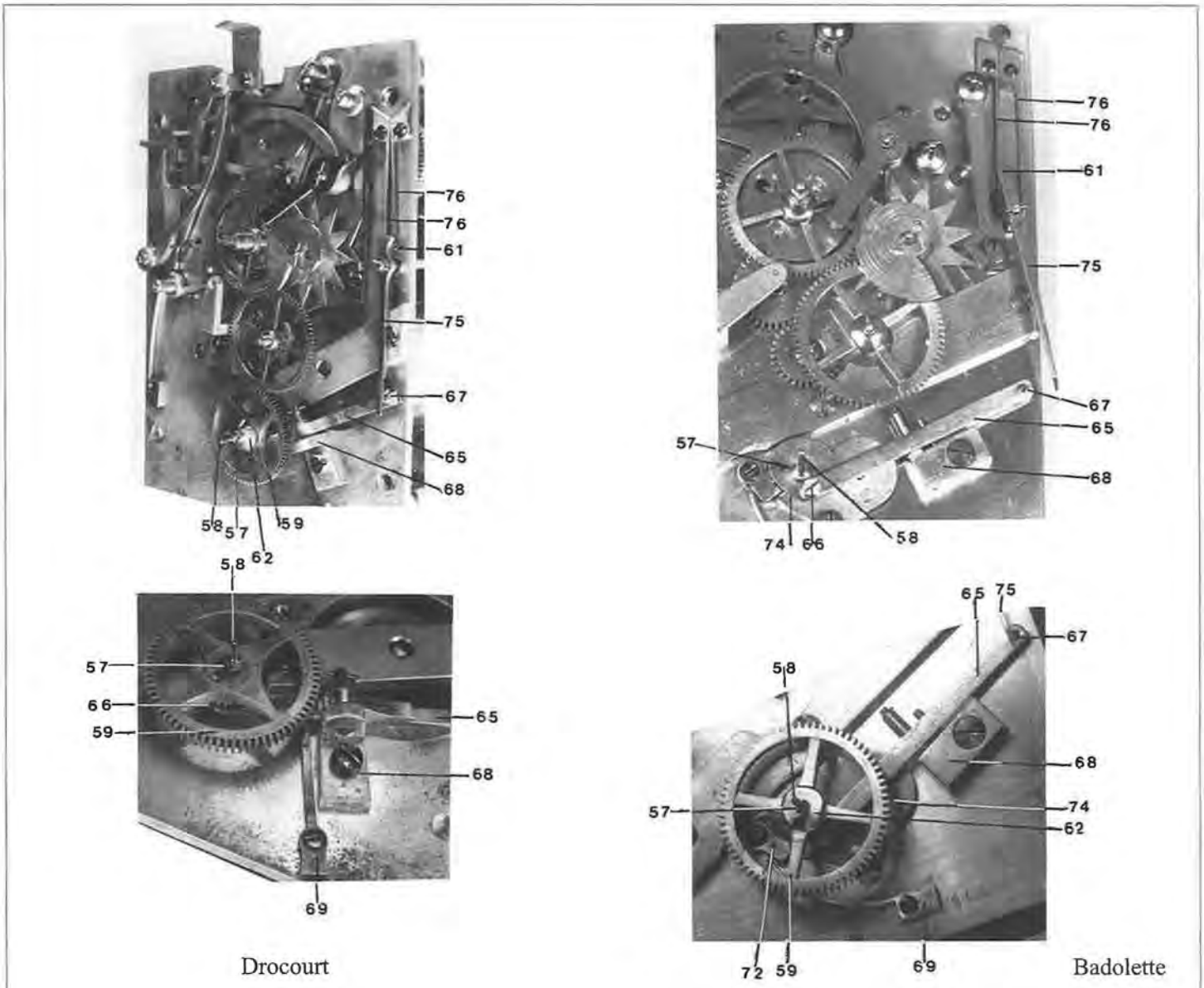
The main alarm wheel (59) is mounted on the post which is not numbered, but is part of the alarm hand arbor (58) and set ratchet which make up the assembly which is not numbered. It is free to rotate and move up and down, similar to the action of this assembly on the Drocourt clock. The purpose of the ratchet wheel and click (72) is to allow setting the alarm in one direction only.

The notched collar (62) is mounted and pinned to the square of the hand arbor (58). The main alarm wheel also has the alarm control pin (60) mounted on the upper side of the wheel. This pin also rides under the notched collar as the wheel turns. One side of the tip of this pin is beveled and polished. This allows it to ride up the step curve (64) in the notch of the notched collar.

The balance bar (65) design of both clocks is slightly different. So are the balance bar pivots (68) and balance bar springs (69). But the operation is the same. The balance bar lifts the main alarm wheel as the spring, under compression, rotates the bar clockwise (CW) lifting the left end of the bar.

A filister head screw (66) is located on the left end of the balance bar, making the actual contact with the main alarm wheel. Its purpose is for fine adjustment of the whole assembly. It is also used to correct for wear.

At the right end of the balance bar is the start/stop pin (67) (Figure 40.4). When the alarm control pin is riding under the notched collar, the balance bar spring is compressed and the start/stop pin is raised. In this position the pin is in the



57 Alarm Control Arbor
58 Alarm Hand Arbor
59 Main Alarm Wheel
60 Alarm Control Pin
61 Banking Pin
62 Notched Collar
65 Balance Bar
66 Filister Head Screw
67 Stop/Start Pin
68 Balance Bar Pivot
69 Balance Bar Spring
72 Alarm Set Click
73 Alarm Set Spring
74 Alarm Arbor Bridge
75 Alarm Hammer Control
76 Banking Springs

