

HOROLOGICAL TIMES

April 1999



American Watchmakers-Clockmakers Institute

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HOROLOGICAL TIMES (ISSN 145-9546) is published monthly and copyrighted by the American Watchmakers Institute, 701 Enterprise Drive, Harrison, OH 45030-1696. Subscription price for the public is \$45.00 per year (\$4.50 per copy) in the United States and \$50.00 per year (\$5.00 per copy outside the U.S.); members subscription is \$14.83 which is included with annual dues of \$45.00. Periodicals postage paid at Harrison, OH 45030 and additional entries. POSTMASTER: Send address changes to HOROLOGICAL TIMES, 701 Enterprise Drive, Harrison, OH 45030-1696.

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NUMBER 4
APRIL 1999

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COVER

This month's cover features a Table Regulator by Sinclair Harding (UK) Ltd.



President's Message

David A. Christianson

The Mid-Year Board of Directors' meeting brought significant progress in various house-keeping measures involving our Constitution and Bylaws (which you'll be voting on this month) as well as various administrative and policy measures which you'll have a chance to review as the various Board motions are reported in *Horological Times*.

One of the more significant motions considered and approved by the Board which will have long-standing implications for our association is AWI's new Mission Statement. It is a statement that summarizes our past and defines our future. It is the guiding statement that will focus our attention and guide our Board of Directors and administrative staff far into the 21st century. In other words . . . it is our big picture of who we are and where we are going.

The statement reads: *The American Watchmakers-Clockmakers Institute is the premier international organization dedicated to preserving and promoting the highest standards of workmanship in the horological crafts. It is the role of AWI to set the standard of excellence to be applied to the quality of instruction and restoration and repair practices taught.*

And then it is further clarified by expanding upon how we have and will manage to accomplish this mission: *To accomplish this, AWI manages a state-of-the-art certification program that ensures individual craftspersons have the traditional and contemporary skills required in repair and restoration in the horological and allied crafts. In order to assist artisans in acquiring needed skills: AWI provides world class educational programs, publishes a professional journal (Horological Times), provides liaison activities for horological schools, maintains cooperative relationships with industry leaders, and facilitates communications among various horological groups. In conjunction with the educational services, AWI supports its members by providing technical support through services such as Material Search, Movement Bank, and providing technical documentation upon request. To the extent that they support the educational mission, the AWT-ELM Trust also manages a time collection, publishes books, creates audiovisual programs, and provides internet services.*



Executive Director's Message

William J. Ewbank

For several years there has been a rising interest by many members of both AWI and the National Association of Watch and Clock Collectors in establishing a closer, more beneficial relationship between the two organizations. This has been largely a grass roots sentiment that has led the leadership of both groups to a series of informal meetings to discuss the various ways in which the two institutions could cooperate in matters that are of interest to all our members. Last fall, Jim

Lubic, AWI Education and Technical Director; Tony DePrato, AWI Audio-Visual Manager; and myself paid a visit to Columbia, Pennsylvania for a quick tour of the NAWCC facilities and a discussion with Tom Bartels, my counterpart as Executive Director of NAWCC. One outcome of this visit, and the discussions that took place, was a proposal by this office to NAWCC for cooperation in several areas of mutual interest.

I am pleased to report that the NAWCC Council adopted the AWI proposal in whole at its January meeting. The first program that will be available to members of both organizations will be at the Metro St. Louis Regional Meeting at the St. Louis Hyatt hotel on May 28, 1999. AWI instructor Alice Carpenter will be conducting a one-day seminar on the American pocket watch. This program is open to members of both AWI and NAWCC for the special price of \$32.50. We encourage as many AWI members as possible to participate and are confident that many NAWCC members will be able to learn firsthand about the quality and professionalism of the AWI education programs. For more information, contact David Warner at (314) 227-4817 or Gene Bertram at (314) 822-2150.

I hope that you all take the time to read Gerald Jaeger's series of articles concerning the AWI certification and recertification programs. As a professional organization, issuing a nationally recognized professional credential, it is essential that AWI demonstrate not only its commitment to excellence in the proficiency and skills of its members, but also its commitment to assuring that persons holding those credentials continue to maintain, polish, and improve their skills. We hope that all of our presently certified professionals choose to participate in the recertification program and that all of you who are not certified begin to work on the program as soon as possible.

We also need to enhance the benefits of certification to those who hold the title. There is no better way for you, the members, to express your opinion on this matter than to use the forum provided in *Horological Times*' "Letters to the Editor." Drop us a line about your opinions on certification and what AWI can do to improve the process and to help you benefit as professionals.

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MG2.0	2.0mm	Fossil, Seiko, Pulsar	18.0-32.0mm in 1/2 sizes	2.00	1.75
MG2.5	2.5mm	Guess, Fossil, Divers	20.0-34.0mm in 1/2 sizes	2.50	2.25
MG3.0	3.0mm	Tag Heuer, Super Divers	18.0-34.0mm in sizes	3.00	2.75

New Dome "MG" Crystals

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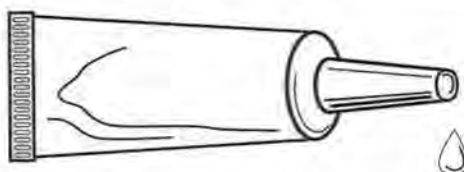
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Questions & Answers

Question

You will find photos of a clock that I own. I have repaired many clocks, but this one is most unusual. The plates that separate the gears are made of wood. The pivots fit in tubes of some type of metal. All other clocks that I have repaired have brass or steel plates to separate the gears.

I would appreciate any information you have on a clock such as this. It appears as though the clock strikes one time each hour. As shown in Figure 4, the mechanism that controls the strike is missing. What does this look like?

I have no idea as to where or when I acquired this clock. There are no identifying marks on the clock. I have done no restoration on the clock.



Figure 1.

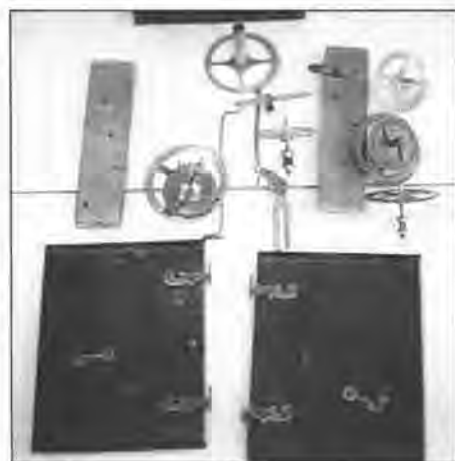


Figure 2.

If the clock is of any horological significance, I will gladly give it to the AWI museum. My reference shows nothing on a clock like this.

Ruell Owens, Garland, Texas

Answer

Your interesting wooden plate clock was manufactured in the Black Forest region of what is now Germany. In fact on your Figures 1 and 4 you'll note a brass plate in the shape of a running hare (rabbit) that provides a brass bearing hole for the anchor (strip pallet) pivot. This running hare is the trademark of Phillipp Haas and Sons of St. Georgen in the Black Forest. The firm was founded in 1831 and dissolved in 1920. But during this period it built a worldwide market for especially high-quality cuckoo clocks, which were the successors to the wooden plate clocks such as yours.

The wooden plate clocks, which typically consisted of a movement and dial, were usually hung on a wall but some were placed in floor cases. When they originated in the mid-seventeenth century, they were a major part of the original cottage

industry in the Black Forest. Wood was readily available, the people highly talented, and the long winter hours in the mountains provided the time for individuals and families to evolve into a widespread, small but effective manufacturing industry, centered in farm houses and cottages throughout the region. These clocks were inexpensive, but dependable and primarily produced for the local families; but over the years the industry evolved into providing relatively inexpensive clocks for the world.

Originally the wheels, arbors, pinions and plates were of wood (with iron pivots). Cast brass wheels with steel lantern pinions replaced the wooden ones (still with iron pivots) sometime after 1730. Milled steel pinions replaced the lantern pinions in the mid-1800s. Milled brass wheels and solid milled pinions came into play around 1900. Early on the strike train was placed behind the time train, but after about 1830 the strike train appeared next to the time train, like yours is supposed to be. So with this information, I'd expect your clock to have been made in the mid-1800s.

As you noted, your clock has a missing strike train that would have struck the hours on its cast bell. It would have been a count-wheel type of strike mechanism similar to those found on earlier cuckoo clocks and American time and strike clocks of the late 1800s and early 1900s.

Your clock is a good example of the early work of a company that at one time grew to international prominence. AWI would be happy to display it in its collection of timepieces.

David A. Christianson



Figure 3.



Figure 4.

New Items from Borel



Single watch model #MTB100

Jewelers Cost: \$ 99.95

Suggested Retail: \$140 to 199

Watch Winders, for resale

NEW



Double watch model #MTB200

Jewelers Cost: \$ 129.95

Suggested Retail: \$199 to 299

These units can be sold to your customer to keep his high grade self-winding watches wound. Or can be used as a bonus item in place of a discount to make the sale. Or use it to attract attention to your display of watches. Both models run on easily replaceable batteries (2-D cells). This allows them to be used anywhere; on the dresser, in the safe, or in the display case. Model MTB200 is also AC-powered (110V) using the supplied adapter. These Borel winders rotate one revolution and then pause about every minute. Rotation direction is changed with the flip of a switch. The base stands 6 inches tall and has a speckled finish. Made in Germany.

Jborel Feb. '99

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CMC, FAWI, FBHI

Ask Huck

Replacement of a Broken Wheel Tooth

Question

I know about repairing a broken wheel tooth, but the job is very difficult. How do you perform that task?

Answer

The secret is to “keep a handle on your work.”

I cut into the rim of the wheel an area large enough to give the insert sufficient strength, and soft solder the piece in place.

Cut the insert pocket into the wheel rim with straight sides and a flat root. Now prepare a suitable insert. I chose a piece of brass that is a little thicker than the wheel and about an inch long. The end of this piece is cut skin-tight to fit into the pocket. Tin the wheel pocket and the insert. Now, while hot, brush away the solder. This permits insertion of our new piece.

Push the insert into its pocket and give the job a quick heat-flash from a small torch flame. A small inexpensive propane torch is suitable. As soon as the solder fuses, remove the fire.

You should now have the insert, with its handle, locked in place and overhanging each wheel surface. Cut away the handle and reduce the thickness of the wheel insert. Saw and file the tooth to shape and polish the wheel flats.

Skillfully executed this will result in a joint-line so small that it is only visible under careful inspection.

The handle gave a means of holding the insert while soldering. The extra thickness eliminated the problem of holding in exact flat position during soldering.

As in making any small part, make it on a handle, which is cut away as the last work step.

True a Wheel in Flat

Question

What do you do with a train wheel that wobbles? Is it necessary to correct this situation, and how is it done?

Answer

Rough clocks, as the classic American ones, may have wheel wobble of a wheel thickness without a readily detectable performance problem. However, all obvious wheel wobble should be corrected.

First let's be sure it is a wheel problem. A bent pivot, or arbor, will also manifest its error in wheel wobble. I hold the arbor between thumb and forefinger for a spin. Observe the arbor, arbor shoulder, pinion, and wheel hub. If these look acceptable then we can work on the wheel.

Most thin wheels can be straightened in flat with a little finger-work. As the wheel approaches true in flat, carefully observe the teeth tips for truth in round. If error is found here you may yet have arbor trouble.

Thinking about a bent pivot—for old American clock pivots we may use a smooth jaw plier or strong tweezer. Careful work may correct this within the range of a little final polishing. But beware, this method is almost certain to break the pivot of a finer clock.

Anneal the pivots first, on the finer clocks. I turn the flame on the arbor and let the heat be conducted into the pivot area. This helps to avoid pivot burning.

Correcting wheel wobble is really a very easy clock repair—it just requires a little patience.



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Ewell D. Hartman,
CMW, FAWI

Battery of Information

Enthusiasm Makes The Difference

Testing of Watch Batteries, Part 1

Some time ago a watchmaker called to tell me that he was having a problem with S70 (337, SR416SW) batteries; they were only lasting about ten months after installation. His stock was relatively new, so shelf-life did not seem to be a problem. A malfunction in the watch would have seemed logical, except this was happening in a series of replacements. I asked him if he tests all new batteries before they are installed and he assured me he did. I discovered that he was testing these *very small* batteries with a unit that placed a very high load (current flow) on the battery; in effect, he was decreasing its "life" by using that tester.

What Battery Tester Should I Use?

Your selection of a tester requires that it be designed specifically for watches and/or watch batteries (*not* hearing-aid cells). You will also need to consider the technical understanding of its user(s), and you will want to consider some of the options available in today's testers.

Comparison of Testers

I tested eight meters to determine how much current is drained from the battery during testing. I verified these readings by checking the resistance (load) on each setting of the meter, and then, using Ohm's Law (current = voltage ÷ resistance), determined that the readings were nominally correct. It is important to remember that while most watches today show a consumption of 1 to 3 microamps (millionths of an amp), this is an average which includes the pulse of current going through the coil as well as the quiescent periods. (A watch with a coil resistance of 3100 ohms and a 1.55 volt battery will use about 500 microamps of current at the *moment* of pulse.) Watches with lighted dials may use as much as 15,000 microamps (15 milliamps) when lit!!

"This Consumer Reports"

The following list of testers will show the brand name, special features, the method of reading voltage, and the settings or stations based on battery type and voltage, followed by the microamps of current used from the battery during the test.

ENERGIZER WATCH BATTERY ANALYZER

Features: Provides for pulse test of watch movement
Dial: Voltage shown in 1/10 volt increments on the silver oxide scale and in 1/2 volt increments on the lithium scale, along with color coding
Silver Oxide, Low Drain 500 microamps of current
Silver Oxide, High Drain 6,900 microamps of current
Mercury (Low Drain) 450 microamps of current
Lithium (3 volts) 4,800 microamps of current

RENATA WATCH & BATTERY TESTER

Features: Provides for pulse test of watch movement
Automatic shut-off after two minutes
Dial: Voltage shown in 1/2 volt increments for silver oxide and mercury in 1.0 volt increments for lithium, along with color coding
Silver Oxide/Mercury 850 microamps of current
Lithium (3 volts) 850 microamps of current

RAYOVAC BATTERY TESTER

Features: Pocket size, very low cost
Scale: Color coding only
Silver Oxide, Low Drain 550 microamps of current
Silver Oxide, High Drain 7,000 microamps of current
Lithium (3 volts) 3,750 microamps of current

ACCUTRON BATTERY TESTER

(Old—listed for comparison)
Scale: 1/10 volt increments with color coding
Mercury only 37 microamps of current

MICRONTA BUTTON CELL TESTER

Features: Pocket size, no leads (drop cell in tester)
Scale: Color coding only
Mercury/Silver Oxide 960 microamps of current

TRIPLETT MULTIMETER

(20,000 ohms/volt rating)
Features: Can also test current and resistance
Scale: 1/20 volt increments
3-volt setting 25 microamps of current

CITIZEN ANALOG MULTI-TESTER

(50,000 ohms/volt rating)
Features: Can test current down to 1/5 microamp, as well as resistance
Scale: 1/10 volt increments
3-volt setting 10 microamps of current

SEIKO DIGITAL MULTI-TESTER

(1,000,000 ohms/volt rating)
Features: Can test current down to 1/10 microamp, as well as resistance
Indicates: 1/1000 volt increments
Automatic volt ranging 1-1/3 microamps of current

Reliable
performance,

Precise attention
to detail,

Innovative
technology,

and we're just talking
about the battery.



1999 Candidates for the AWI Board of Directors

This year there are 13 candidates vying for a seat on the AWI Board of Directors. Five directors will be elected for three-year terms. The five who receive the most votes will join the current Board members during the annual AWI Board of Directors meeting, June 26-27, 1999.

During the month of April, the ballots and a background sketch of each candidate will be mailed to all AWI members eligible to vote. The election mailing will also contain the position of each candidate regarding this question:

What is your vision for AWI in the 21st Century?

A ballot return envelope will also be included in the mailing. The envelope will be addressed to the

Certified Public Accountant who is responsible for counting the votes and certifying the outcome of the election.

All ballots returned must be in the ballot return envelope and postmarked on or before the deadline date published in the voting instructions. Only marked ballots should be sent to the Certified Public Accountant. Please do not include any notes or requests for information. The CPA must hold all ballots received until some time after July 1. AWI will be unable to answer any messages you might enclose until that time.