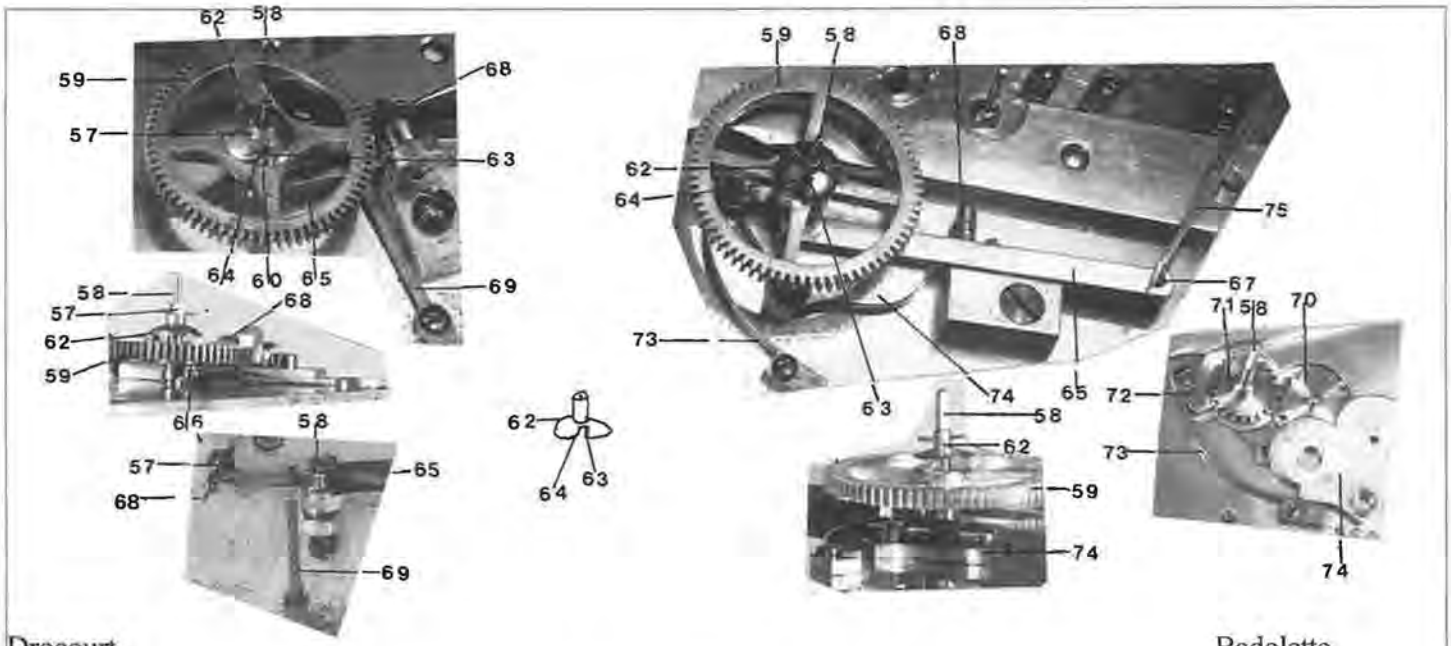
Figure 40.1. Alarm System Component Comparison

path of the alarm hammer control (75) tail. This prevents operation of the alarm even with the main alarm spring fully wound.

The Alarm Components (Figures 40.3 and 40.4)

The alarm is set from the back using the alarm set arbor (84). In Figure 40.3 please note the direction arrows at the arbor (84) are in opposite directions for both clocks. The Badolette, you remember, doesn't have the direct set arbor as does the Drocourt. The set arbor drives the set wheel (70) counterclockwise (CCW). This in turn rotates the ratchet wheel/post assembly CW.

As the set arbor is turned it also rotates and positions the notched collar. Since the alarm indicator hand is mounted on the same arbor it also rotates. The notched collar has a notch milled into it (63) (64) (Figure 40.2). The let-off side (63) of the notch is straight up and down. The



57 Alarm Control Arbor	64 Stop Curve	70 Alarm Set Wheel
58 Alarm Hand Arbor	65 Balance Bar	71 Alarm Set Ratchet
59 Main Alarm Wheel	66 Filister Head Screw	72 Alarm Set Click
60 Alarm Control Pin	67 Alarm Stop/Start Pin	73 Alarm Click Spring
62 Notched Collar	68 Balance Bar Pivot	74 Alarm Arbor Bridge
63 Let Off	69 Balance Bar Spring	75 Alarm Hammer Control

Figure 40.2. Alarm Control Comparisons

stop curve on the other side of the notch is a curved incline. As the start/stop pin goes around under the notched collar, it comes to the notch. The compressed balance bar spring pressures the balance bar through the filister screw to lift the alarm main wheel and its mounted alarm control pin into the notch. This action drops the start/stop pin out of the path of the hammer control tail. The alarm runs.

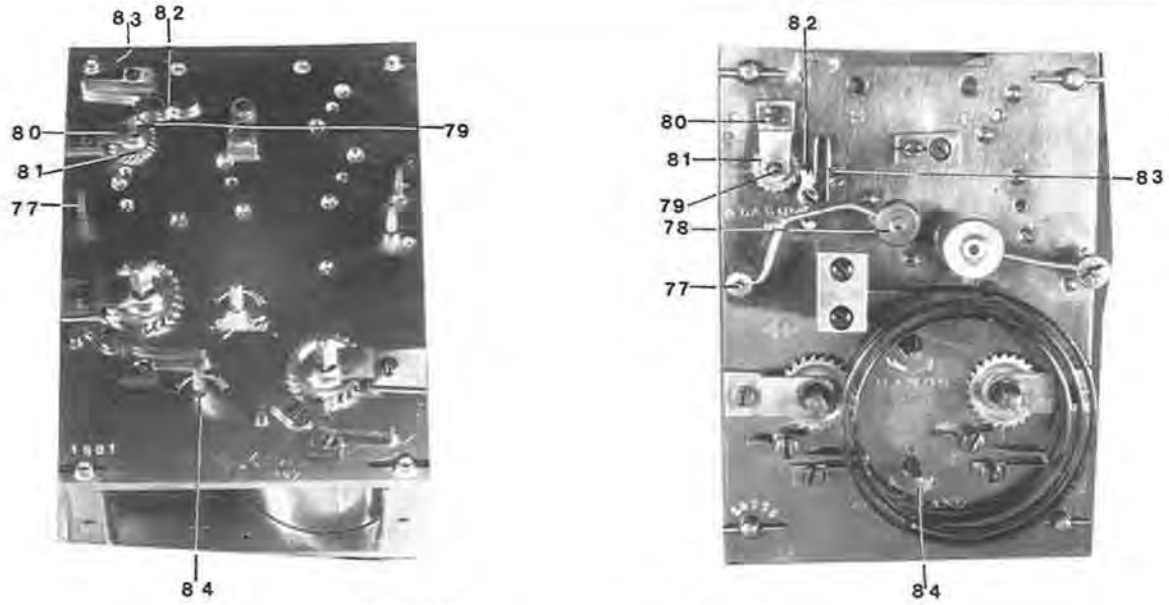
Let's continue with the alarm component description. We will get back to the operation later. The alarm spring barrel (85) is wound by the alarm spring arbor (79) which comes through the back plate. A ratchet wheel (81), click (82), click spring (83) which are held together by the alarm spring cock (80) complete this assembly. A wheel is an integral part of the spring barrel.

This wheel engages with a pinion (not shown) and the alarm escape wheel arbor (not numbered). The alarm pallet (87) works with the escape wheel to vibrate the hammer arbor (77). The hammer arbor goes through the rear plate and the alarm hammer (78) is mounted on it. The other end of the hammer arbor goes through the front plate (49) and the hammer control is mounted on it. A banking pin (61) is pressed into the underside of the upper end of the hammer control. This pin rides between two springs which I call the banking springs (76). These springs absorb the shock as the pin vibrates between the two when the alarm is operating, and also reduces the bounce of the hammer.

Let us go through the operation. The alarm is set for 6 o'clock. As the alarm indicator hand and the notched collar are on the same shaft, they both rotate together. The notch on installation is also lined up to act in conjunction with the indicator hand. The alarm mainwheel turns CW when the time train is running. The mainwheel is held down by the control pin (60) riding under and against the bottom of the notched collar. Pressure is provided by the compressed balance bar spring through the balance bar and filister screw. This position brings the start/stop pin into the path of the hammer control tail, preventing movement of the control. The alarm therefore does not operate, even with the alarm mainspring fully wound.

At 6 o'clock, (which the alarm is set for), the alarm control pin rises into the notch. The balance bar spring raises the left end of the balance bar and lowers the right end with its integral start/stop pin. The hammer control is now free to vibrate. The alarm mainspring now rotates the escape wheel which acting on the alarm pallet vibrates the alarm hammer, and the alarm sounds.

This system has no shut off. The alarm will sound until the alarm mainspring is run down. As the time train is still running, the alarm mainwheel with its control pin continues to rotate. When the control pin reaches the other side of the notch, it rides down the stop curve pushing down on the alarm mainwheel. The downward movement is trans-



Badolette Drocourt

77 Alarm Hammer Arbor
78 Alarm Hammer
79 Alarm Spring Arbor
80 Alarm Spring Cock
81 Alarm Spring Ratchet
82 Alarm Spring Click
83 Alarm Click Spring
84 Alarm Set Arbor

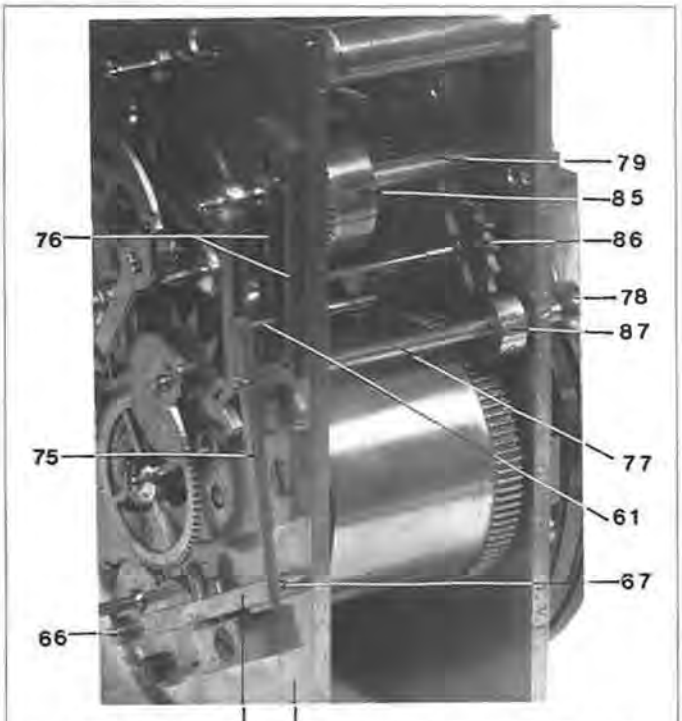
Figure 40.3. Alarm Rear Plate Components

ferred to the balance bar, compressing the balance bar spring. This action lifts the start/stop pin on the other end, into the path of the hammer control tail. If the alarm mainspring is not fully wound down by this time the alarm will be stopped, or locked if it was run down. It can't run again until the spring is rewound and the set time is reached once again.

Just a note on a problem I encountered with the Badolette. The clock would stop many times just after the alarm rang. I finally found that over the years a groove had been worn in the stop curve (64) surface of the notch in the notched collar. When the control pin got stuck in the groove it was able to provide enough back pressure to stop the time train.

I filed and polished the curved surface to eliminate the groove. That cleared the problem.

This concludes Part 40. In Part 41 we will start the description and operation of the sonnerie system of the Badolette clock.



49 Front Plate
61 Banking Pin
65 Balance Bar
66 Filister Head Screw
67 Start/Stop Pin
75 Alarm Hammer Control
76 Banking Springs
77 Alarm Hammer Arbor
78 Alarm Hammer
79 Alarm Spring Arbor
85 Alarm Spring Barrel
86 Alarm Escape Wheel
87 Alarm Pallet

Figure 40.4. Alarm Mechanism

A Pin Wheel Regulator

By David J. Carlson

The pin wheel regulator is my favorite weight-driven clock. Many of these wonderful old clocks were the time standards for those in our craft lucky enough to afford one. The story on the restored clock shown in Figure 1 is different because it did not grace the wall of a jewelry store, but was installed in one of the local hotels long since demolished to make way for "progress." The clock is impressive in size. The case is walnut measuring 86" tall, 9" deep, and 24 ½" wide. The dial measures 13" across with a 10" chapter ring. The pendulum is temperature compensated with a 12" bob.

As found, the clock was truly a disaster. The case, minus its door, was stored in an unused upstairs bedroom.

Figure 1. Pin Wheel Regulator

The movement, dial, pendulum, and door were found down in the basement. The condition of the parts from the basement was so bad that the clock could have been put in the trash. Fortunately, I had occasion to alert the owner that this was truly a horological treasure well worth being restored.

Restoration

Case

The condition of the case was reasonably good. All it required was cleaning using 4-0 steel wool dipped sparingly in Orange Hand Cleaner[1]. Most commercial hand cleaners do an excellent job, are easy on your hands, and do not raise the grain. For some grease and oil stains, WD-40 was used on a dry piece of steel wool. The solvents in WD-40 are very effective. The condition of the door and lower gallery was poor enough that the job was placed with a friend skilled in wood refinishing.

Glass Installation

The door was brought to a local glass dealer who cut single weight glass to size. Quarter-inch square wood strips to retain the glass were purchased and stained to match the case. After cutting the strips to length, a ½" finishing nail was nailed into but not completely through the strips with at least one nail every 8". The strips were put in position and each nail in turn was "squeezed" into the door frame by operating the trigger on the "Quick Grip" bar clamp[2] shown in Figure 2. Note that the rubber pad on the nail end has been removed to expose the metal clamp face. The pad on the trigger end is left in place to prevent marring the door. This method of installing the retaining strips is very quick and not subject to the possible misadventures when using a hammer.

Dial

The dial assembly was removed from the movement and taken apart into the three pieces shown in Figure 3. The brass bezel was cleaned in water-based clock cleaning solution, hand polished, and then finished with a coat of tung oil.