The future of AWI depends on the quality of the candidates the members select to serve as directors. Please take time to study the qualifications and positions of each candidate carefully when you receive the election mailing. ☺



David A. Christianson
Kendallville, IN



Clarence E. Hardy
Vinton, VA



Gerald G. Jaeger
Sheboygan, WI



Jim Door
Kennewick, WA



Ewell D. Hartman
Richmond, VA



Daniel M. Fenwick
Mount Joy, PA



James E. Williams
Cortez, CO



Marshall F. Richmond
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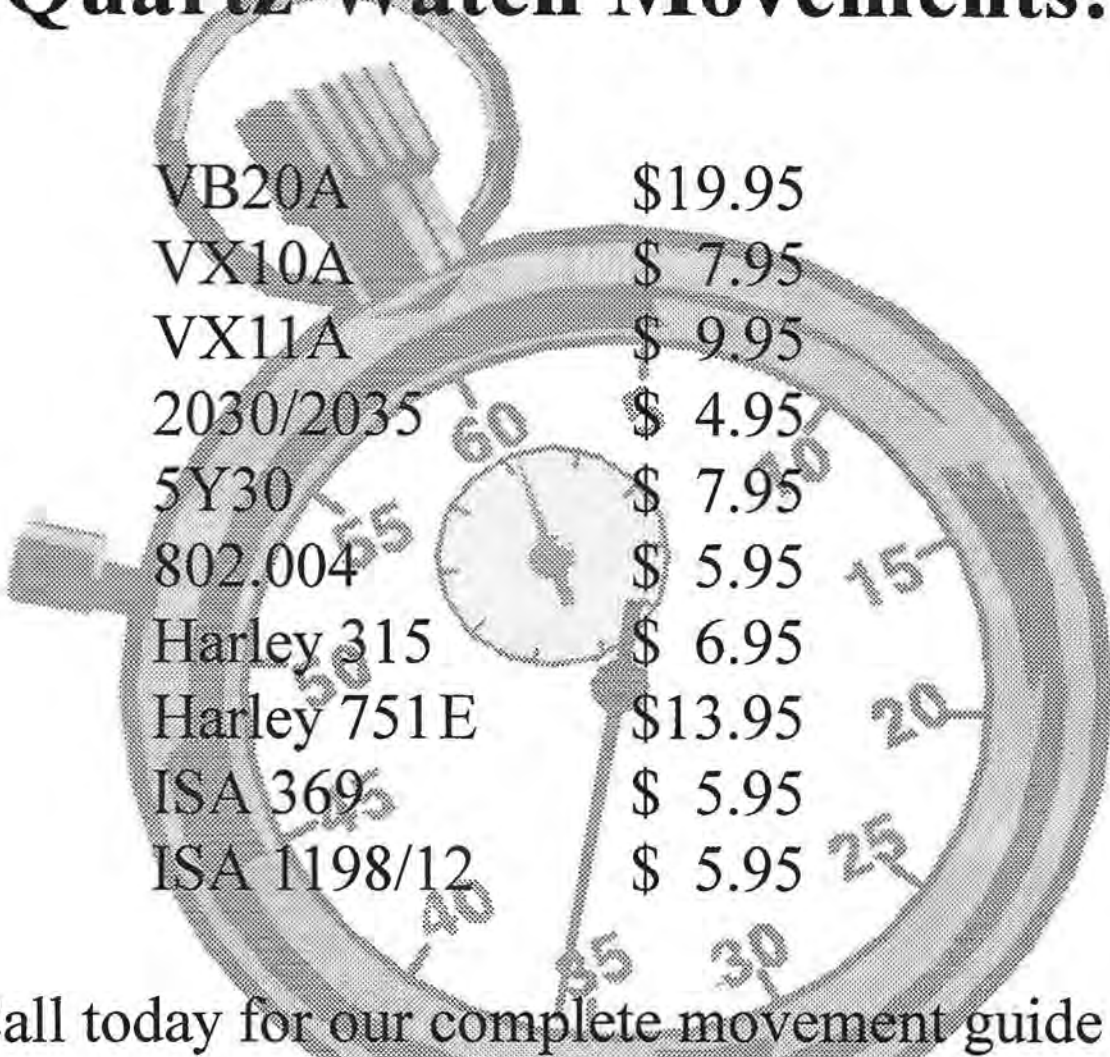


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This month's cover features one of the fine clocks made by Sinclair Harding (UK) Ltd. Sinclair Harding is one of a handful of artisan clock-makers producing fine clocks using traditional methods.

I first had the pleasure of seeing one of their clocks in 1975. At that time I had a clock shop in a suburban Cleveland area mall and John Daly, an independent sales rep, called on me with, in his own words "something special." He then presented for my inspection a traditional English bracket clock done up in stunning burl walnut and mahogany, glowing with an obviously hand rubbed finish. Every detail was attended to, from the hand-pierced, polished and blued hands, to the escutcheon, lock and key for the doors, all produced in the maker's shop. A look inside revealed a magnificent 3-train triple fusee movement, with a nest of bells, built to the exacting standards established by the finest clockmakers of the late 18th century. The most impressive aspect in everything my eyes fell on was the impeccable level of finish. Every screw head was mirror polished and drawn to a deep iridescent blue, every arbor, bridge and sub-plate had the same flawless lustre.

My next exposure to the work of this shop came about 10 years ago when a customer came to me with a Sinclair Harding tall case clock. He had owned this clock for 15 years or so and it was due for some servicing. This was a weight-driven movement, again with a nest of bells for the quarters, and a gong for the hours. As I put the movement up on my bench, it was apparent that the same uncompromising standards had been applied in the building of this clock. It was a classic dead beat escapement with jewels in the escape wheel pivots and jewels cut into the pallets. The plates, wheels and arbors all shone with that astonishing level of finish I had by now come to expect of this producer. I completely dismantled the movement and found the pivots to be flawless. They were hardened and polished to a mirror finish, every pinion leaf was as well. The design of the movement is elegant, including the shifting mechanism for the chime drum which is mounted outboard of the plates. The rack tails were made with the classic French curve, even the spaces between the teeth of the rack were polished.

Bob Ockenden, CMC

Sinclair Harding (UK) Ltd.

By Robert Bray

History

Established in Cheltenham in 1965 by Mike Harding and Bill Sinclair the Sinclair Harding started out making longcase clocks with simple striking movements. In the 70s more complex chiming movements were developed for the longcase clock and which led to the introduction of a chiming bracket clock and a magnificent three-train skeleton clock. In the 80s a classic perpetual calendar carriage clock was added to the range and a unique table regulator with a gravity leg escapement.

Clockmaking peaked in the late 80s when Sinclair Harding employed 12 clockmakers and three cabinet makers.

In November 1995, Mike Harding had decided to retire and, with no natural successor, reluctantly had set in motion plans to close the company down. It was at this point where I heard about the company. After a short introduction and a couple of weeks soul searching I found myself owning a company with no orders, one employee and with hardly any time (or money) to get an exhibition ready for the World Watch, Clock and Jewelry Fair in Basel Switzerland.



Sinclair Harding's Perpetual Calendar Carriage Clock

Fortunately, the first order came through within weeks, it was a commission for a large feature clock for the Oval cricket ground in London (just what we needed). After a lot of hard work we made the exhibition, but came away with very few orders. The Oval clock was successfully completed and installed over the members' entrance on July 26th. Two days later the workshop machinery was loaded onto a wagon and the company moved to West Yorkshire to start again.

Over the last 2½ years we have continued to pick up orders, recruit and train personnel, and are now a team of five. We also developed two new clocks for the 1998 Basel Fair which was our most successful to date.

In the field of domestic clocks the company is renowned for the outstanding quality of its workmanship and is recognized as the makers of the finest handmade clocks in the world. Clocks made by Sinclair Harding can be found in private collections worldwide. Each clock is individually made and serial numbered. Sinclair Harding guarantees each clock for the life of the original owner.

At present Sinclair Harding makes between 20 and 25 clocks each year and supplies them all over the world. The waiting list is on average about six months.

Unlike most companies claiming to "make" clocks, we actually do. The only parts brought in are specialist items such as springs, cast/hand tuned bells, and the handmade chains for fusee movements. Wherever possible we try to use traditional techniques. A pair of hands takes two days to pierce, file, hammer, and polish into a three-dimensional sculpture then finally blue in a bed of heated brass filings.

Each clock is very much a team effort. Once the customer's exact wishes are finalized, the material is ordered and the all parts machined. The clock is then built in the unpolished and checked to ensure each piece works correctly. It is then completely stripped, finally polished, and all the non-moving parts gold plated. After reassembly the clock is bench tested and regulated for at least two weeks before final shipping or in the case of all UK customers—hand delivered and set up.

We currently make nine clock styles and receive many special commissions. Our last longcase clock made for a gentleman in England had a case made from solid yew and featured a chiming movement. Two striking movements are now on test with hand-painted moonphase dials



Sinclair Harding's Sun & Moon Clock

featuring scenes selected by each customer, calendar wheels, and engraved dial centers.

All the clocks feature some of the mechanisms invented by the great pioneers of the past. Perhaps the most popular at the moment a sea clock inspired by John Harrison, featuring linked pendulums and the grasshopper escapement. Five variations of this clock are available from the simple to the moonphase model with fusee and maintaining power.

Three skeleton clocks are made, an elegant great wheel skeleton clock, typical of the work of late 18th century French horologists. An unusual sun and moon clock has a hand-painted dial that rotates once a day and features a moonphase aperture. Perhaps the most spectacular clock is our three-train skeleton clock in which every wheel, screw, and arbor has been meticulously finished by hand, costs over £16000 and takes the best part of six months to make; normally we make just one a year.

The table regulator is unique with a 6-legged gravity leg escapement. The original version of this escapement regulates the Great Clock of Westminster, better known as Big Ben. Our latest design, a congrue clock, is most unusual. It features a 15-second tray mounted on the top of the movement with the mechanism triggered by a ruby ball. The clock is mounted on a Derbyshire fossil base in which fossils are actually visible. ©

In Search of the Best Watch Lubricants

Part 4

Gary Crighton

Gary Crighton of Los Angeles shares with us a series of experiments in his quest for the best watch oils. This is his fourth article in the series.

The author's opinions of specific brands of equipment and lubricants are strictly his own and should not be considered as an endorsement by the American Watchmakers-Clockmakers Institute of the products mentioned.

The final installment in my series on watch lubrication concerns quartz watches. These are even more critical of the type and amount of oil that one uses than mechanical watches, especially the ultrathin models. Even more important than both the former and the latter is the cleanliness of the parts and jewels, as my observations of watches in general and quartz watches in particular has been that slightly overoiling an exceptionally clean pivot won't result in the oil being bled away, but that is exactly what will happen if the parts are not 100% clean. When the parts are not clean, the surface tension of the oil on the contact surfaces is greatly reduced, resulting in the oil flowing away from the pivot.

To be honest with you, I haven't experimented as extensively with quartz watches as I have with mechanical, mostly because my job was made considerably easier by fellow watchmakers sharing their knowledge with me. Both my oiling technique and the type of oil that I recommend was shown to me by my friend Fahd Younes of Perfect Timing, and I haven't found anything better yet. This statement is based not only on what I see comparing watches that I have serviced with those serviced by others but on new watches also. It has been about six years ago since I serviced my first quartz watch, and in that time I haven't had one comeback. The first quartz watch that I serviced was my wife's Seiko Cal. 16A, which I bought for her twenty years ago. When it stopped functioning after thirteen years I gave it to a friend to service, as I had no prior experience with quartz watches at that time. After it had been back to him three times in six months I decided that I had better tackle it myself. Thanks to Fahd pointing me in the right direction—he was also the one who pointed out to me the importance of balance amplitude, something that most watchmakers today still unfortunately don't have

a clue about—it has been working perfectly ever since, which I think is pretty amazing as it is just a regular dress watch and is not water resistant, although my wife is careful not to splash water on it when she washes her hands.

Let me digress a little here to address the problem of comebacks, or lack thereof, as a measure of one's success. A hobbyist who read my first article, a doctor by profession, engaged me in an extensive discussion concerning this particular issue. He was extrapolating his medical experiences to watch repair, which I felt was an issue of comparing apples and oranges. His argument was that if a doctor treats a patient and at the end of the treatment the patient doesn't return, then the doctor assumes that his treatment was a success, but in reality his (the hobbyist's) experience was the opposite. That is, the patient was so disappointed with the results of the treatment that he sought relief elsewhere and didn't return to the original doctor. My argument, with which he didn't agree, but has been extensively supported both by my own experiences and the experiences of others, is that if a customer is not happy with the repair of his watch, he will return it to the original watchmaker once or twice to make it good whilst it is still under warranty and then demand a full refund if he can't get satisfaction. Most people don't like throwing away \$200 to \$300 on a duff watch repair and then have to fork out the same amount to another watchmaker in order to correct the errors of the first. There are, of course, exceptions to the above, but usually very few, viz., those customers that move to another state or country, but even then most customers will ship their watch out of state in order to get satisfaction, or demand a refund. All the places that I have worked have the watchmaker initial the inside of the caseback for just such an occasion so that one will be made aware of an error, or of one allowing the quality of one's work to slide. Also, the boss doesn't hesitate to inform the watchmaker if, for whatever reason, he has to give a customer a free service or refund in order to ensure the customer's satisfaction. If you guys out there would share your thoughts and experiences about this issue by writing to the magazine, so that we can all learn, that would be great.

Although I started doing quartz watches only six



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years ago, I found them to be both very easy and lucrative—no wasting time on poisoning or hairspring problems—so I applied myself to cover as wide a base as possible. (As parts are no longer available for the Accutron, I chose not to venture into that area as I didn't want to get my fingers burnt by damaging a watch while learning and then not being able to get the part, or end up being sued by an irate customer.) I now have extensive experience on virtually all the Swiss quartz watches which are currently in production, including the ultra thin ETA Cal. 210-001 (this one wins the prize hands down as the one that most frequently gives watchmakers a hard time due to its comeback record, 99% of which is because of the reasons mentioned in the beginning), the ETA perpetual calendar Cal. 252-511, the ETA quartz chrono with five motors Cal. 251-262, and both electro mechanical quartz chronographs the Frederic Piguet Cal. 1270 and the IWC/Le Coultre Cal. 630. I mention the diverse range of calibers above only to point out that I use the same oil and technique for all of them, and all with the same reliable and repeatable results. Keeping in mind that I haven't had one quartz comeback in six years clearly shows me the superiority of my friend Fahd's method.

I know that you guys don't want to hear this, due to lack of availability, but the best quartz oil I have found is the PML 92. This is a very thin red synthetic oil, originally recommended for ladies' watches, a purpose for which I found it to be totally useless as it was much too thin for the latter, but just perfect for all quartz watches. Nye Company is the license holder for the Hamilton PML oils, and I would suggest that as many of you as possible call and FAX them and ask them to put these oils back into production. The PML 79 is still one of the best oils around, and although not quite as good as the Elgin, it is far superior to the Moebius 9010 in its ability to stay in place in the long term. As mentioned by Marvin Whitney in his book *The Ship's Chronometer* the PML 163 was, according to him, the best clock oil. If one looks through old Rolex and Patek Philippe technical manuals, just to mention two, one will see that both companies recommended the PML grease and oils for many years. The Nye Company has introduced a new synthetic oil called PML

80 as a replacement for the above three oils. The earliest samples I saw were bluish green, and the latest samples are light blue, very similar in color to the Moebius 9010. As mentioned in my first article on watch oils, I found this oil to be virtually useless as both its color and viscosity changed with age. This didn't happen to the original PML oils. So how about it Nye, please put these excellent oils back into production as they are far superior to most of the stuff that is out there. For those of you who can't get your hands on a bottle of PML 92, a lot of supply houses still have old stock. The next best thing is the Moebius 9000 quartz oil. This is also red, but although the viscosity is a little heavier than the PML 92, it doesn't match the latter's ability to stay in place. The Moebius 9010 is too heavy for the ultrathin calibers, but it does work fine on virtually all the others. Because of my great success with the Elgin oil in mechanical watches, I did try it out with one or two quartz watches without the same success. A friend of mine, who like me is a big fan of the Elgin oil, tried it in an Accutron, only to have to service the watch again and replace the Elgin with 9010. So, although to date I have yet to find a better oil for mechanical watches than the Elgin, I don't recommend it for quartz watches or Accutrons.

On to the actual oiling, but first two things to keep in mind: Quartz watches are much more critical of overoiling than their mechanical counterparts. Secondly, those magnetic motors don't produce much torque, so any additional friction will cause the watch to stop intermittently and the customer will complain that his watch is running slow. I use a very fine black oiler with only a tiny amount of oil on the very tip (approximately one-sixth of the amount of oil that I use for a fine pivot in a mechanical watch, e.g., an escape wheel). Where possible, I deposit this oil on the pivot before putting the wheel in place. Otherwise I put it into the pivot side of the jewel hole. How can one confirm that one has deposited the correct amount of oil?? This is easy, if you can see any oil in the oil well then you have deposited too much oil. That's right—the oil well should look dry. Nervous that too little oil has been deposited? The only way to check is not quite as easy. After the watch has been serviced, assembled and oiled, let it run for a few days. Now disassemble it and if there is

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a small wet ring of oil around the jewel hole extending no wider than the diameter of the pivot shoulder, that is exactly the right amount of oil. With a little bit of practice the correct amount will be deposited in all the right places. Due to the low viscosity of this oil I don't use it where there are no jewels and I don't use it where there is metal-to-metal contact, such as the shaft of the second pinion, or the shoulder of the same which usually rests on a brass tube friction-fitted to the dial side of the movement. Use the Moebius oils 9010 or 9020 instead.

It has been about two years since I submitted my first article on watch oils. So, have I changed any of my original recommendations? Only one. I originally recom-

mended Elgin oil for the pallet jewels of slow beat movements (21,600 or slower) and Moebius 9415 for the fast beat movements (28,800 or faster). I now use Moebius 9415 for the pallet jewels regardless of whether it is a slow or a fast beat movement. I didn't find the 9415 to be superior to the Elgin, but I did find it to be at least as good as the latter for that application, and I also found it easier to deposit the correct amount of lubrication on the pallets due to the much higher viscosity of the former; this helped me with both my production and consistency. I was originally skeptical about using the 9415 on the slow beat movements, but when a friend of mine showed me the good results that he was getting I decided to give it a try,

EDITOR'S NOTE: The author's opinions of specific brands of equipment and products are strictly his own and should not be considered as an endorsement by the American Watchmakers-Clockmakers Institute.

I am making a few recommendations of tools which I believe are indispensable to helping the watchmaker achieve excellent and repeatable results. This leads to satisfied customers, which is the whole object of this series of articles.

1. For non-magnetic tweezers, I like both the Fontax with the Taxal alloy tips and the Dumont Dumostar. I prefer the feel and handling of the Fontax, but the Dumonts are quite a bit harder and therefore stay in shape longer. I like both the #3 and #5 style of tweezers. The #2 on both brands require too much work before one has a usable point. The tweezers can be ordered from any supply house that has an account with Bergeon.

2. It is absolutely essential to have a top quality 10x magnification loupe. The B&L Hastings Triplet is good value for money and has very low distortion, but as mentioned by Ron Decorte in the October 1996 issue of *Horological Times*, the Achromatique is quite a bit better. In fact I bought mine based on his recommendation. For pivot work one can use magnification greater than 10x, but I don't recommend this for watch work as one runs out of working distance. With the 10x loupe the focusing distance is about 20 mm. The 12x loupe reduces that to 16 mm. The Achromatique loupe can be ordered from Schürch & Cie in Neuchâtel, Switzerland. Phone: (032) 724-34-34. FAX: (032) 724-34-36.

3. There is a blue type of Rodico available from Albert Froidevaux (A & F) in Switzerland called Rub-Off, (product # 18580). Any supply house having an account either with them or F. Fils Witschi SA can order this product for you. For most applications I prefer the Rub-Off to the Rodico® as it is both softer and more sticky, so it leaves pivots, pinion leaves and rotors cleaner, and residue free.

4. As more and more watch companies put anti-glare coatings on their watch crystals a good cleaning cloth is a must. About two years ago in the "From the Workshop" column I recommended the Luminex/Dustoff brand of microfiber cleaning cloth as it was the best one that I had found. In a recent issue of *Popular Photography* Herbert Keppler said that the best cleaning cloth he had found was the Micro Dear by Etsumi. I promptly picked up the phone and ordered one. Thanks Herbert!! This is a large, thick and very soft microfiber cleaning cloth, and I agree with Mr. Keppler it is quite a bit better than everything else I have tried. Although I must say that I still rate the Luminex/Dustoff one a lot better than the competition except for the Micro Dear. The cloth is available in two sizes, 11 x 11 inches and 14 x 17 inches, and is available only from Adorama (a photography shop in NYC), who import it directly from Japan themselves, for about \$10 and \$15 respectively, plus shipping and taxes where applicable. Phone: (800) 815-1260 or FAX: (212)463-7223.

and have been satisfied with the results since I switched, which is a little over a year ago.

So, to recap my lubrication recommendations starting from the barrel and moving to the balance wheel. Where oils or greases are discontinued or difficult to get I have listed alternatives in parenthesis. These are not as good as the first recommendation, but are more than acceptable for most applications.

- Barrel wall of automatic watches - Chronogreas P (Moebius Glissalube 20-8217).
- Barrel Arbor - Cuyper's Grease (PML Stem Grease or KT22).
- Barrel Arbor Pivots - As above, whether these are jeweled or not.
- Mainspring - Moebius 8141.
- Great or Center Wheel Pivots - Moebius D5 if both pivots are jeweled, otherwise grease.
- Third Wheel Pivots - Moebius D5 for fast beat and Elgin for slow beat.
- Second Wheel Pivots - Elgin (Moebius 9010 and PML 79 are the only acceptable alternatives for the Elgin.)
- Escape Wheel Pivots - Elgin (Moebius 9010 and PML 79 are the only acceptable alternatives for the Elgin.)
- Pallet Jewels - Moebius 9415 (Be sure to mix thoroughly before each application as it tends to settle.)
- Balance Pivots - Elgin.
- Pivots of Wheel in the Automatic System - D5 for men's watches and Moebius 9020 for ladies' watches.
- Pinion Leaves of the Ratchet Driving Wheel - Cuyper's Grease.
- Ball Bearings - Elgin or 9010 (very sparingly).
- Setting System - see greases above.
- Gearing of all Steel on Steel Wheels - as above.
- Date Jumper - as above.
- Dial Train - D5 (very sparingly).
- Cannon Pinion - Cuyper's Grease and PML Stem Grease for the ETA style cannon pinion.

Last but not least, the ETA reversing wheels in the extremely popular ETA 2892-2 and the ETA 2824-2 and their derivatives. Dip the wheels for a few seconds in a solution of Sovasol and Moebius 9020—2.5 cc of 9020 mixed with 500 cc of Sovasol (L & R Ultrasonic rinse can be used instead of the Sovasol). Dry under moderate heat and then clean off the excess oil on the wheels and especially the pivots with Rodico®; otherwise when the wheels are placed in the watch and the jewels are oiled, it won't take too long for the oil to dissipate. This recommendation comes courtesy of Dan Fenwick of SMH, and I have had good and consistent results with it in the almost two years that I have been using it, including my own watch.

As usual, all queries and comments are welcome. These can be sent to me via the magazine.



Editor's Note: The following letters were written in response to "In Search of the Best Watch Lubricants" by Gary Crighton, October 1998 issue of Horological Times.

Re: In Search of the Best Watch Lubricants, Part 3

Dear Mr. Crighton

In the October issue of *Horological Times* I read the above-mentioned column about watch lubricants. First of all I'd like to congratulate your article. It shows a high degree of professionalism and is very informative for the watchmaker.

In your text, you mentioned that it was not possible to get the lubricant Chronogreas P for independent watchmakers even though it is recommended in our technical specification of Cal. 7750.

The product is available to independent watchmakers, but so far we distribute it only from our Customer Service Centre in Switzerland.

We realize that this situation must be improved. May I ask you to give me more details of your research for the Chronogreas P. It will help me to contact certain places and find out what corrective action we have to take.

I would like to thank you for your constructive comments and I appreciate very much that you pointed out a missing service in our organization.

Oliver Scholer
QM ETA Customer Service

Dear Mr. Scholer

As mentioned in my article my experience with the Chronogreas P is based on using it in hundreds of watches over the past four years. From the ultrathin Audemars Piguet Cal. 2121 to the Rolex Cal. 4030/Zenith 400. The latter, by the way, has the strongest bridge and mainspring of any automatic watch that I am aware of, with the ETA Cal. 7750 being a close second.

I have always gotten consistent and reliable results from this braking grease, and because of this it always helps the watch to deliver its maximum power reserve. Due to its film strength, its ability to stay in place, and the fact that it is not easily washed away I also found it to be the perfect grease for the bezel and click spring of watches with rotating bezels such as divers' watches, etc. It is the absolute best grease for this application, allowing the bezel to turn very smoothly and click accurately into place.

Gary Crighton



Gerald G. Jaeger,
CMW, CMEW, FAWI

Certification News

Recertification

In the spring of 1996, before his retirement, AWI Executive Director Milt Stevens traveled to Washington DC to participate in a legal symposium concerning certifications. At this symposium he learned we had an excellent certification system with the exception of one thing...recertification. Mr. Stevens learned that in order to protect the Institute, our members (certified or not), and the public, AWI had to develop a recertification system.

An example of what might occur: AWI certification holder for the past 20 years, Mr./Mrs. X repaired a timepiece for Mr. Joe Public. For whatever reasons Mr. Joe Public decides to sue Mr./Mrs. X. Once in court Mr./Mrs. X would be asked about their training and experience, etc. Mr./Mrs. X would

explain how they earned their certification designation. The Institute could then be asked to explain how they know if someone who earned certification 20 years ago has been interested enough in their trade to stay current with the changes, and has kept up their skills in order to do quality work for the public. The answer of course would be, "Your honor we have no way of knowing whether that is true or not."

So for the last 2½ years the Certification Committee has been working on a recertification system that would be fair to our current and future certified members, as well as satisfying legal requirements.

The following is what was developed:

- AWI Certification is valid for a period of five years. Certified members are required to earn 12 Continuing Education Units (CEUs) per 5-year cycle to qualify for recertification. Your cycle begins from the AWI mailing date of your notification of successfully passing the certification examination.
- Continuing Education Units (CEUs) will be earned in the following areas:

Mandatory Re-examination Questionnaire	8 CEUs
Plus four (4) additional CEUs from any of the below options:	
AWI Video (any discipline)	1 CEU
AWI Bench Course (minimum of 4 hours)	2 CEUs per day
AWI Sanctioned Lecture (1-2 hours)	2 CEUs
Project Extend Courses	2 CEUs per day
- You will have 5 years to accumulate 12 CEUs. Any CEU in excess of the required 12 are nontransferable to future certification periods.
- The mandatory recertification examination will be mailed to you along with the *AWI Recertification Study Guide*. It is an open book exam. You will have 90 days to complete the exam and return it to AWI. You will need to answer 75% of the questions correctly for a passing score.
- The *AWI Recertification Study Guide* will contain articles on watch and clock repair. Articles from recent past issues of the *Horological Times* will make up 75% of the material while the other 25% will come from other trade magazines. The chosen articles may cover practices that should be observed by everyone; they may cover information not readily found in the usual shop library; they may cover a more advanced topic; and/or they may cover topics or practices of less common knowledge within our craft.
- If you receive a passing score, you will be included in AWI's national registry of certified professional watch and clockmakers. This registry will be circulated to the trade, free of charge. You will also be mailed an update label to attach to your certification certificate stating your next recertification date.
- If you fail, you must retake the exam within 90 days of being notified of your failing score. If you fail the second examination, you will not be considered a certified watch or clockmaker by AWI and you must cease advertising your certification credentials. You may earn these credentials again by retaking and successfully passing the complete certification examination, including both written and practical work.

Recertification is not meant to be difficult. Our hope is that it will be gratifying and add value to your certification. Next month I will explain how recertification will be implemented. ☺



Introduces the ZF2000®



This revolutionary mainspring removal tool represents the most advanced technology that will narrow the gap between the independent watchmaker and the manufacturers' service center.



Directors of Production Manufacture Des Montres Rolex SA Bienne Suisse stated: "This is a tool of modern technology of service developed to assist professional watchmakers to work comfortably and safely."

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Snap-Action Timelock Movement Part 2

Snap-Action Setup

1. Note the shape of the snap-action cam. It has a rounded lobe and a peaked lobe (Figure 12).
2. With **no power** on the mainspring, backwind the winding arbor in a clockwise direction to position the snap-action cam in relation to the snap-action lever as shown in the initial setup of Figure 13. Be sure to hold the snap-action lever in a raised position when making this initial setup.



Figure 12. Note the snap-action cam on the winding arbor with a rounded lobe and a peaked lobe.

3. Wind the arbor three full turns. Continue winding until half of the side of the peaked lobe is visible beneath the rocker arm, with the snap-action lever pushed up (raised) as far as it will go (Figure 14):

Think of the peaked lobe as a mountain side and the arm should be halfway up the side of the mountain.

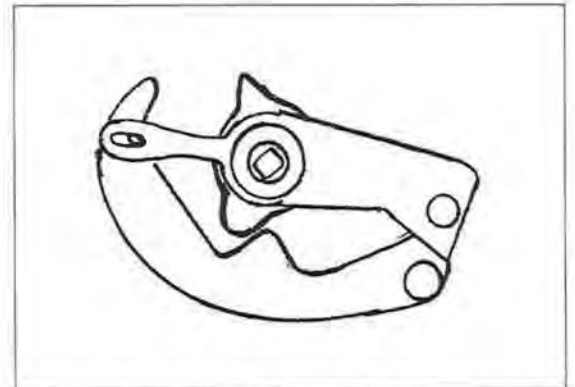


Figure 13. Initial set up of the snap-action mechanism.

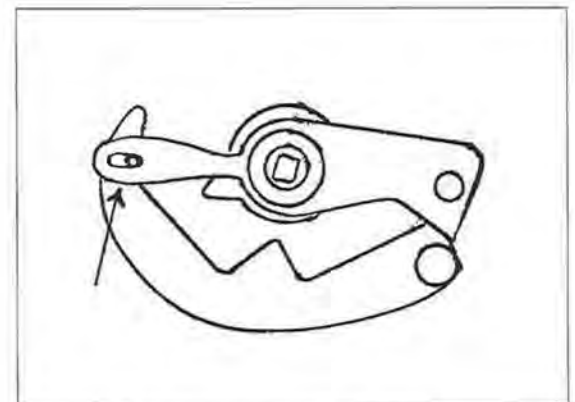


Figure 14. Position of the peaked lobe of the cam after winding the arbor three full turns and continuing until the rocker arm is halfway up the side of the peaked lobe.



Figure 15. Indicator dial/gear wheel assembly positioned so that the stiff snap-action spring touches the heavy pin on the gear wheel in preparation for installing onto the movement.

4. Holding the gear wheel assembly in your hand, rotate the indicator gear wheel counterclockwise in relation to its lower gear wheel plate until the heavy snap-action spring touches the heavy pin on the gear wheel (Figure 15).

5. Install the indicator dial/gear wheel assembly halfway down the center post, hooking the horn of the lower plate of the gear wheel on the solid pin on the bridge of the movement (Figure 16A) in such a way that the gear wheel teeth just clear the pinion of the winding arbor (Figure 16B).

6. Grasp the gear wheel with the sides of your thumb and index finger and turn it counterclockwise to load the snap-action spring of the gear wheel assembly (Figure 17); and then slip the gear wheel assembly down fully onto the center post, engaging the teeth of the gear wheel with the teeth of the winding pinion (Figure 18).

7. Install the snap-action lever coil spring so that one end attaches to the post of the gear wheel plate and the other attaches to the post on the snap-action lever.

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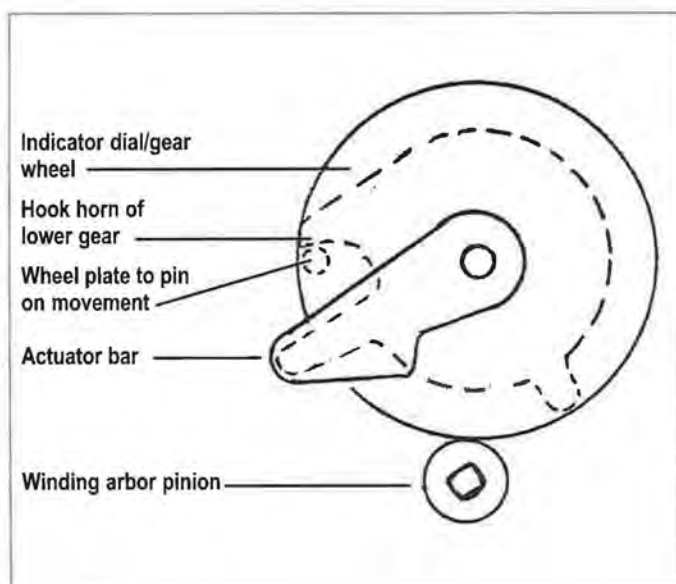


Figure 16A.

8. Wind the winding arbor one full turn to arm the snap-action mechanism and then continue winding until the indicator indicates the desired opening time.

To ease in understanding this setup, you might try the above setup procedure with the platform escapement removed and the fifth wheel blocked with your finger. This way you can set up the snap-action mechanism, wind the arbor one full turn to arm (or load) the system, and then let the power down slowly with your finger braking the train so you can observe the operation and see the actuator lever snap as the peaked lobe of the cam trips the snap-action lever.

To Set for Less than 12 Hours Opening

The shaded area on the indicator dial shows the amount of space that must be traveled to actuate the snap-action feature. If less than twelve hours are to be set on this style of movement, the dial must be set past twelve hours and then reset (backed up or backwound) to the number of hours desired before opening time.



Figure 16B. Dial/gear wheel assembly inserted halfway onto the center post with the horn of the gear wheel hooked onto the top of the large pin (indicated by the tweezer point).