Figure 2. Installing Glass Retaining Strips

The mounting plate and the back of the porcelain dial were covered with rust. A paint-on solution for ferrous metals[3] was used to chemically convert the rust to a black shiny finish. The surface is attractive and resists further rusting. The surface can be dulled with 4-0 steel wool, sanded, and painted if required. In this case the finish was entirely acceptable without any further work.

Pendulum

The pendulum rod assembly is shown in Figure 4. It is composed of an alternating combination of brass and steel rods that provide temperature compensation because the equal and opposite expansion of the two metals cancel and the pendulum length is maintained. Note in Figure 4 that the steel rod carrying the rating nut can be unscrewed from the lower crosspiece. This was convenient because the brass rating nut was stuck in place with rust. To free the rating nut, the thread on both sides was cleared with a combination of rust remover and wire brushing. Penetrating oil was then used to break the rating nut free. The threads that were under the rating nut were then cleaned. Finally, all the components including the brass and steel rods and the pendulum bob were hand polished and

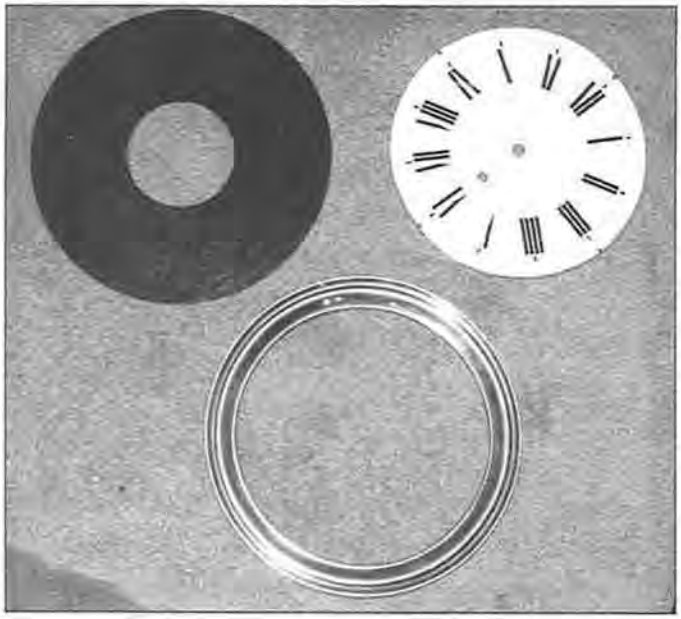


Figure 3. Dial Disassembled

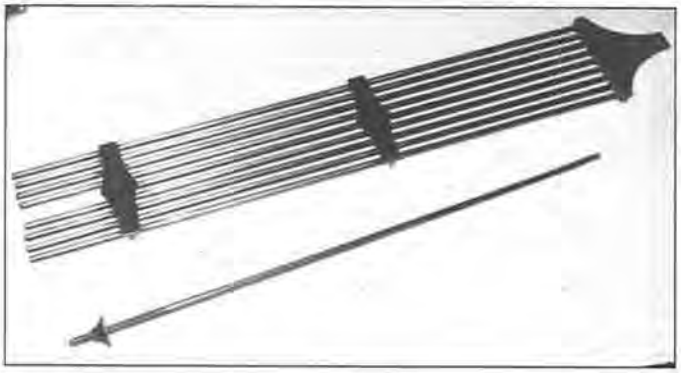


Figure 4. Gridiron Pendulum Shaft

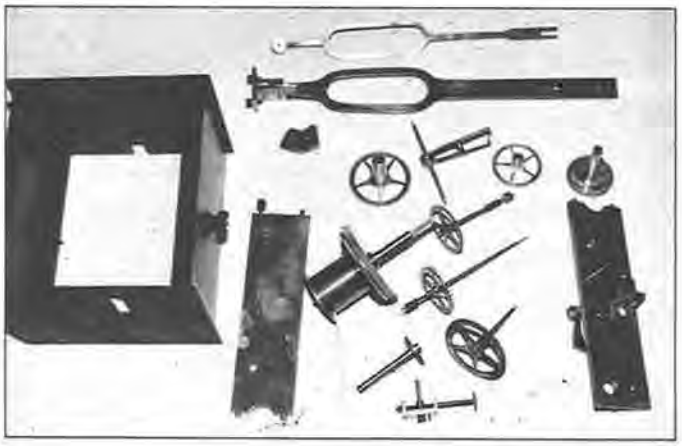


Figure 5. Movement Components

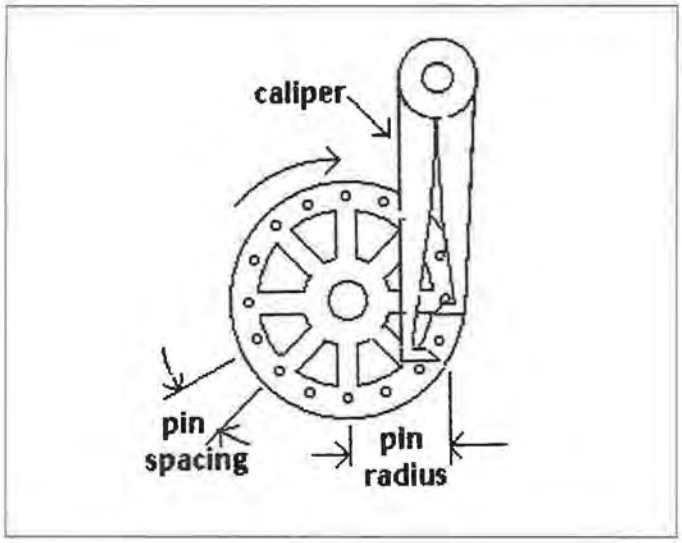


Figure 6. Escapement Schematic

finished with tung oil except the rating nut thread that was lubricated with a thin coat of heavy grease.

Movement

The component parts of the movement are shown in Figure 5. All parts required hand polishing to remove rust and to brighten the brass. The enclosure for the movement shown on the left was wire brushed and treated for rust[3].

Escapement

The pin wheel is immediately to the right of the winding arbor/drum in Figure 5 and the escapement one gear removed above it. The pin wheel and caliper-like escapement are shown schematically in Figure 6. The critical dimension is the **pin radius**. Figure 7 is the setup for testing and adjusting the pin radius. The pin wheel is supported between female centers in a watchmaker's lathe and a dial indicator is set up to check the pin radius. All pins are first inspected to assure that they are straight and vertical with respect to the wheel. The pin radius is then adjusted to be within +/- 0.001" for all pins. Maintaining the pin radius is analogous to requiring equal teeth height in the escape wheel of a deadbeat escapement.

Assembly

After all the components were cleaned and checked, the between-the-plate components were installed, followed by the caliper and crutch as shown in Figure 8.

The suspension spring assembly was found to have a cracked spring. Figure 9 shows the top block, bottom block, and the two springs after removing the rivets. New spring leaves were cut from steel spring stock and installed. The lower of the two holes in the top block is a safety feature. A pin through this hole into the support bracket prevents the pendulum from falling if a spring breaks.

Figure 7. Setting Pin Radius

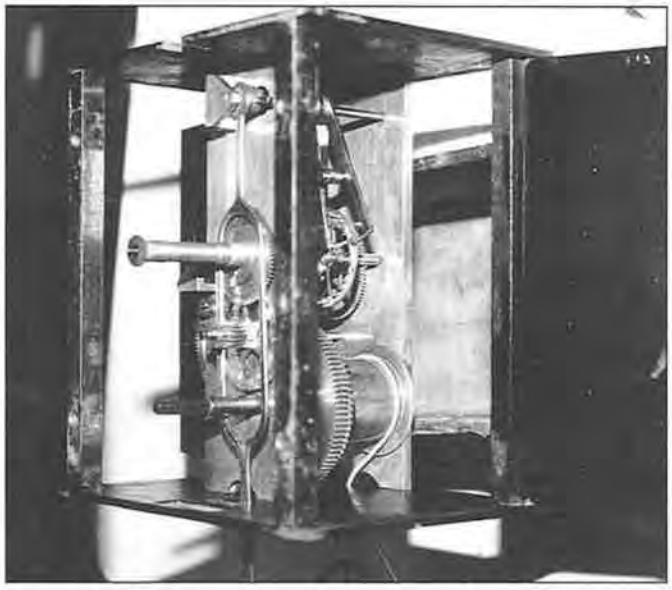


Figure 8. Movement Assembled

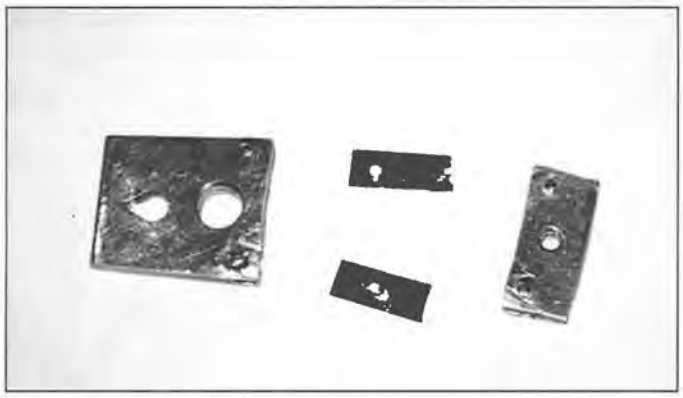


Figure 9. Suspension Spring

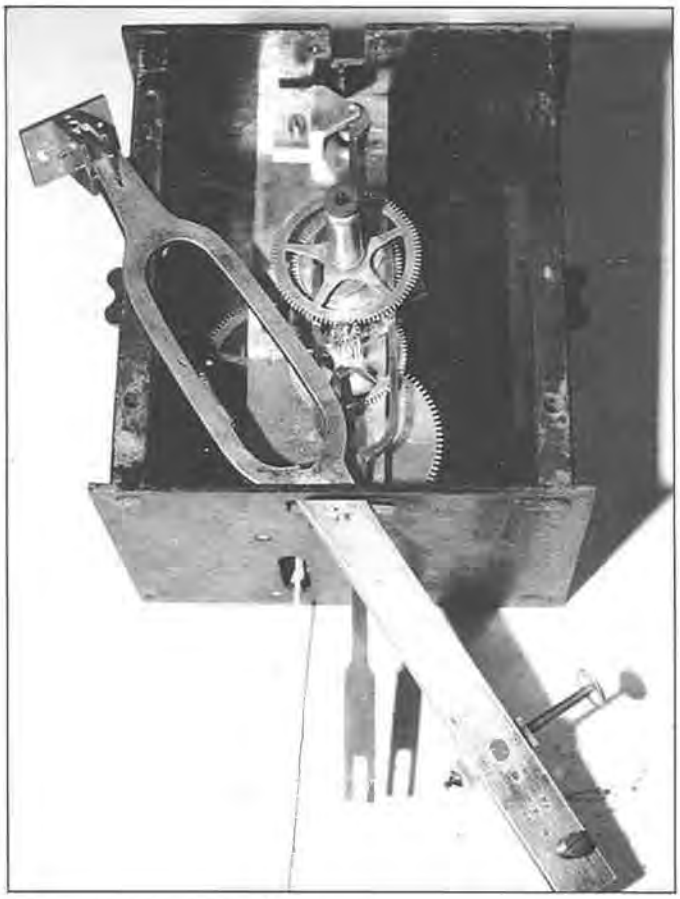


Figure 10. Pendulum Support

Figure 11. Test Stand

Figure 12. Test Stand Bracket

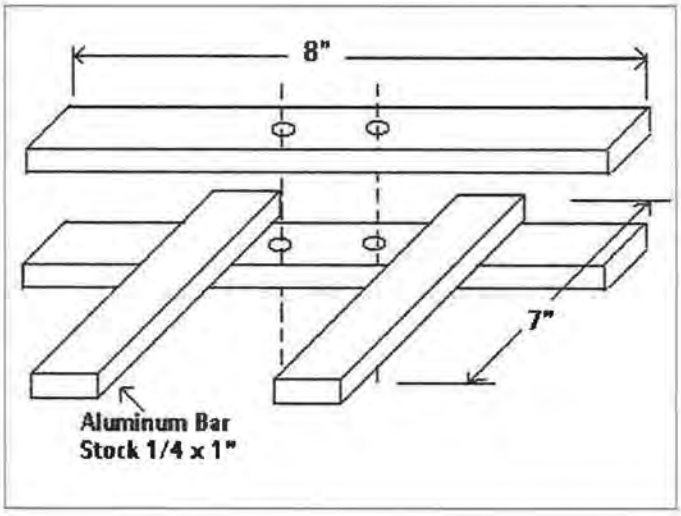


Figure 13. Bracket Details

The pendulum support is shown ready to be attached to the top plate in Figure 10. The mounting bracket on the top left of the pendulum support contains the suspension spring assembly. The pendulum support is installed through a slot in the bottom of the movement housing. The beat adjuster on the bottom of the support must be removed so that the support will pass through the slot. It is reinstalled afterwards.

After final check and lubrication, Figure 11 shows the clock set up in a test stand. It was necessary to accommodate the clock by modifying the test stand with the bracket shown in Figure 12. Figure 13 is a schematic detailing the bracket. The material used for the bracket is ¼" x 1" aluminum bar stock. The bracket is held together with two 10-24 bolts and two wing nuts. This removable bracket has proved handy for several other jobs.

After checkout in the test stand, the clock was installed in the case as shown in Figure 1. My personal pleasure was saving a wonderful clock for the future.