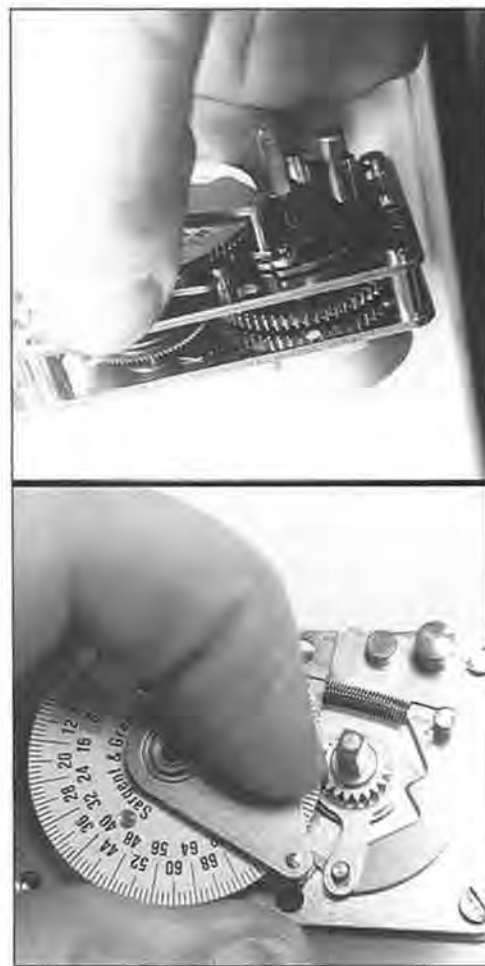


Figure 17. Grasping the indicator dial/gear wheel assembly and rotating it counterclockwise to arm (or load) the tension onto the snap-action spring.



Figure 18. With the spring tension loaded onto the dial/gear wheel assembly, the unit is pressed fully onto the center post, meshing the gear wheel teeth with the winding pinion.

To Remove an Overwind

If the movement is accidentally wound farther than the desired opening time, the vault will open later than wanted. If this is going to be a problem, this overwind must be removed before the vault is locked up for the night.

Simply "backwind" or turn the winding arbor backwards, below the desired opening time and rewind the winding arbor to the proper opening time. If during this resetting procedure you notice the balance motion is sluggish or not running, the movement must be disassembled and serviced.



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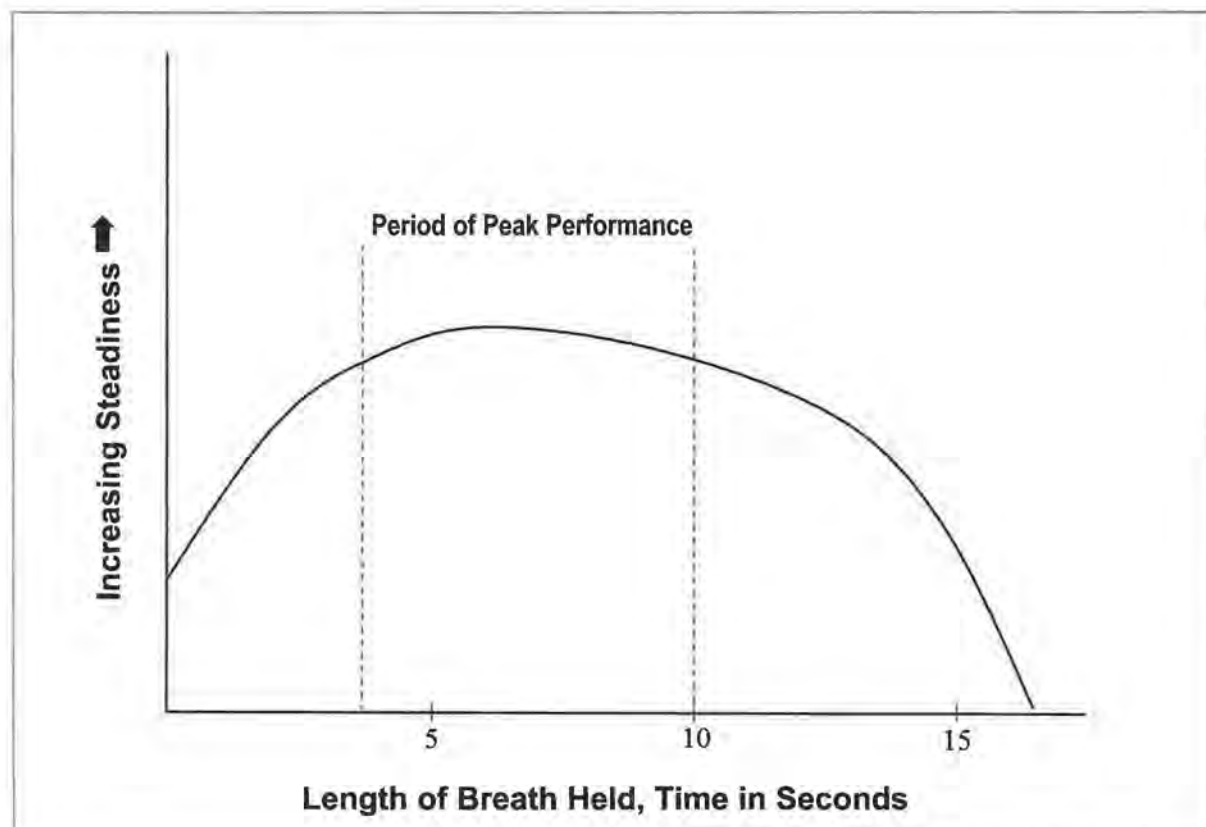
Breathing Technique for the Horologist

In my years of restoring timepieces I have come to the realization that I breath differently than normal when I'm performing a delicate operation. Athletes utilize different breathing techniques to aid them in their performance and many people relieve stress and other health threatening problems by altering their normal breathing patterns. Generally, a controlled breathing technique will allow your body to utilize as much oxygen as possible. This has the effect of a slower heart rate, higher alertness, better dexterity, and less anxiety. I know I need all of those qualities when I'm working on a delicate French movement.

Most breathing techniques have several things in common. Breathing is done through

the nose, uses the diaphragm, is slow and regular, and often involves holding one's breath. Breathing with the diaphragm is how the human body was designed, but we have been mis-training ourselves most of our lives. You can tell if you are using your diaphragm by lying flat on your back and watching your chest and stomach as you breath. If your stomach moves up and down more than your chest does, congratulations! You are breathing correctly.

The technique that I use is derived from a method I learned while shooting in competition. I was taught that if I wanted to be really good I had to control my breathing before, during, and after a shot. Two long slow breaths through the nose, using the diaphragm, followed



by one more that was held for a count or two and then let out halfway and I was ready to take my shot. This slowed my pulse, steadied my aim, and calmed me so I could "squeeze" the trigger. I think it even improved my vision so I could see the target better. Following the shot, I would let out my half-breath and prepare for the next shot by repeating the technique. Marksmen have found that this creates a window of opportunity in which your aim is as steady as it is going to get and that a shot taken during that window will be your most accurate.

Now, how to apply this to the restoration of timepieces. The next time you are presented with a difficult and delicate task, like shellacking a roller jewel or straightening a French pivot, try changing your breathing. You may already hold your breath in situations like that but you may not be taking those important first two calming breaths followed by the third that is let out halfway. Don't hold that third breath for too long though. The window in which you will be the steadiest doesn't last long (see graph on opposite page), so if you feel yourself getting unsteady (hopefully you're not to the point of passing out), stop what you are doing, let out that breath and start the technique over. Pretty soon it will come naturally.

I won't guarantee that this technique will prevent broken pivots or crooked roller jewels, but it will make you more steady during those testy delicate chores that always seem to take forever.

For Further Reading

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Smith, Philip. *Total Breathing*, New York, McGraw-Hill Book Company, 1980.

Web Sites for Further Information on Breathing Techniques

<http://www.shsu.edu/~counsel/breath.html>

<http://www.viewzone.com/breathing.html>

<http://www.transformbreathing.com/body/athlete.html>



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Technically Watches

Pocket Watches and Their Maintenance Part 11

The Winding and Setting Mechanisms

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Except for key wound and key set watches, it is difficult to separate the winding and setting mechanisms of a watch into two separate units. In the case of modern winding and setting mechanisms or KEYLESS MECHANISMS, these are combined so they work together to perform both operations. Some of the same parts function for the setting of the watch that are used for the winding. We will first discuss key wound and key set watches.

Key Wound Watches

Watches made before 1850 were key wound except in some rare cases where other methods were used to wind the mainspring. One method was to wind the mainspring by turning the bezel on the watch case which was geared to the winding gears. Another method was to move a slide on the edge of the case which was geared to the mainspring barrel arbor. Some watches were wound by pumping the pendant up and down.

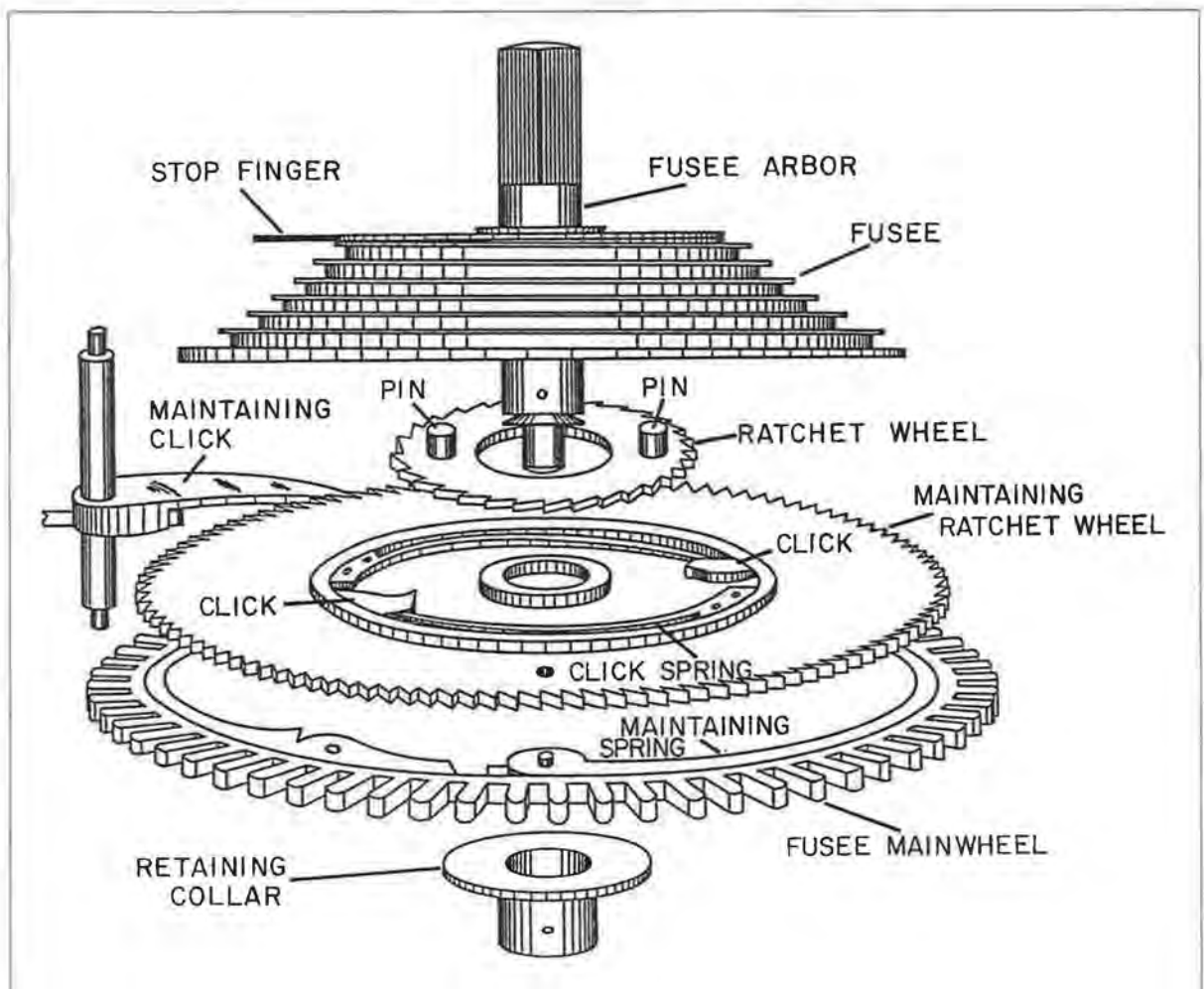


Figure 1.

Figure 1 shows the winding arrangement used on fusee watches. When these watches are wound, a key is used on the fusee arbor to turn the fusee. This action winds the fusee chain around the steps of the fusee from the mainspring barrel. As the chain is being unwound from the barrel, the barrel is being turned which winds the mainspring in the barrel around the barrel arbor. The fusee ratchet wheel is pinned to the bottom of the fusee with two pins. Two clicks on the maintaining ratchet wheel work in the teeth of the fusee ratchet wheel.

The purpose of the maintaining ratchet wheel is to maintain power on the watch train during the winding process to keep the watch from stopping or changing its timing. The maintaining ratchet wheel has its own click and power spring. Just before the watch is wound, the key is turned in the opposite direction to the direction used to wind the watch. This winds the maintaining spring. The key is then turned to wind the watch.

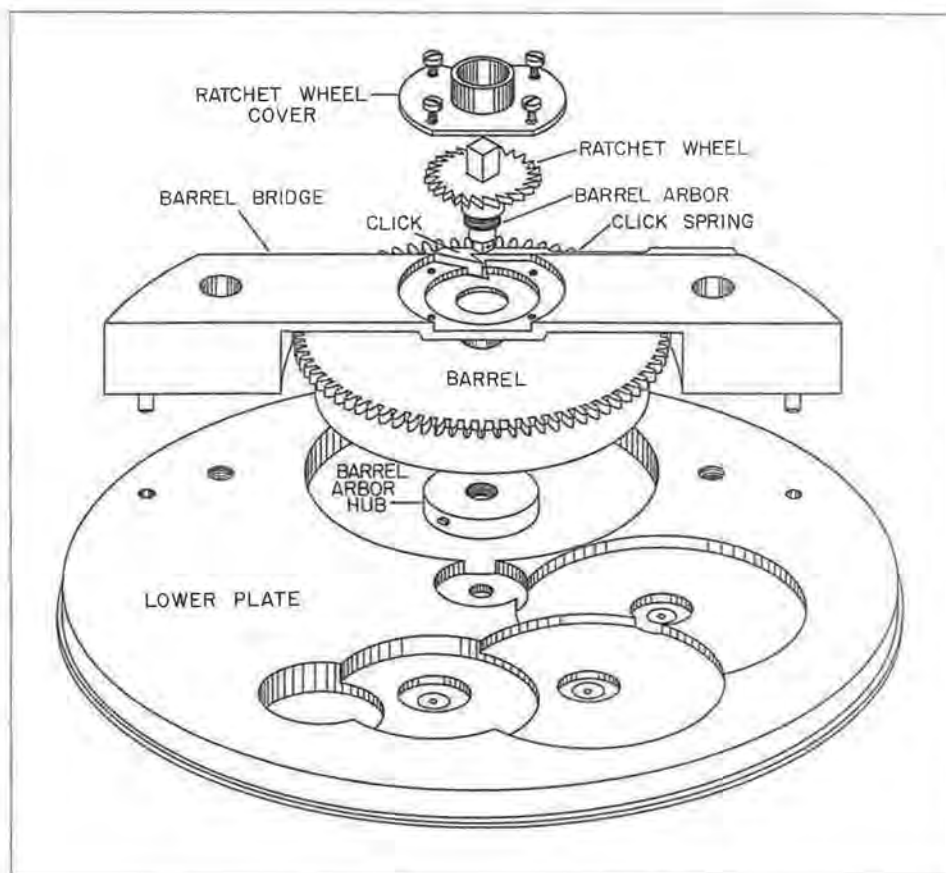


Figure 2.

Key Winding Mechanism for Watches with a Going Barrel

Figure 2 shows a more modern key winding mechanism. This mechanism employs a combination barrel arbor and ratchet wheel. The arbor hub is threaded onto the arbor. The combination click and click spring is mounted on the side of the barrel bridge. The barrel arbor and ratchet wheel are held onto the barrel bridge by a ratchet wheel cover. The inside end of the mainspring is hooked to the barrel arbor hub. When the key is turned, the mainspring is wound around the barrel arbor. This particular barrel is suspended on the barrel bridge. There is no support for the lower end of the barrel arbor.

The Key Operated Setting Mechanisms

Figure 3 shows one style of key setting mechanisms. This style of mechanism has a hollow center wheel pinion that has a pin which goes

through the center pinion. This pin has a square on one end so a key can be used to turn the pin inside the hole in the center pinion. The pin fits through the hole in the pinion with enough friction to cause the pin to turn with the center pinion when the watch is running but with light enough friction to allow the pin to be turned inside the pinion for setting the watch.

A washer is usually used under the square end of the center pin, especially if there is no round shouldered section at the lower end of the square. The washer forms a stop for the end of the key to prevent the end of the key from doing damage to the center wheel bridge. If there is a round section at the lower end of the square, the washer will not be necessary, although it is sometimes used anyhow.

The cannon pinion fits on the end of the center pin that projects beyond the end of the center pinion. The cannon pinion fits on the pin friction-

tight so it will not turn on the pin but will turn with the pin when the pin is turned to set the watch. The pin usually extends past the end of the cannon pinion enough for the minute hand to friction onto the end of the pin.

A second style of key setting mechanism does not have a hollow center pinion. The cannon pinion has a square on its end to take a minute hand which has a square hole. When the minute hand is in place on the square of the cannon pinion, the square must project beyond the hand enough for a key to fit on the square to turn the cannon pinion on the center pinion to set the watch. In this case, the cannon pinion is frictioned onto the center pinion with enough friction to carry the hands but with enough freedom so the watch can be set.

A third style of key setting mechanism is when the setting square is off center. In this case, the setting square has a gear on the opposite end

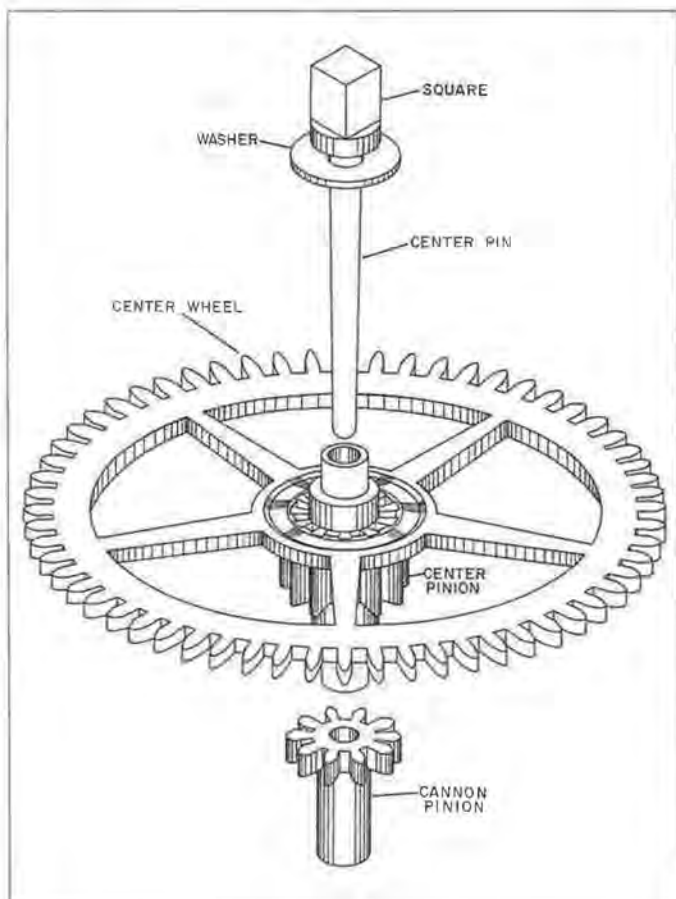


Figure 3.

of the square arbor that gears with setting wheels that gear with the cannon pinion on the center pinion.

The Keyless Winding and Setting Mechanism

Figure 4 shows one of the earlier keyless winding and setting mechanisms. This mechanism uses a winding and setting stem that goes through the pendant of the watch case and is held in the watch movement by a stem brace which fits in a groove in the stem. Note: Sometimes the stem is held in place by a set screw in the pendant of the case. The end of the set screw goes into a groove in the stem. The stem has a square that fits a square hole in the clutch pinion. Back of the square on the stem is a round bearing surface which forms a bearing for the winding pinion. The winding pinion has two sets of teeth. One set of teeth is conventional and gears with a winding wheel which has crown teeth. Crown teeth are teeth that extend vertically from a flat surface of the wheel. Another set of teeth on the crown wheel extends out from the edge of the wheel and connects with the ratchet wheel on the barrel arbor.

The second set of teeth on the winding pinion is ratchet teeth which gear into ratchet teeth on the clutch pinion. When these ratchet teeth are connected, as shown in Figure 4, the watch can be wound by turning the stem clockwise when viewing the crown from its top. When the crown is turned counterclockwise, the clutch pinion teeth ratchet on the winding pinion teeth without winding

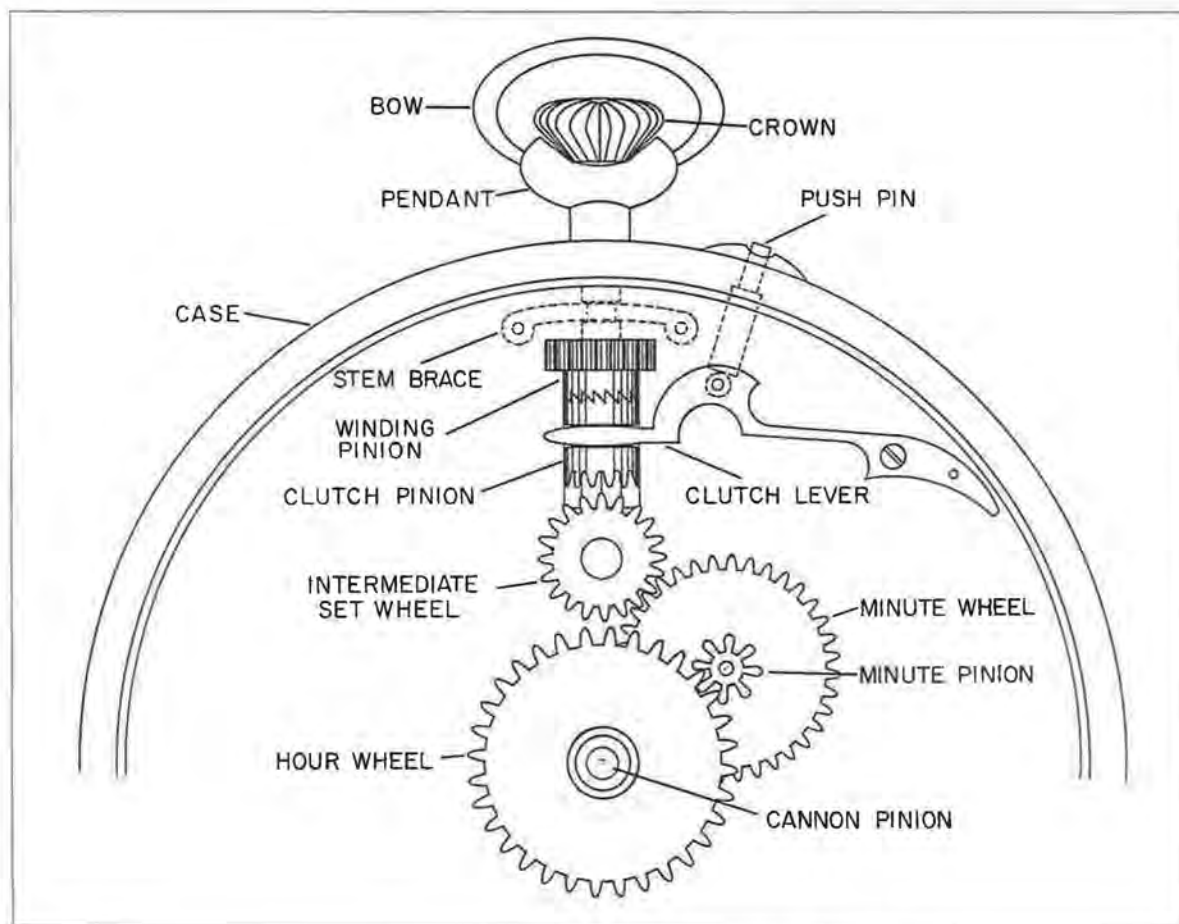


Figure 4.

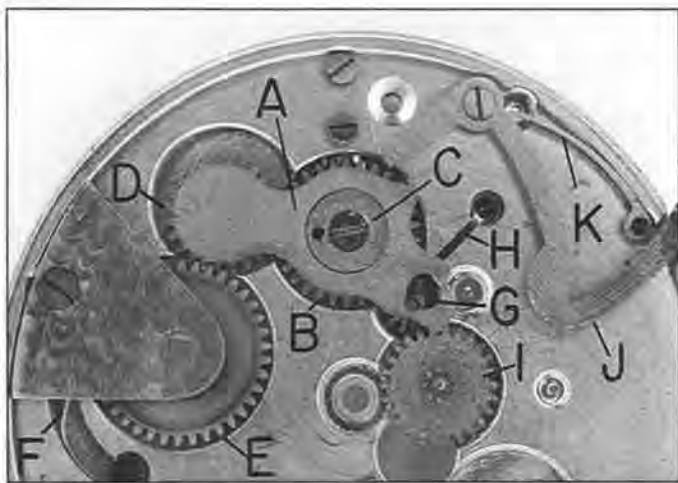


Figure 5.



Figure 6.

the watch. When the ratcheting is taking place, the clutch is sliding back and forth on the square of the stem.

The clutch lever with its spring action controls the clutch pinion to hold the tension between the teeth of the clutch pinion and the winding pinion. To set the watch, the push pin on the edge of the case near the pendant is depressed to shift the clutch pinion into the setting position. The end of the push pin goes against a pin on the

clutch lever to cause the lever to slide the clutch pinion downward on the square of the stem allowing the clutch pinion teeth to engage the teeth of the intermediate set wheel. Then, when the stem is turned, the watch is set. The intermediate set wheel drives the minute wheel, and the minute wheel drives the cannon pinion, and the minute pinion drives the hour wheel.

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The Rocking-Bar Keyless Winding and Setting Mechanism

Figure 5 shows one style of rocking-bar winding and setting mechanism. This is a Waltham mechanism. View A shows the rocking-bar or yoke. View B shows the crown wheel. View C shows the crown wheel stud or washer and screw, and View D shows the intermediate winding wheel. The yoke spring that holds tension on the yoke is not seen, but it works against the stud on which the intermediate winding wheel fits. View E shows the ratchet wheel, View F shows the click spring, View G shows the setting wheel, View H shows the setting wheel spring, View I shows the minute wheel and pinion, View J shows the setting lever, and View K shows the set lever spring.

This winding and setting mechanism operates in the following manner. In Figure 5, the mechanism is in a winding position. The set lever is pushed in to allow this position. When the stem is turned clockwise, the winding pinion turns the crown wheel which turns the intermediate winding wheel, ratchet wheel, and barrel arbor to wind the mainspring.

The watch is set by pulling out the set lever, as in Figure 6, to shift the yoke to connect the setting wheel with the minute wheel. The setting wheel is located in a depression where it is held down by the yoke so it will not connect with the minute wheel teeth when in a winding position. When the yoke is shifted to setting position, the wheel rises so it connects with the minute wheel teeth for setting the watch. The end of the setting wheel spring goes underneath the setting wheel to lift the wheel into

connection with the minute wheel when the set lever is pulled out.

"The Winding and Setting Mechanisms" will continue.

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AWI Material Search

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

- 1S1 Tiffany (Rayville 550) lady's backwind wristwatch crown and attaching screw.
- 1S2 P.W. Elgin (R.W. Raymond) 16s, 21 jewel, Serial #28406663, Grade 478 pallet fork; F#2967

- 1S3 Otay 18s P/W dial
- 1S6 J.W. Benson - English hairspring
- 1S9 Bulova 9AN (Font 1146) 9¼ L movement suitable for overhaul (does not need dial)

If you can supply any of these items, please contact: AWI Material Search Network, American Watchmakers-Clockmakers Institute, 701 Enterprise Drive, Harrison, OH 45030; Phone: (513) 367-9800; Fax: (513) 367-1414.



Book Review

Watchmaking in England 1760-1820 by Leonard Weiss. Size: 5 1/2" x 8 3/4", 304 pages, 86 illustrations, hard bound. This 304-page book covers some of the early developments of watchmaking in England. Published in Great Britain, 1982, by Robert Hale, London.

Chapter 1 gives some background information on the early development of watchmaking in England and some early books on the subject. Chapter 2 tells how the watchmaking trade was organized in London in the eighteenth and early nineteenth centuries. Chapter 3 tells about the Lancashire trade. This chapter has information on watchmaking and toolmaking. Chapter 4 gives information on the history and development of the mainspring. Chapter 5 tells about the fusee and the fusee engines used to make the fusee. Chapter 6 gives information on early fusee chain making. This is an excellent chapter on making fusee chains and the equipment used. This chapter is well illustrated and is worth more than the price of the

book to the antique watch restorer. Chapter 7 shows some early hairspring and escapement development. Chapter 8 shows some division and dividing techniques. Chapter 9 shows wheel cutting engines, gear teeth, and gear cutters. Chapter 10 is about making pinion wire. Chapter 11 shows the layout and design of watch movements. Chapter 12 shows some watch case making methods. Chapter 13 is on watch glass making. Chapter 14 is on watch dial making. Chapter 15 is on the state of the English watch trade in 1818. The appendix has information on longitude and gilding.

Although this book is not the best book for the modern watch repairman, it is a good book for the antique watch restorer.

Archie B. Perkins,
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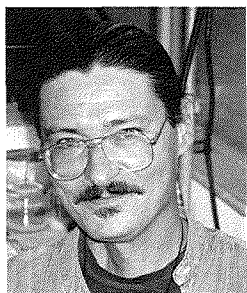
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Oro Logics II: The Aurum Perspectives

Adhesives for Jewelry Technicians, Part 2

In the adhesives industry, adhesive products are generally classified as either industrial or consumer types. Industrial products are engineered to meet highly specialized demands in very specific manufacturing situations and are usually purchased in large quantities. Consumer products are those adhesives that are marketed for consumption by the general public. Select adhesives are chosen to be packaged in quantities that consumers are most likely to use in household, office, or workshop environments. These consumer adhesives tend to be formulated for both safety and practicality and lend themselves to a wide range of common uses.

Engineers in the adhesives industry are available to help develop specific adhesives to meet jewelry manufacturing criteria. They may also aid in helping adhesive-dependent jewelry manufacturers bring resolution to certain problems.

For those in the repair, custom and artisan end of the jewelry trade, technical data sheets may be required for a better understanding on a specific adhesive product. Questions not answered on such sheets can be directed to an engineer from the company of a specific product.

The jewelry trade most commonly utilizes adhesives in the consumer classification that are known as either epoxies or cyanoacrylates (super glues). Various other adhesives and glues are used as well which, along with epoxy, we'll explore later.

Cyanoacrylates will be the focus of Part 2 of the adhesives series.

Cyanoacrylates

The primary cyanoacrylate used in the jewelry industry is known as an ethyl cyanoacrylate. Other formulations do exist, such as methyl or alkoxy cyanoacrylates, which may find specialized usage in the jewelry trade in the very near future.

A cyanoacrylate adhesive cures by reacting to very minute, trace amounts of moisture on the surface of an adherend or substrate. It cures rapidly and does not require mixing. Application to only one surface is all that is required for maximum benefit.

While setting time is usually within a few short seconds, with many cyanoacrylates the initial cure rate ranges from 10 to 90 seconds. This means that a bonded item may be carefully handled after this time. Full bond strength may be reached after one hour with some products. Full cure may require as much as 24 hours as is the case with a number of cyanoacrylates.

A bonded product or repair, using a cyanoacrylate, should not be given to a client until after 24 hours have passed. This will help assure that conditions surrounding the bonding process have been given ample time to reach their full potential.

Cyanoacrylates can generally hold a bond in the -65°F to 180°F range. Tightly mated surfaces can provide an airtight bond.

Cyanoacrylate bonds are neither waterproof or water resistant nor are they chemical resistant. They have very poor peel strength and shock resistance and do not form a flexible bond.

Tensile strengths range from about 2,000 P.S.I. to around 3,600 P.S.I., mainly depending on who manufactured the product and how it was manufactured for the consumer market. It is this high tensile strength that makes a cyanoacrylate appealing for use in the jewelry industry.

Most consumer class cyanoacrylates require one drop per square inch to hold. Any more than this may jeopardize the strength of the bond.

Cyanoacrylates can be formulated by the adhesive manufacturer to provide greater flexibility or peel strength or any number of

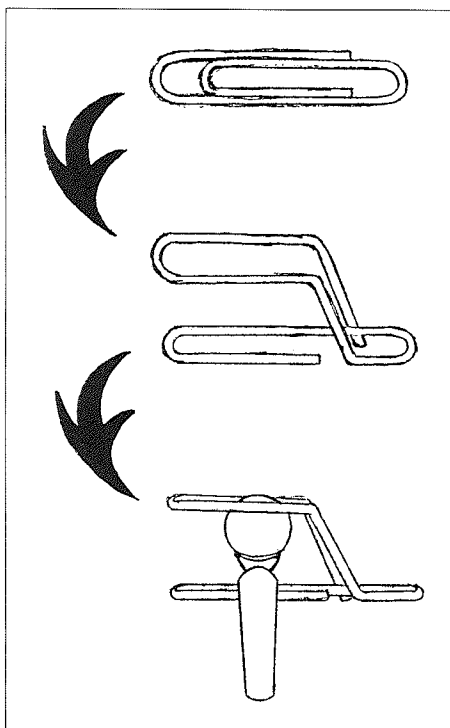


Figure A.

other modifications necessary to perform a specific function; however, certain other properties may diminish to some degree.

Cyanoacrylates are not considered amenable to color pigmentation or treatment in the workshop. Epoxies are better suited for this purpose, as we will explore later. However, clear and black cyanoacrylates do exist and may have potential for application in certain situations behind the bench. A thin film of black cyanoacrylate applied onto the back of an opal may enhance colors or assist in very minor repair of a black stone such as onyx, black coral, or the like.

Cyanoacrylates are meant to be extremely thin adhesive films with thicknesses commonly ranging from .002" to .010". This reflects the fact that these adhesives are available in several viscosities ranging from very thin to a gel-like consistency. The thicker cyanoacrylates are better suited to handle the bonding of such porous items as wood or leather.