Footnotes

1. Orange Hand Cleaner by gojo®
2. Quick Grip bar clamp by Vise Grip®
3. Rust Eater by Turtle Wax® is one example.

THE AWI CAN REJOICE AT THE SMITHSONIAN'S ANNOUNCEMENT ON QUARTZ WATCHES

A personal history by Ben Matz

Twelve years ago I visited the wonderful horological exhibit at Smithsonian's National Museum of American History and found to my amazement that it ended with the revolutionary but now antiquated Accutron. There was no sign of a Quartz Watch. I reported this to then Executive Secretary Milton Stevens and suggested that AWI contact the Museum and request that quartz watches be included in their exhibit.

Curator Carlene Stephens responded that it was a great idea, but warned us that "large institutions like the Smithsonian move very slowly." (Wow! Was that the understatement of the decade!) As a result of all this, AWI appointed me Adjunct Historian Liaison to the Smithsonian Institution. I was a one-man committee with these objectives:

"This committee is to continue to communicate and cooperate with the Smithsonian Institution on the project of updating the time display to include technological developments which have occurred since the Accutron timepiece."

To carry out these objectives the following procedures were adopted:

- I carefully examined the major watch and jewelry publications for reports or press releases on new quartz or other timepieces which embodied significant technological advances.
- The Smithsonian's curators would be notified of any significant additions.
- If an acquisition was approved, the Museum contacted the manufacturer for a sample. If the manufacturer declined, or failed to respond, my committee was asked to intercede. AWI's role in assisting the Smithsonian Institute has been extraordinarily significant. In many cases, I was able to contact AWI members who held high positions in major companies. The AWI network was always very helpful in our search. A dramatic example of AWI assistance was in securing the donation of a radio-controlled quartz clock made by the Junghans company in Germany. Jim Lubic, who was in Switzerland on a training program at the time, was contacted by Milton Stevens. Jim was able to get in direct touch with Mr. Kiolbassa of Junghans and the exhibit donation was soon on its way to the Smithsonian.
- Newly acquired quartz watches became part of the national collection for research and exhibition.

On several occasions, Smithsonian curator Carlene Stephens had shared her plans for temporary exhibits of the new quartz collection. For reasons of funding, these exhibits never materialized. Finally, in 1997, through a grant from the Lemelson Center for the Study of Invention and Innovation, a major breakthrough was achieved. The Smithsonian's quartz watch exhibit debuted on the Internet (See *HT* cover in the November, 1998 issue.) In the resources section of the quartz exhibit several prominent AWI publications and authors are listed, including Henry Fried's *Repairing Quartz Watches*, Louis Zanoni's "Repairing the LCD Watch," and my own "History and Development of the Quartz Watch."

Significant portions of the quartz exhibit will be included in a new Smithsonian permanent exhibition titled, "On Time," that is now scheduled to appear in the Fall of 1999. AWI can take pride in the role it has played in assisting the Smithsonian Institution preserve and display this important part of the history of horology.

Material Matters

By Peter W. Eckel

As you read this latest installment of "Material Matters" it is the beginning of February and the holidays are a fading memory and a pleasant one, I hope, for all. We've made it to 1999 and as I find myself looking down the barrel of a 40th birthday in a few weeks, I thought it might be a reasonable time to reflect a little (in a mid-life crisis kind of way). Since this column is about a year old, this is a good time to say that I have really enjoyed sharing my thoughts with you and hope to continue doing so. This time I thought you might find it interesting to know how I came to be a material person in the first place. If not please skip immediately to the next article. I promise not to take it personally.

I was born poor and hungry in a small log cabin in the hills of Toledo, Ohio. No wait a minute that can't be right. I've never seen a log cabin here, there are no hills in northwest Ohio, we weren't poor and I don't remember ever going hungry. I must have been thinking of something else. Something a little closer to the truth might be that I had a rather uneventful childhood and the thoughts going through my mind, career-wise, had nothing to do with watches, material, or the supplies thereof. Fast forward to my senior year in high school when in October of that year I spent the only two weeks of my life unemployed, having just given up a less than lucrative position at the neighborhood Baskin-Robbins ice cream store.

This is a point that turned out to be rather important although it didn't seem like it at the time. A dear friend of mine, who happens to be older than I am, was doing trade work out of his home after having returned from the Joseph Bulova School in New York. Being aware that I was no longer counting on being an ice cream mogul he mentioned that the material house he frequented was looking for a "gofor" (euphemistically, a delivery engineer). At that time Toledo had many jewelry stores downtown and so when I finished school at 1:00 I flew downtown to do the deliveries. It was really quite interesting. There were jewelers and watchmakers and I remember my first trial by fire. I was asked to locate in my trusty catalog a diamond stretcher since the benchman I was talking to had misplaced his and was in dire need of one as soon as possible. Surprisingly enough I was unable to find one in the catalog but promised that I would ask when I got back to the store and bring one on the next trip. They say a little humiliation is good for the soul and I learned a lesson about being a little too gullible that day. Although there is only one jewelry store left in downtown Toledo-proper now and we now deliver only to the malls and independents, I still enjoy taking care of many of the same people I started with those many years ago.

The summer following graduation from high school I worked full time and found that I enjoyed the work and the people in the industry. That fall it came time for me to begin my higher education at the University of Toledo in electrical engineering. A funny thing happened on the way to that career. I never went and decided to spend a little more time in the material business to see if I really liked it as much as I seemed to. Well I guess I did because, needless to say, I'm still here. I did go back to the university but this time as a business major. That lasted two years; I left only to return to another college, Heidelberg in Tiffin, Ohio, years later to complete that degree in 1997.

In the meantime I began to learn material along with tools and equipment for both the watch and jewelry industries. The best part of this business is that the learning never stops which keeps it very interesting and challenging. That is the great advantage and disadvantage of the material business, even though there are no schools to attend to learn material there's the plus of always encountering something new.

I started at a time when the digitals were a few years in the future and the American pocket watches were somewhat in the past. This made for an interesting problem when I began to pick material. I was amazed that my co-workers could find things with such incredible ease and I thought I must be a real dolt because I was asking the same questions over and over. I now realize that it was just the same learning process that every material person goes through. The classics include "You mean a set bridge in Swiss is the same as a minute wheel clamp in Elgin and a setting cap spring in Hamilton and a yoke in some of the other brands?" The answer always being a resounding yes! The pocket watches still represent a challenge for me because the people that have been doing this longer than I seem to be able to walk right to the drawer that has the part in question or at least find a note saying that it's discontinued. I still must do it the hard way and check the books though I still end up in the same place.