Cyanoacrylate adhesives can bond skin virtually instantly, but newer formulations have been created that delay the setting process in the

adhesive to allow time to remove any that accidentally gets on the skin. Borden's has a product known as "Krafty Glue LSA" (LSA-Less Skin Adhesion) that possesses this feature. This delayed timing can also be used to the advantage of the user in repositioning adherends that might not be capable of being repositioned using other types of cyanoacrylates.

Until recently, most consumer-grade cyanoacrylates were formulated with a thin consistency and did not require clamping of substrates or adherends. The recent introduction of cyanoacrylate gels, such as Borden's "Krazy Glue Gel," 3M's "Super Glue Gel," Loctite's "Duro Quick Gel," and their "Permatex Super Glue Gel" as well as a host of other gels from manufacturers such as Devcon, Kony and Ross, have presented an even greater need for adherends to be tightly mated together for maximum adhesion value. Clamping may be required due to the thick nature of the adhesive.

Cyanoacrylate gels can be deceptive by virtue of the fact that they are thick. The temptation to purchase these gels for the purpose of filling gaps and voids between two adherends should be avoided. Cyanoacrylates are not considered to be gap-filling adhesives in jewelry applications with regards to pearl setting. There are applications in the lapidary sector of the jewelry trade where the gap-filling properties of certain cyanoacrylate formulations may have a value.

In pearl setting, cup surfaces should not be warped or irregular and must have full surface-to-surface contact with the pearl in order for an adhesive situation to be successful. Another requirement is that the required peg be of sufficient thickness to fill the hole of the pearl with full contact or with strong enough friction to assist any bonding effort so that friction and adhesion work together to hold a pearl in place. Unfortunately in many repair situations a client is not willing to pay for necessary modifications or other situations are present within the

jewelry piece that preclude the possibility of the modification required for a sound adhesive effort. In such situations where a bonding is required and the mechanical considerations must be bypassed, a slower-setting cyanoacrylate gel coupled with clamping assist can maximize the effectiveness of the bond as long as the cup faces are in contact with the curvature of the pearl. It is very important to make absolutely certain that both the cup and pearl surfaces to be bonded are clean. The use of acetone to clean the surfaces may also contribute to a strong bond. Even though such bonding efforts cannot be guaranteed, they can aid in maximizing the effectiveness of the bond.

Various sizes of paper clips can be bent to form clamps in pearl bonding situations. Pre-bending the clip to match the situation before the actual application of an adhesive will save time and help assure good contact. (See Figure A.)

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For bonding pearls to pierced earrings, a spring-loaded wooden clothespin can be used by modifying the upper jaw with a round bur to create a nearly half-spherical depression of appropriate size, to press down on the pearl or a gemstone sphere. The bottom jaw is modified by drilling a hole through to accommodate the earring post. Rub beeswax or petroleum jelly on the lower jaw to help prevent the earring finding from bonding to the clothespin. (See Figure B.)

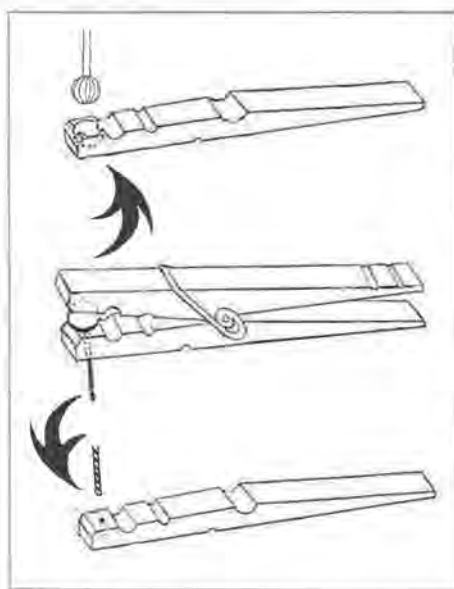


Figure B.

Another reason for using clamps, especially with gel-type cyanoacrylates is that the thickness of the gel can lift the pearl away from the cup and create a poor bond. Some cyanoacrylates require 90 seconds for initial cure which translates into three minutes of holding parts together for a pair of earrings. A couple of clothespins can be quite helpful.

Clothespins and paper clips are cheap and require less than two minutes to modify and they can be used over and over again. They are especially helpful if a number of items have to be bonded in a day's work. The clothespin works well with pendants also.

Bonding speed can be enhanced in slower-bonding cyanoacrylates by immersion in water, but care

should be taken to not put the bonded item through shock or abuse during this process in that the bond can be weakened, thereby counteracting the effort.

Priming the surface of adherends with a bond accelerator can also make a slower-setting cyanoacrylate set more quickly. If used with medium- or high-viscosity cyanoacrylates, gap-filling capabilities may be enhanced. Bond accelerators may also be applied after the adhesive has been put into place.

"Zip Kicker" and "NCF Accelerator" are two accelerator products that are on the market and work especially well where a large area of adhesive is needed in bonding situations.

Due to poor shock, peel and water resistant factors, cyanoacrylates are not considered good adhesives for cushioning torque-sensitive (temperamental) stones in prong or bezel setting situations. Slight mechanical motions of the stone, water penetration between stone and metal, as well as other forces or elements can serve to displace or eliminate a cured adhesive mass or film from its intended position. This could affect the integrity of the setting leading to possible loosening, loss, or damage to the stone. Epoxies are better suited for this purpose. Attempting to build up cyanoacrylates can also create another danger in setting. The built-up mass can potentially break under pressure leading to a sudden uncontrollable torque down force that could result in a fracture, chip, or break in the already temperamental stone.

Some "Hot Stuff"

While many have used "Aaron Alpha" for a number of years as a pearl adhesive, due to the different setting times and viscosities available, a newer cyanoacrylate has recently appeared on the market.

A company by the name of Satellite City manufactures industrial strength cyanoacrylate products known as "Hot Stuff," "Hot Stuff Super T," and "Hot Stuff Special T" that bond in 5, 25, and 60 seconds, respectively.

These industrial strength adhesives are targeted for a more specialized consumer market such as the jewelry, lapidary, and crafts trades.

While many cyanoacrylate products do not dry to a truly clear color, the "Hot Stuff" products do and are also touted to have great shear strength. These are used considerably in the lapidary sector of the jewelry trade. They are frequently used to mount stones in adhesive-dependent stone mountings, inlay work, filling cracks, treatments of porous stones, and dopping gemstone rough for cutting purposes. These amazing cyanoacrylates will even take a polish.

What makes "Hot Stuff" products so hot is that they are actually high-purity cyanoacrylates that are formulated without oil. Oil is used most commonly in "off the shelf" cyanoacrylates to extend their shelf lives. Storage of "Hot Stuff" products should be at or below 32° F in a freezer to extend the shelf life beyond one year.

The names of the three "Hot Stuff" products also represent the fact that they come in three different viscosities.

Another new cyanoacrylate product on the market known as "Slo-Zap" has a very slow setting rate of 1 to 2 minutes. This product is good for those that require a little time to steady their hands or require a little time to clamp or reposition adherends together.

Debonding Cyanoacrylates

There are times when items need to be debonded. Two methods can be applied in debonding circumstances. The first is without the use of solvents and the second is with the use of solvents.

Solventless debonding requires the use of one of the following procedures. Soak item to be debonded in hot water above 200° F until parts can be freed or use a jewelry steamer to steam the parts loose. The clothespin clamps covered earlier in this writing can be quite useful to hold earrings or rings for this purpose. Repeat the

steaming until the parts are separable.

Solvents used in debonding include commercial preparations that are cyanoacrylate specific such as "Z-7 Debonder" and "Duro Super Glue Remover." Other known solvents include acetone-based fingernail polish remover, acetone, and a solvent made by the Savogran Company out of Norwood, Massachusetts known as "Kutzit." "Kutzit" is formulated as a paint solvent and is available in liquid and semi-paste forms. The liquid may prove to be more desirable behind the bench. "Kutzit" contains four known adhesive solvents: acetone, toluene, methanol, and methylene chloride. Bonded items require a fifteen-minute or longer soak with the use of this product. Methylene chloride is also a solvent used in debonding epoxies and is also marketed by itself under the brand name "Attack."

Adequate ventilation is required in the use of all adhesives and their solvents. Fumes can be noxious,

toxic, and carcinogenic. Solvents are flammable. Poisonous gas can result if these are allowed to drop on a hot surface or flame. Avoid direct contact with skin. For further safety tips request a Manufacturer's Safety Data Sheet (MSDS) from the manufacturer of the product intended for use.

Finally, cyanoacrylates can be used with a variety of materials such as metal, rubber, glass, ceramics, china or porcelain, wood, leather, paper, and polystyrene plastic. Polyethylene and polypropylene plastics are not recommended for bonding with cyanoacrylates. Objects such as glass, china, ceramics, and porcelain should be decorative items only; using such items for food, drink, or other similar purposes may result in rebreaking.

In the next Oro Logics II, we will investigate epoxies and other adhesives and share a trade secret or two or three or ...



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Material Matters

Peter W. Eckel

Ah, spring is in the air. Well not exactly—as I write this northwest Ohio is getting a dusting of snow. I'm hoping that this is winter's last gasp and that spring really is just around the corner. I guess it's not much of a trick to figure out that winter and I are not the best of friends by any stretch of the imagination.

Well, now that I've gotten my seasonal commentary out of the way, back to some things horological in nature. I'd like to propose that as a watchmaker you have at your disposal a great resource of information. That resource is the material person that you order from on a daily or weekly basis. Who would have thought that one day I would declare myself and all my fellow material people a resource. I will explain by using one of my favorite tools—the car analogy.

The last time I went new car shopping, which was about four years ago, my first stop was at the parts counter of my local Olds dealer. It just so happens one of my best friends, Larry, works there. Since I had already narrowed the field down to a few different GM models, it was time to find out which were going to give me trouble and what kind of trouble it might be. Ask a parts person in any industry and they can tell you what almost all the weaknesses are of a particular model of anything. For me in 1995 it was the fact that the Pontiac Grand Prix I was looking at would need to have the brakes serviced more often than usual to prevent a problem or a major expense. As most of you know if it's a Seiko 11A it's not the brakes, it's the clickspring. Along the same lines if you're working on a vintage ESA 578.004, a module has a better than average chance of being a problem.

OK, I've stated the obvious, material people get a feel for what they sell for certain models and can sometimes aim you in the right direction. It actually goes further than that though, we also sift through your comments about what assortments are good to have, time management techniques, a little on pricing and maybe even a little perspective on the quirks in retrofitting one movement for another. So starting with this column I'd like to pass on some of this wisdom.

I would like to begin by making a few of those suggestions that seem to have worked out well for other watchmakers. Please bear in mind that I might

inadvertently suggest ideas that require you to buy things from me or your favorite material house but that is purely coincidental.

Gaskets, gaskets, and more gaskets! Almost nothing in your shop is as inexpensive on a per piece basis as your gasket assortment but do you have the right one and are you getting the most out of it? Nothing is more frustrating than to complete a job and have a gasket be the only thing standing between you and a check. Hey wait, there is something even more frustrating than that, doing a simple battery replacement and having a bad or missing gasket turn quick profit into a “you'll have to leave it while I order a gasket from the supply house” job.

You may already know this but let me begin with how gaskets are measured and how to order them. Most gaskets have two measurements, the cross section or thickness followed by the **inside** diameter (i.e., .50-25.0). This means that the gasket is .50 mm thick with an ID of 25.0 mm and an OD of 26.0 mm; remember you have to double the thickness and add that to the ID to arrive at the OD. There are two basic types of rubber gaskets, flat and O-ring. Most watches will need an O-ring gasket which looks like a round tube if you were to cut it across. (I would not do this, they aren't very useful if you start cutting them up to see if I'm right.) The flat gasket as the name implies looks like an Accutron 218,G780 gasket. If you are going to avoid wasting a lot of time looking for the right gasket I have a few suggestions. If you are lacking flat gaskets you might consider the “ISO” brand flat gasket assortment; it has many of the popular sizes and can usually be purchased for less than \$40. These gaskets are made of the same material as the O-ring which is far superior to the old style plastic flat gaskets. The other essential assortment is one that I/we call the “Newall” assortment of O-ring gaskets. The larger version of this assortment has 4 each of 180 sizes ranging from 15.0 mm to 31.5 mm ID with thicknesses including .40, .50, .60, .70, and .80 mm.

This assortment will probably run you a little over a hundred dollars but the time savings alone, along with the convenience of having a complete set will pay you back handsomely. Remember, suggesting that a new gasket be installed can be a great selling tool. If you have almost no gaskets in your bench or you've given up on

trying to organize the few that you have, you might want to try an assortment that is now available that has both flat and O-ring in one. The assortment I have in mind has 1,000 pieces and costs just under \$100.

For those of you who are even more adventurous there is one more style of gasket available in an assortment. I am speaking of the dreaded plastic or nylon gasket. These things can be the biggest pain in the ... wait this is a family column. I had better keep it clean. They are a challenge, that's better. The assortments available for plastic gaskets are much more expensive on a per piece basis and only you can decide if they are worth your while. Still, they can be a real time and frustration saver. You do have to bear in mind that the plastic gasket assortments are for case backs or bezels and will be of little or no value for crystals since crystal gaskets are usually "L" shaped in cross section.

Now that I've hit you up to spend anywhere from \$40 to \$150 on little pieces of gasket material I think it's only fair that my next suggestion should be a freebie. We often get calls for an up-to-date cell interchange guide. The best interchange book out there is from our own AWI. This book is based on the AWI cell numbering system which was well thought out and very logical in its design. The problem is that no one uses it. Sorry guys, I had to say

it because it's the truth. Even though the AWI system never caught on, the book itself is still genius because it lists all of the cell manufacturers' numbers, even the very obscure, and references them all to the AWI number, which just happens to have the Energizer® number right next to it. Speaking of Energizer®, they along with Renata® have purchased many of these books from AWI and sent them to your distributors which may make the book available free of charge to you through your friendly material distributor. Ask your material person for details. If not, they are still available from AWI for \$5. If that isn't enough, also hit your material person up for a plastic template that is available from most distributors. This handy little device has cut-outs for most of the button cells and the lithiums as well. It can be a real time-saver especially when you are confronted by a cell from another industry that may be marked with the voltage only.

I guess that's all for now. I hope you all have a great spring and got a charge out of the battery information. I know it's bad but it's me. Before I close though I would like to wish Frank "Bud" Toy a happy but maybe not total retirement from horology. He has been at the bench many years and has contributed much to our industry. Keep in touch, Bud, and remember, material matters.



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Jack Kurdzionak

From the Workshop

Call in the Reinforcements

Barry Marcus, a watchmaker from Massachusetts, has had some problems with replacement cells for Hamilton 505s. The negative cell connector can often cause a short circuit between the negative terminal and the edge of the case shell which is positive. Barry has solved this problem by applying a self-adhesive insulator to the negative terminal of the cell. This circular insulator with a central hole will prevent a short circuit while allowing the negative cell connector to contact the negative terminal without creating a short circuit.

These insulators can also be used as substitutes for missing insulators in other watches that may no longer be available from your material supplier. It seems easy enough, but you might ask the source of the insulator. Just go to your local office supply store and purchase some self-adhesive reinforcements designed to protect the punched holes in three-ring binder paper.

Plastic Wrap Strikes Again

When the hands are removed from any watch, the dial should be protected. Dials can be easily marred by the feet of the hand remover pressing on it. Conventional sheet plastic dial protectors with a cutout notch to slip under the hands have served the purpose well for older watches with sufficient clearance under the hands to accommodate the dial protector. Modern watch styles are often very thin and there is not clearance for the old style dial protectors. Yet something must be done. Daniel Matheu, CMW, of Colorado, suggests protecting watch dials and hands with plastic wrap. He uses a small piece of the thin wrap to cover the dial and hands completely and then uses the Presto-style hand remover in the conventional fashion. The plastic wrap is thin enough to allow the tool to function

as a hand remover and still protect the dial from the feet of the hand remover. The hands are also secured by being under the plastic wrap when they are removed. The plastic wrap prevents the hands from flying off when they are pulled off the cannon pinion and hour wheel.

Cell Change Complication

Your customer brings a watch featuring a 6¾ ligne movement by Citizen or Miyota in for a cell. You install the cell, close the case, and then set the hands. Then the trouble begins. The stem cannot be pulled into setting position or you pull the stem out past the detent. Out it comes and it won't stay in. Of course you had checked the setting mechanism when the customer presented the watch to you and everything seemed fine. You realize you did something wrong. But what did you do? You didn't even touch the setting mechanism.

Jim Door of Washington state has experienced those problems when replacing cells on those movements with caliber numbers such as 6030, 6L32, 6100, 6M12, etc. The cause, he discovered, is the positive cell contact. This contact serves a dual purpose. It makes a secure electrical connection between the side of the cell and the main plate of the watch. It also is a spring load to hold the cell securely in its well by pushing on the side of the cell. The replacement cell must be installed so as to push the spring contact laterally and not down toward the bottom of the well.