Now I get the joy of watching this process from the third person since we now have a material person in training at the store. His name is Toby and he just happens to be the son of one of my partners, Bill. The only problem I have with Toby is the fact that with his arrival I am no longer the youngest. I'll get him for that if it's the last thing I do! He is running into all the confusing things that I did many years ago. Many companies such as Elgin and Hamilton have "old" part numbers and "new" part numbers, not to mention the different part-numbering systems themselves. In Elgin a winding arbor (stem) is part #3, but when you go to Bulova it is part #16 and of course the Swiss number is #401, not to mention the six-digit ISO system that Bulova uses on some of their electrics. That is the one advantage of being older, now I get to answer some of the questions instead of asking them all. Toby is also being introduced to the classic "I'm going to do this but YOU are never to do this yourself." An example, the armed crystal that has been sheered off at the bezel line with the ring and a part of the crystal still in the case. When I started doing this kind of work I saw one of my mentors take a small screwdriver and drill out a small piece of the plastic allowing him to remove the remainder of the crystal and ring without taking the movement out. My first attempt at this procedure produced a rather unsightly scratch on the dial of a ladies Omega. A dial that had to be replaced and a dial that I have to this day to remind me to be careful these twenty some odd years later.

Like any business your material house is made up of a unique group of talented people and I am reasonably sure that most are like ours. Each material person brings his or her own special forte that when combined with everyone else's makes for a very professional and service-oriented group. My purpose in writing this little autobiography is twofold. The first reason is to let you, the watchmaker, know that most material people are "lifers." In other words we've been doing this a very long time and we enjoy serving you. The second reason is to put a little bit of a human face on those people you see or more than likely only talk to numerous times a week. We material people rely on you the watchmaker for our livelihood and we respect the work you do even if it seems sometimes that your customers do not. So as 1999 progresses take care and remember, oh what the heck you know what comes next (material matters).

Industry News

Rayovac Launches Quartz Watch Battery Line

Rayovac recently announced the launch of its line of Quartz™ watch/electronic batteries. The brand's new graphics, new packaging, improved quality, and select number of SKUs will all add up to increased sales and profits in this category.

Rayovac Quartz watch/electronic batteries include both silver and lithium systems and come in the most popular sizes to meet the needs of consumers. Improved quality ensures that Rayovac Quartz batteries will meet the power demands of today's devices. The new line minimizes the number of SKUs retailers need to carry while still managing to cover 95 percent of the watch/electronic battery market. Additionally, a cross-reference guide listing battery sizes between different brands is available to facilitate battery replacements by jewelers.

The increase in popularity of smaller electronics has created the need for tiny, powerful batteries. The battery replacement market is pegged at $470 million and growing. Rayovac's Quartz battery line gives jewelers the opportunity to purchase and install high-quality watch batteries that are competitively priced and profitable.

The Rayovac Quartz watch/electronic battery line is currently available through many watch and jewelry supply houses throughout the United States and Canada.

For more information about the Rayovac Quartz battery line contact your watch battery distributors or Rayovac Customer Service, P.O. Box 44960, Madison, WI 53744-4960 or call 1-800-470-7328.

1998/1999 Watch Distribution & Service Guide Now Available

The 1998/1999 edition of the *Complete Guide to Watch Distribution & Service* is available for order from the Watchmakers of Switzerland Information Center (WOSIC). Also known as the Official Guide of the Federation of the Swiss Watch Industry, this directory serves as a valuable source of information for members of the watch and jewelry trade.

Revised annually, the Guide contains an A to Z listing of U.S. distributors and service facilities for most Swiss and non-Swiss watch brands. Also included are directories for material and supply houses, antique watch and clock resources, antique watch associations, auction houses, watchmaking schools, Swiss consulates, trade publications, and industry associations.

The Guide also takes a historical look at the Swiss watch industry in the United States and offers information through a glossary of watch-related terms and sections entitled "Timely Tips on Fine Watches," "Mechanical vs. Quartz Watches" and "Measurement of Time."

To order the 1998/1999 *Complete Guide to Watch Distribution & Service*, mail a check or money order for $28 (includes shipping and handling) to WOSIC, 201 West Passaic Street, Suite 103, Rochelle Park, NJ 07662. For volume discounts, call (201) 291-8811.

Hermle Buys the Urgos Clock Company

Urgos, established in 1920 and one of the three leading clock movement manufacturers in Germany, was purchased by the Hermle Clock Company in December 1998. Urgos was known for tradition in craftsmanship but the company was out-gunned by its competitors in technological innovation and new product development.

Hermle has been known for their technological leadership in movement manufacturing. Hermle was also the first and only company of the three movement manufacturers who decided to open their own subsidiary in USA. Hermle Black Forest Clocks in Amherst, Virginia was established in 1977.

By the decade of the eighties, the Urgos manufacturing plant employed around 200 people and exported to more than 60 countries. Lack of automation, high cost of the company's labor commitments, and tough competition made their movements increasingly expensive for overseas customers. Sixty percent of their production was exported to the USA. In December 1990, the Urgos management decided to cease operations and sell the company. An American company showed interest in buying at that time but German law and the lack of experience in manufacturing of mechanical clock movements stopped the deal.

Walther Steinbach GmbH & Co. KG bought Urgos on March 31, 1993 and tried to re-establish the business. However, after 5 years of struggling, they decided to stop production and sell Urgos. Several companies showed interest in purchasing the know-how, patents, machinery, tools and the company logo. Rather than have the clock manufacturing transferred to another country, Hermle decided to take over in order to keep the clock movement manufacturing in Germany.

Hermle/Urgos will continue in clock movement manufacturing. New innovations combined with automated manufacturing and computerized quality control will guarantee that Hermle can supply products at prices everybody can afford.

Hermle employs more than 400 people in three manufacturing plants in Germany. The Amherst, Virginia plant has a unique reputation on the North American continent. Hermle is the OEM supplier for well-known companies around the globe, not only on the mechanical side but the quartz side.

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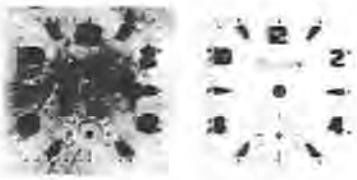

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Watchmakers tools, equipment, material, and supplies, mostly used. Sold by free list, available from Dashto, Tom Mister, 2557 Sandpiper Rd., Virginia Beach, VA 23456; Phone (757) 426-1155, Fax (757) 426-3133; e-mail: dashto@erols.com. View all lists at http://www.erols.com/dashto/

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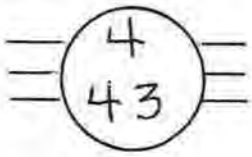
For more information contact the *HT* Editorial Department at 513-367-9800

BULLETIN BOARD

NEW REQUESTS

Russian-Made Clock
Richard A. Osterman, Kent, WA, is trying to identify a Russian-made clock that he has taken in for repair. The clock has a broken balance staff and he would like to know if balance staffs are available for this clock. It has a platform, 12-jewel escapement. The only identification on the movement is as follows:



If anyone can identify this movement or help Mr. Osterman with a source for a balance staff, please contact *Horological Times* "Bulletin Board".