If the spring contact is pushed downward into the well it interferes with the setting parts which are just beneath the contact spring. No amount of manipulation of the stem and crown will cure this situation. You must reshape the contact spring so that it is above the setting parts. The tip of the contact spring is bent at a

90° angle toward the back plate of the watch. This shape should be maintained when reshaping the contact spring.

A Notch Above

Some leather watch straps must be fit to the watch case by cutting a notch in the end of the strap. This is done most often for Gucci models, but many others call for this fitting. A call to your material supplier can get you the appropriate tool for cutting the notch. Jim Door suggests finishing the notching operation by using a flat-tipped soldering iron such as Weller #6150 to smooth the rough edges left after cutting the notch. He does caution not to apply too much heat as this may discolor the strap.

Clock Bezel Repair

Replacing the glass on an American clock with a brass bezel can present quite a challenge. These bezels had the glass held in place with a number of brass tabs soft soldered to the inside of the bezel. Electric powered soldering irons designed for light use just don't generate enough heat to properly solder the tabs back to the bezel. The brass conducts the heat away from the joint faster than the soldering iron can supply that heat. If you use a propane or a butane torch, you get enough heat but you also risk burning the finish on the outside surface of the bezel,

cracking the glass, or both. John Kurdzionak, a promising young clockmaker from Massachusetts, suggests the following. After obtaining the proper size replacement glass, he cleans the surfaces to be soldered with an abrasive cloth. The cleaned surface of the tab that receives the solder is coated with flux and tinned with solder. The cleaned surface of the bezel that receives the tab is also coated with flux and tinned. The heat is supplied using an old fashioned soldering copper heated with a propane torch. The copper soldering iron is mounted on a steel rod with a wooden handle on the end. The pointed tip of the copper is cleaned, coated with flux, and tinned with solder to aid in the transfer of heat.

After heating the copper for a bit in the torch, the copper is touched to the bezel with a small bit of solder to tin the bezel. The copper provides enough heat to cause the solder to flow without burning or discoloring the bezel. Now the tinned tab is placed on the tinned surface of the bezel and the reheated copper is touched on the tab and within a few seconds the solder on both the tab and the bezel flows and a secure joint is assured without damage to the bezel. John also uses the same technique to solder a hinge onto the bezel. With a bit of practice, an excellent joint is made every time.



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026041\$5.95

Harley 751; 2.50 height; 2 hd., sizes 70/120 ; 392 power cell; INTERCHANGES Eta 578.004, Eta 978.002.

026045\$7.95

Harley 753; 2.50 Height; 3 hd., sizes 70/120/20; 397 power cell.

026046\$7.95

Harley 751E; 5 1/2 X 6 3/4L; 2.50mm height; exact interchange for ETA 578.004 & 978.002

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Hattori Y481; 2 hands;65/110;

INTERCHANGE:Bul 2831.10, 2831.27, 2831.37

026017\$8.95

Pulsar Y482; 2.89 height; 2 hd., sizes 65/110; 364 power cell.

026018\$8.95

Miyota 2030; 2.89 height; 3hd., sizes 70/120/18; 377 power cell; INTERCHANGES Cit.2035, Cit.2038, Cit.2030, Adec2838.

026019\$5.95

Miyota 2025; 2.89 height; 2 hd., sizes 70/120; 377 power cell; INTERCHANGES Cit.2020, Cit.2025, Cit.2028.

026021\$5.95

PC21A; 3.15 height; 3 hd., sizes 70/120/20; 377 power cell.

026042\$5.95

PC22A; 4.15 height; 3 hd., sizes 70/120/20; 377 power cell; date.

026063\$6.95

11 1/2 L SIZE

ISA 1198/32; 3.70 height; 3 hd., sizes 90/150/20; 395 power cell; sweep second date.

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Harley 315; 3.15 height; Date/sweep

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Thursday, June 24

3:00 - 7:00 PM

Registration

7:00 - 11:00 PM

Affiliate Chapter Delegates' Reception & Round Table

Friday, June 25

8:00 - 9:00 AM

Registration

9:00 AM - 3:00 PM

Affiliate Chapter Meeting

Saturday, June 26

8:00 - 9:00 AM

Directors' Breakfast (Directors only)

9:00 AM - 3:00 PM

AWI Board of Directors Meeting

3:00 - 6:30 PM

Vendor Display

6:30 - 7:30 PM

President's Reception

7:30 - 10:30 PM

Kentucky Bluegrass Buffet & Awards Program

Sunday, June 27

9:00 AM - Noon

AWI Board of Directors Meeting (conclusion)



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Wilson, Rob M.—Daphne, AL

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Merrill, Marvin D.—Russellville, AR

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Downey, Robert—Long Beach, CA
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Riddle, John E.—Rancho Santa Fe, CA

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Business Practices

Tom Gref, CMW

I was asked by Jim Lubic, AWI Education and Technical Director, to write an article concerning my business philosophies and practices to benefit the members. At first, I was hesitant because I don't consider myself to be an expert businessman (more like a businessman/watchmaker in training). I hope that this article will serve as a starting point for an ongoing discussion of how to run a profitable business, with more input from a variety of members to follow. Without more input, it could be viewed as fairly one-sided. I have always thought such information was paramount to the vitality of the AWI, and have always been disappointed at the lack of articles on business practices. I guess you have to start somewhere, so here we go!

I think that a successful business has to address five main issues:

1. Offer a unique product or service, with a clear cut position in the market
2. Effectively advertise and promote the business
3. Build a strong reputation/name recognition
4. Set prices for good profitability
5. Run the day-to-day business so that the business grows and prospers

Offer a Unique Product or Service

It is important that you can easily distinguish your business from other businesses offering similar services. This should really stem from the question, "why would a customer do business with you rather than someone else?" This is of paramount importance, and will help differentiate your business from your *competitors*. (I really dislike the word *competitor*, as I consider most of my *competitors* to be friends and allies, but it gets the point across.)

How do you make sure you are offering a unique service? Pretend that you are an uninformed customer, and consider the businesses you are likely to find. See who advertises, where they advertise, and what kinds of service they offer. If you can position your business in a niche where there is little competition, you will have a much better chance of being successful. For example, say that you repair watches. People can take them to a local repair

shop, they can take them to a dealer, they can send them back to the factory, or they can ship them to an independent repair shop. Most factories will not fix watches that are very old, so your niche might be fixing watches the factories won't repair. This way you offer a unique service, and have effectively eliminated most of your competition.

Effective Advertising and Promotion

You can be the most talented and skilled watch maker/clockmaker in the world, but if nobody knows about you, your skills are essentially useless (in terms of running a successful business). Effective advertising is basically comprised of a well thought out message, a good presentation, and a targeted audience. There are many forms of advertisement, including trade magazines, collector magazines, newspapers, TV, radio, etc. Select the ways in which you choose to advertise based on the audience that each medium provides, getting the most exposure for the least amount of money. If you want to attract affluent customers, advertise in magazines that affluent people read. Then, most importantly, keep track of the responses so you know which ads are performers and which ads are duds. Some will be duds—if you don't keep track you'll end up wasting money on ads that don't produce revenue.

Make sure that your ads reflect your business. If you service high-end clocks and watches, don't put together a homemade ad on a typewriter and expect to get business. The *look* of your ad, in addition to your message, will have a significant affect on how well it produces for you. Personally, I hire a graphic arts company to do my import advertisements. It is money well spent. Homemade ads don't work, and are a waste of time and money.

Don't forget about free advertising and promotion. Local papers are always looking for a good story, so give them one. Tell them about your business, do a story about an interesting watch or clock that you restored, basically give them a reason to write a feature story about you. It's cheaper than running an ad and will probably generate more business. Be creative.

Build a Strong Reputation

This actually ties in with some of the other categories, especially advertising and promotion. Your reputation is one of the most valuable things you have, and is really worth money. You've seen companies buying other companies just for their name, so they could launch a product line under a well-known name.

I believe Donald de Carle's statement that your reputation depends on each individual job. Don't give a customer a reason to be dissatisfied. Give them reasons to be delighted, and encourage them to tell their friends about your great service. Get results for your customer.

Your credentials also affect your reputation. For example, Tom Gref, watchmaker is weak compared to Tom Gref, AWI Certified Master Watchmaker, BS Mechanical Engineering. Wherever your name and business name appear, so should your credentials. Get certified through the AWI. The tests can be taken through the mail with the aid of a suitable proctor. Certification will enhance your knowledge, your skills, and your reputation.

Pricing

Pricing, in the horological world, seems to be a very touchy subject. Don't let it intimidate you, as it is paramount to a successful and profitable business.

There seem to be a few steadfast rules in terms of pricing. One that everyone agrees on is the fact that you need to be turning away a certain percentage of your business based on price. This percentage will vary somewhere between 20% and 75%. If you are not losing some business based on price alone, then your prices are too low. If you can't afford to turn away that much business, then you need to advertise and promote your business better. Think of it as skimming the cream off the milk—you want to take the business that fits your niche and that is most profitable, and leave the rest.

Get a realistic assessment of your abilities based on your competition. If prospective customer took a watch to other repair facilities that were not able to repair the watch, and you repaired it successfully, then you have a unique and valuable talent. The prices that the other places charge is irrelevant, because they were unable to get results. You should be charging at least double what the other places quoted.

Also, don't underestimate the value of your abilities. Doing a proper cleaning on a watch and finding a few correct replacement parts is a valuable skill. If this is all it takes to make a watch run properly that the other places couldn't fix, then you have a unique skill. Don't underprice yourself.

Setting prices should be based on a combination of the value of your time and what the market will bear. It should not, especially on low-end pieces, be based on the value of what you are fixing. If someone gives you a watch

to repair that is worth \$200, and it will take \$300 in parts and labor to repair it, then quote them \$300. On low-end pieces, there is no correlation between the value of your time and the value of what you are fixing. On higher-end pieces, you will consider what the market will bear. You can probably charge more to fix an expensive watch than you can to do the same work on a cheaper watch. Either way, you should make money.

How do you know what actual dollar figure you should choose? For a rough hourly figure, look at watchmakers, clockmakers, auto mechanics, and any other similar business. Most people, as far as I know, are in the \$30 - \$75 per hour range. This will at least give you a ballpark figure.

What will the market bear? Good question. Look at what other people are charging, and try to get some idea as to their quality and results. Don't assume that your definition of expensive is the same as the average customer's. I have learned that what I think is expensive is perfectly acceptable, even reasonable to some customers. What I suggest is that you run small tests on your pricing. For example, one day take the next five jobs and increase your normal quote by 25%. See how many of the jobs you get. If you get 4 of 5, try the same on the next five. Pretty soon, you'll get a good idea as to what the market will bear. You might be surprised.

Daily Business Practices

Treat your customers well. Give them honest advice and they will repay you with referrals and more business. You may need to set some guidelines, though. Don't spend too much time talking with someone who is just looking for general information, and doesn't present any real business opportunity. Figure out early exactly what they are looking for, and if it's just general information get them off the phone or out of the shop. Don't be rude, but don't let them eat up your time either. They need to understand that you are a busy professional, and they need to respect your time.

Set and meet expectations. This is very important. Make sure that your customers have a realistic understanding of the work to be done, and what kind of results they can expect. I think it makes sense to set expectations slightly lower than you can reasonably achieve. If you meet or exceed your expectations set up at the start of the job, the customer will be happy. Explain things that might be problematic to your customer, so they understand the nature of your work.

Hopefully, this article will give you some ideas to improve your business. I also hope it will inspire members to make corrections and additions, to improve our collective knowledge. ☺



John P. Kenyon,
CMC

A Practical Course in Clock Repair

The Rack and Snail Strike Control Mechanism

The rack and snail strike control mechanism is somewhat more complex, but superior to the count wheel strike control mechanism in design and operation. It always strikes the correct hour as long as both trains are wound, and the last hour struck can be repeated on demand. This used to be of particular advantage prior to the twentieth century when artificial light was not prevalent. To repeat the hour strike, a release lever installed either on the top or front of the clock is actuated to cause the mechanism to operate (until the time of warning for the next strike). Another advantage is that the rack and snail mechanism can be used on very small-sized clock movements.

Unlocking and Warning Actions

Figure 1 illustrates a French clock movement with a rack and snail strike control

mechanism. The hour unlocking pin (A) is located behind the cannon pinion. A few minutes before the hour, unlocking pin (A), which is turning clockwise, contacts unlocking lever (B) to raise upper wing/warning lever (C) which has an extension that extends through a slot in the front plate into the path of warning pin (D) in warning wheel (E). As the cannon pinion turns, unlocking lever (B) contacts pin (F) in rack catch (G) and slowly raises the rack catch to drop the rack (H). Locking lever (I) fastened to the same arbor moves out of the path of locking pin (J) in locking wheel (K) to release the strike train. When the train goes into motion, warning wheel (E) will turn one-half of a revolution; then, warning pin (D) will limit against warning lever/upper wing (C) to lock the train,

Shortly after the warning action is complete, further movement of unlocking lever (B)

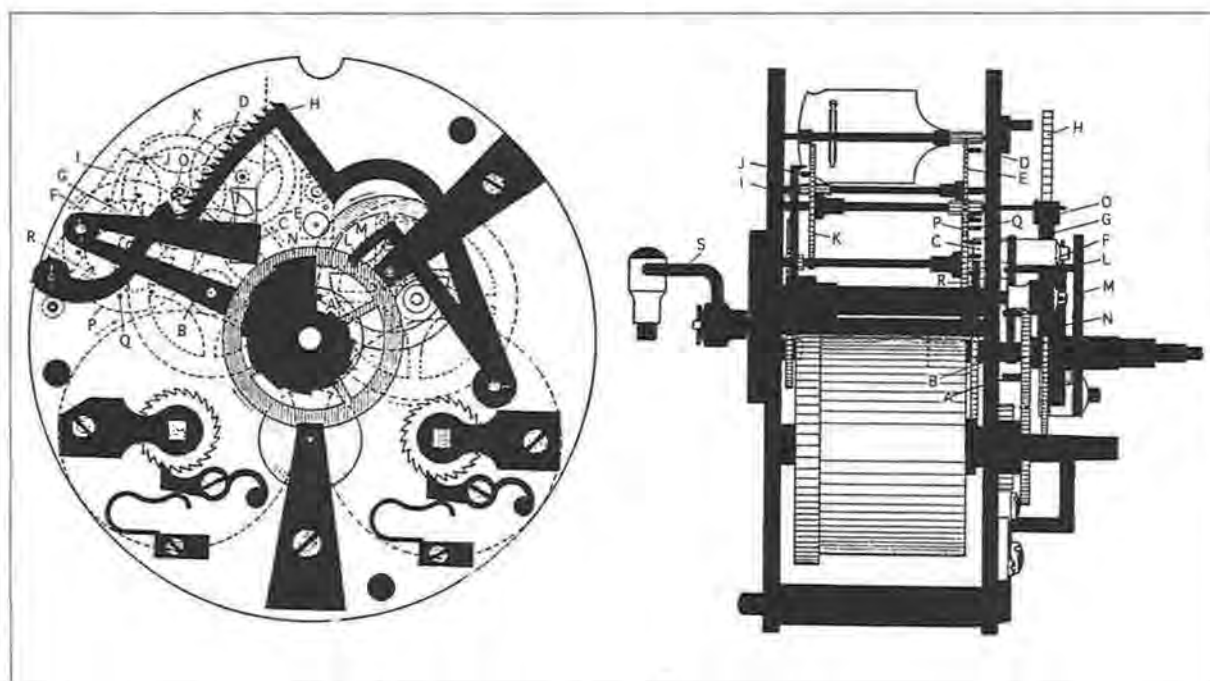


Figure 1. Rack and Snail Strike Mechanism

will raise rack catch (G) sufficiently to allow rack (H) to drop. Its fall is arrested by pin (L) in rack arm (M) and is limited against a step of snail (N) which is fastened to the hour wheel and turns with it.

Striking Action

When the minute hand reaches the hour marker, unlocking pin (A) will move out from under unlocking lever (B) and allow warning lever/upper wing (C) to drop out of the path of warning pin (D) in warning wheel (E) to release the train for striking. When unlocking lever (B) drops, rack catch (G) is allowed to drop into the teeth of rack (H) in position to hold the rack as it is raised, while holding locking lever (I) out of the path of locking pin (J) in locking wheel (K), which is then free to turn.

As the train runs, gathering pallet (O) which is fitted on an extension of the locking wheel arbor turns counterclockwise contacting a tooth of rack (H), lifting the rack the distance of one tooth. The rack catch (G) moves out of one of the lower tooth spaces and into the space beneath it to hold the rack until gathering pallet (O) rotates again to gather up another tooth and so on. When the rack catch falls under the last tooth of the rack, locking lever (I) will move back into the path of locking pin (J) to lock the train.

With each revolution of the gathering pallet, strike pin (Q) on strike wheel (P) contacts hammer lifting arm (R) to raise and drop hammer (S) to strike the gong.

The Half-Hour Strike

The half-hour strike is actuated by the half-hour unlocking pin (not shown), located behind the cannon pinion, 180 degrees from hour unlocking pin (A). The half-hour unlocking pin is positioned a little closer to the center arbor than the hour unlocking pin so that it will raise unlocking lever (B) far enough to lift rack catch (G) and permit locking lever (I) to release the train for the warning action, but not far enough to drop the rack. This results in locking lever (I) falling back into the path of locking pin (J) in locking wheel (K) after one revolution of the locking wheel (for one strike).