Bulova Watchmatic Ultrasonic Cleaner
Billy Best, Roanoke, VA, is seeking a parts list and schematic for a Bulova Watchmatic Ultrasonic Cleaner. The cleaner has 60 cycles. It was manufactured in Flushing, NY.

Glass Crystals
Clark S. Donley, Richmond, VA, is seeking information on the process of making glass crystals from scratch.

RESPONSES

Greiner Precicheck
Roy H. Niegel, Spirit Lake, ID; Tim Flower, Pittsburgh, PA; and Mike Okagaki, San Francisco, CA all sent in copies of their Greiner Precicheck operating manuals for Clifford Messner, Jackson, MI.

ITEMS STILL NEEDED

Manson Miniature Engine Lathe
Richard A. Osterman, Kent, WA, is seeking an operator's manual for a miniature engine lathe manufactured by Manson Small Machines, Inc. It is a copy of a large engine lathe, including a one-piece cast iron bed, longitudinal feed, and a two-speed geared head. The housing is one-piece cast aluminum. The head and tailstocks are both taper fit and it takes a 1/8" toolbit.

Unimat Lathe
A.C. Banks, Coarsegold, CA, is looking for someone who restores Unimat Lathes. Mr. Banks would like to have his lathe restored to first-class condition.

ETIC Quartz Watch Testing Equipment
Donald Yax, Howell, MI, is seeking an operator's manual or instructions for operating an ETIC Model 340.525 662 Stabilwatch, an ETIC Model 340-610 or 644 Speedy Trim MKI, an ETIC Switch Box 340-612, and an ETIC Microphone 340-608 32 KH.

Bulova Shelf Clock
Gactan Demers, Lawrence, MA, needs to know the beat rate of a Bulova shelf clock. The clock is battery operated with a mechanical Japanese movement. This clock has Westminster chimes.

Advertisers' Index

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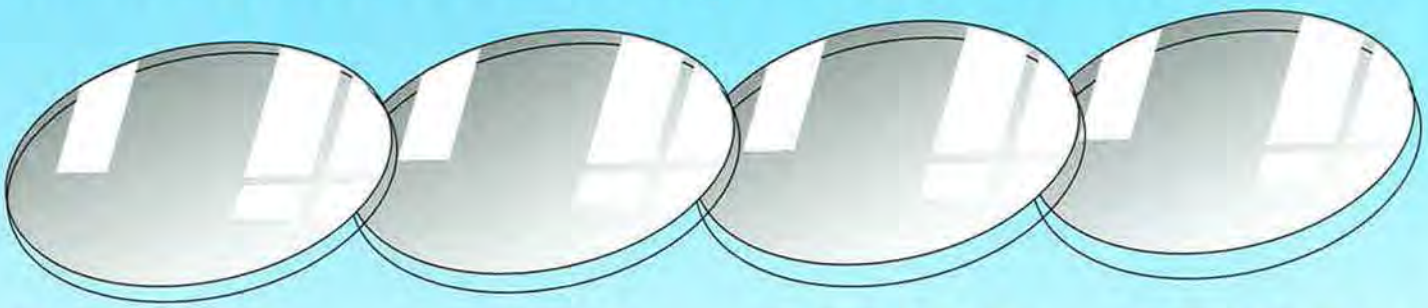
Four New Thick Crystal Assortments!



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DATE	CLASS LOCATION	INSTRUCTOR FEE
FEBRUARY 1999		
27-March 2	Phase II - Clockmakers Micro Lathe Fairfax, VA	Roy Hovey $260.00
• 28	Auto-Quartz Minneapolis, MN	Tamara Houk $65.00
• 28	Sequential Chime Minneapolis, MN	Jim Williams $65.00
MARCH 1999		
13-14	Clock Escapements Sacramento, CA	Jerry Faier $130.00
19-22	Phase II - Watch/Clockmakers Lathe Program Irvine, CA	Roy Hovey $260.00
APRIL 1999		
2-5	Phase I - Clockmakers Micro Lathe Program Austin, TX	Roy Hovey $350.00
16-19	Phase I - Micro Lathe Program Springfield, MO	Roy Hovey $350.00
MAY 1999		
14-17	Racks & Snails Lathe Course Charlotte, NC	Roy Hovey $350.00
• 28	Seiko Kinetic Quartz Watch Repair Boone, NC	David Christianson $75.00
JUNE 1999		
5-6	American Pocket Watches Austin, TX	Alice Carpenter $130.00
11-14	Phase III - Watch/Clockmakers Lathe Program Irvine, CA	Roy Hovey $260.00
JULY 1999		
16-19	Phase I - Watch/Clockmakers Lathe Program Tampa, FL	Roy Hovey $350.00
AUGUST 1999		
7-10	Phase III - Watchmakers Lathe/Clockmakers Micro Lathe Fairfax, VA	Roy Hovey $260.00
20-23	Phase IV-A - Watch/Clockmakers Lathe Program Irvine, CA	Roy Hovey $440.00
SEPTEMBER 1999		
17-20	Phase IV-B - Watch/Clockmakers Lathe Program Irvine, CA	Roy Hovey $440.00

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Academy of Watchmaking

DATE	CLASS	INSTRUCTOR	FEE
FEBRUARY 1999			
28-Mar. 4	Turning Between Centers	Ron DeCorte	$250.00
MARCH 1999			
15-19	Chronograph Repair	Jim Lubic/Tamara Houk	$250.00
22-26	Basic Electronics & Meter Reading	Jim Lubic	$250.00
APRIL 1999			
7-9	ETA Products	Remy Waelchli	$150.00
12-16	Advanced Quartz Watch Repair	Chip Lim	$250.00
19-23	Repair of the Bulova Accutron	Henry Frystak	$250.00
MAY 1999			
3-8	Phase IV - Wheel Cutting Operations for Watchmakers	Roy Hovey	$480.00
JUNE 1999			
1-4	CEWT & CMEW Examinations	Jim Lubic	Exam Fee
7-11	CW & CMW Examinations	Jim Lubic	Exam Fee

Jewelry School

DATE	CLASS	INSTRUCTOR	FEE
MAY 1999			
3-7	Course I Introduction to Jewelry Repair	David Christianson	$595.00
AUGUST 1999			
16-20	Course I Introduction to Jewelry Repair	David Christianson	$595.00
TO BE ANNOUNCED			
	Course II Advanced Jewelry Repair	Tim Schlotter	$595.00