Assembling the Strike Train

When assembling this type of strike train, strike wheel (P) should be in position so that hammer lift arm (R) has just dropped off from one of the (ten) strike pins (Q) and is far enough away from the next pin so that the turning of the strike wheel during warning action will not leave a strike pin in contact with the hammer lifting arm. The reason for this is that the strike train needs to get into motion with some momentum before the load of lifting the hammer is put on the train.

Locking wheel (K) is placed in locked position with locking pin (J) resting against locking lever (I). Warning wheel (E) is positioned so that warning pin (D) is

diametrically opposite its limit on warning lever (C). The hour wheel and snail (N) are positioned so that when rack (H) drops, the pin in rack arm (M) will not contact the back edge of the high step of the snail. Gathering pallet (O) should be installed on the extension of the locking wheel arbor, with the train locked on locking lever (I) so that the pallet edge will clear the rack when it drops during the warning action.

In some rack and snail type strike movements the cannon pinion, minute wheel, and hour wheel are marked with dots that can be aligned during assembly for precise indexing of the wheels and pins.

This type of movement is usually designed so that the hands can be set by turning them in either direction. The unlocking lever is beveled on its upper edge so that when the cannon pinion is turned backwards, the unlocking pins will cam the unlocking lever to one side permitting the pins to pass. The back edge of the high step of the snail is also beveled so that it will cam the pin in the rack arm to one side to permit the snail to pass if the rack has been dropped.

The hammer has a leather insert to enhance the tone of the gong. It is adjusted so that there is a little clearance between the hammer and the gong. When the hammer drops, the tail is arrested by a banking pin while the head springs enough for the hammer to recoil so it will not interfere with the vibrations of the gong. The best position for the hammer is found by trial and error.

The resistance of air to the blades of a fan governs the speed of the strike train. The fan is friction-fitted to an arbor and can be adjusted to regulate the quickness of the hammer strokes.

The principles of construction are similar in most rack and snail striking mechanisms. Each manufacturer may use a slightly different approach to accomplish the same result. It would be beneficial to have this type of mechanism in-hand for perusal while examining the mechanical action outlined above.



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A Grandfather Clock with a Polyphone Music Box

David J. Carlson

The magnificent grandfather clock shown in Figure 1 has a walnut case that measures 23" x 14 ¾" x 84 ½". The center section of the clock with the stained glass is an access door to a Polyphone music box movement as shown in Figure 2. The music box plays 15 ½" disks. Behind the upper door is a high-quality German Lenzkirch time and strike movement. The movement has a brass dial with a 9 ¾" chapter ring. The clock with the dial removed is shown in Figure 3. The grandfather clock was most probably built at the turn of the century in the Black Forest region of Germany.



Figure 1.
Grandfather Clock

The customer purchased the clock at auction with the assurance that both the clock and music box were functional. What proved to be missing was the linkage between the clock and the music box that enabled the music box to play after the hour strike. The challenge was to restore the missing linkage.

Music Box Manual Controls

In Figure 4, the controls for the music box and the winding crank can be seen on the side of the cabinet. The controls are detailed in the schematic shown in Figure 5. The top control is a brass knob on the end of a rod which, when pulled out, disables the clock control. The lever on the lower control is the master control that enables the music box to be on in the "LAUT" position and off in the "STILL" position. For clock control of the music box, the upper control knob must be in and the bottom control lever in the "LAUT" position.

Music Box Movement

Figure 6 is the rear view of the Polyphone music box movement. An important feature for control of the music box is the lever immediately below the baseplate. If the right end of this lever is momentarily lifted the music box will start to play and then stop automatically when the record is completed. The two cords attached to the lever are controls. The center cord is connected to the upper manual control in Figure 5. The cord on the right goes to the clock control system. Understanding the function of this lever is important to restoring the clock control.

Figure 7 is a more detailed look at the lever. The left end of the lever is located immediately below the fan of the music box governor. The position of the lever is maintained by a beveled steel block that is attached to the lever immediately to the left of its pivot point. The steel block rides on the bottom of the wheel in the center of Figure 7. The music box movement drives the wheel. There are two slots in the wheel that correspond to two complete cycles of the playing disk. When the wheel rotates and the steel block rises into a slot, the left side of the lever rises, captures the fan stop wire and the music box stops.



Figure 2. Polyphone Music Box

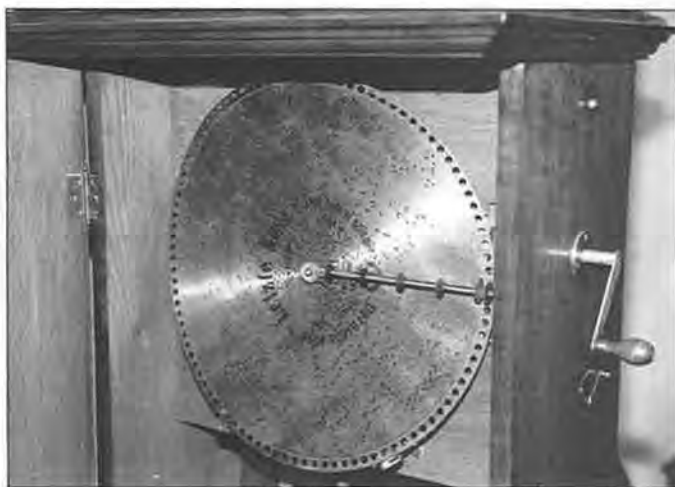


Figure 4. Music Box Controls

If the lever is in the stop position, the music box may be started by momentarily raising the right end of the lever. When the lever is raised, gravity allows the tear-drop-shaped piece immediately in front of the bottom slot to fall and cover the slot. When the steel block on the lever returns to the wheel it cannot enter the slot and the music box starts another cycle.

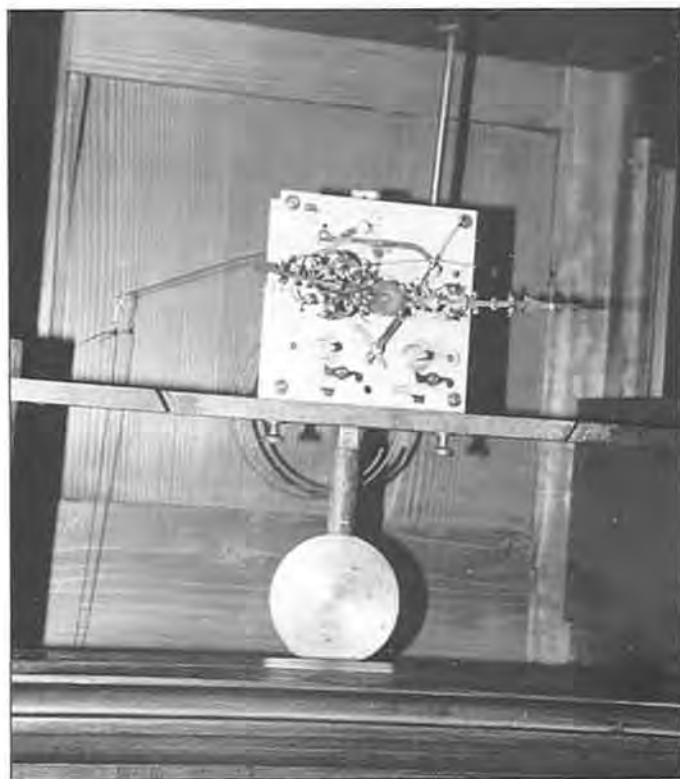


Figure 3. Clock Movement

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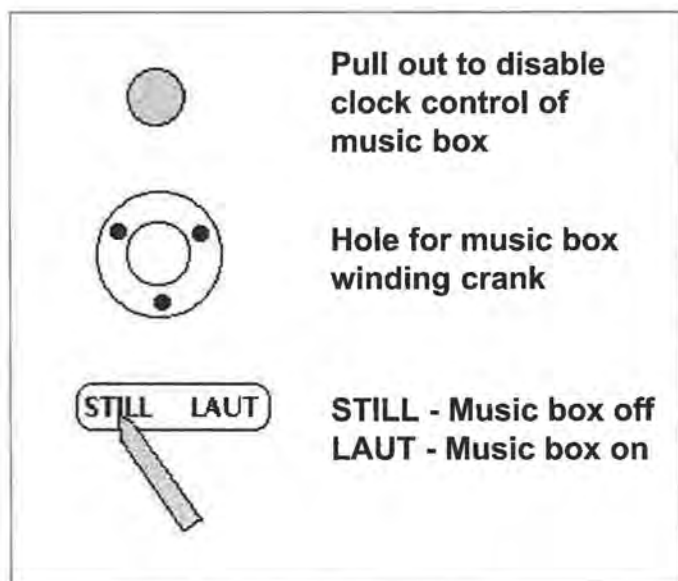


Figure 5. Control Schematic

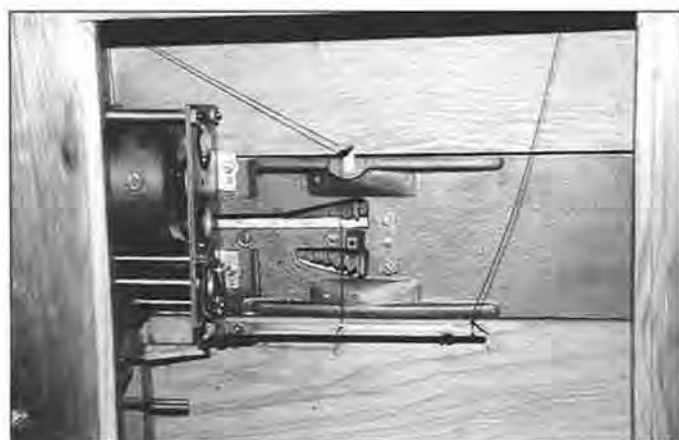


Figure 6. Rear View of Music Box

From the above evaluation of the music box movement, it has been shown that the clock only has to supply a momentary lifting force to the lever in Figure 6 to start the music box cycle. The lifting force is supplied to the lever via the clock control cord on the right-hand side of the lever. It was experimentally determined that a vertical force of 3 grams and a displacement of 0.5" will do the job.

Clock Music Box Control System

The front of the restored clock movement is shown in Figure 8. The strike system is a rack and gathering pallet that has been overlaid with the necessary components for clock control. For clarity, numbered arrows are used to identify the control system components. As shown, the control system is in the rest position ten minutes before the hour.

The following description of the control system starts at five minutes to the hour after the rack 5 has fallen to the left in preparation for chiming the hour. At three



Figure 7. Lever Detail

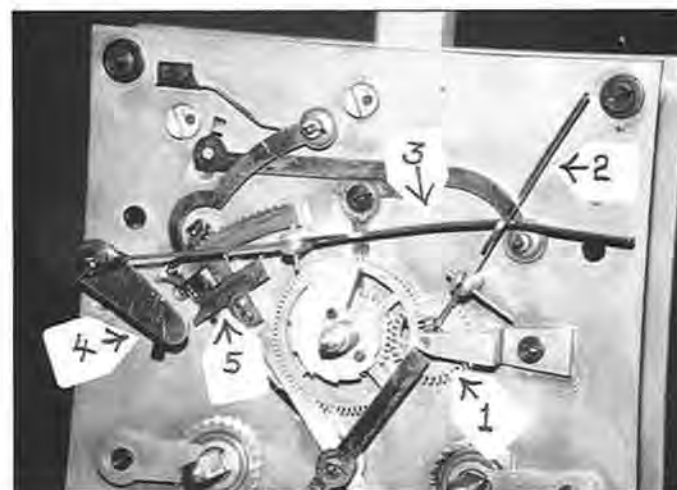


Figure 8. Clock Movement Front

minutes to the hour a slot in the minute wheel 1 allows the nose of lever 2 to enter. The rear end of lever 2 rises vertically, which in turn allows the right end of lever 3 to rise. The left end of lever 3 falls, which lowers the paddle-shaped piece 4. Beneath the lower end of 4 (not visible) is a pin that falls on the baffle plate attached to the rack 5. (The baffle plate is immediately at the end of the arrow pointing to the rack 5.) When the minute hand reaches the hour, the gathering pallet starts moving the rack to the right. As the rack approaches the final strike, the pin on the bottom of paddle falls off the baffle plate (end of arrow 5) which in turn lets the paddle 5 fall (move towards the plate). The action is picked up on the rear of the clock movement as shown in Figure 9.

Paddle 5 in the front view and paddle 6 in the rear view of the movement are connected by an arbor. The arbor is spring loaded to push the arbor towards the rear plate. When the arbor connecting paddles 5 and 6 moves towards the rear plate, a pin on the arbor moves into



Figure 9. Clock Movement Back

position to intersect the strike pinwheel. (The same pinwheel that raises the strike hammer.) When the last strike occurs both paddle 6 and the hammer are raised by the strike pinwheel. Paddle 6 then raises lever 7. (Lever 7 was missing from the grandfather clock as received.) The top wire of lever 7 is 6" long. The end of the wire has a loop through which the control cord is fastened by a clip. The wire and control cord can be seen at the back upper left of the movement in Figure 3. The cord passes through the shelf between the clock and the music box and is connected to the right end of the music box control lever (Figure 6). The action of lever 7 exceeds the requirements to start the music box. Lever 7 will provide more than 7 grams of lift and $\frac{3}{4}$ " displacement.

Summary

It was very satisfying to evaluate and restore the clock control system for this grandfather clock. The only caveat is estimating the job. The job was bid at 15 hours and ended up taking 20 plus. The difference was justified by personal interest in the job and allowing sufficient completion time that it did not compete with high-priority jobs in the shop. ☺

Correction

The pendulum described in the article "A Pin Wheel Regulator" in the February 1999 issue of *Horological Times* is **not** temperature compensated.

Several readers pointed out that both the brass and steel rods are pinned at the upper end of the pendulum. This configuration does not allow compensation. See John Kenyon's article on Compensating Pendulums in the same issue.

David J. Carlson



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Introduction

In Part 41 we covered the description of the hour strike components. We will now cover the operation of this system.

Badolette Hour Strike (Figures 42.1, 42.2, 42.3, & 42.4)

Just before the hour, as the minute pipe/cannon pinion assembly rotates clockwise (CW), the quarter snail goes along with it; they are both attached. The starwheel pin (15) on the surprise piece contacts a tooth of the starwheel (11). The starwheel and the hour snail, which are part of the same assembly, start to rotate counterclockwise (CCW). The jumper (12) under pressure of the jumper spring (13), climbs up a tooth on the opposite side of the starwheel. (See schematic Figure 42.2.) When the jumper reaches the tooth apex and starts down the other side, it accelerates the rotation of the starwheel. The next tooth now contacts the secondary pin (93) giving it a "kick."

The secondary pin is on the surprise piece, which is free to rotate. The kick speeds up the rotation of the surprise piece CW. The banking screws (pins) in the elongated banking holes (94) limit the CW movement of the surprise piece. As the surprise piece shifts in relation to the lower quarter snail (90), the first quarter step moves over and covers part of the fourth quarter step. When the quarter rack tail (97) is released on the fourth quarter it is blocked from dropping to the fourth step of the snail. The starwheel/hour snail is now advanced to the next hour.

Just after the starwheel/hour snail is advanced to the next hour a lifting pin (not shown) on the under side of the minute wheel (38) lifts the lower horizontal arm of the hour/

quarter rack control (111) (Figure 42.3, view D). This action rotates the rack control CCW.

The rack control is a 90-degree, 2-armed lever located just below the hour rack (98). It has a long pin fastened near the top of the vertical arm. This pin I call the rack stop pin (112). When the rack is released in sonnerie this pin is in position to catch the rack and prevent it from falling.

Just after the hour snail/starwheel is advanced a lifting pin (115) (Figure 42.3, view C) on the underside of the minute wheel lifts the horizontal arm of the hour/quarter rack control (111) rotating it CCW. This action moves the vertical arm and the rack stop pin out from under the hour rack (98). When the rack is released on the hour, the rack is free to fall until its tail (99) contacts a step on the hour snail.

Moments later, the flirt assembly vertical arm (16) is actuated by one of the four lifting pins (116) on the underside of the cannon pinion (14). As the vertical arm of the flirt is drawn to the right, the spring loaded horizontal arm (17) is drawn with it. The hinge joint (18) is a shoulder screw holding the two arms together, with the ability to pivot.

The left end of the horizontal arm rides on the flirt knockout pin (25). This pin is located at the upper end of the rack hook (28). The last 3/8" of the flirt horizontal arm has been milled creating a step (19). As the flirt moves towards the right, the knockout pin (25) is engaged by the step. The rightward movement continues until the let-off on the hour. At this moment the flirt moves rapidly left, under the power of its compressed spring (20), lifting the rack hook off the rack (98). This is accomplished by the knock out pin re-engaging with the step (19). The rack now drops rapidly, powered by its spring and gravity, until the rack tail (99) comes to rest on a step of the hour snail.

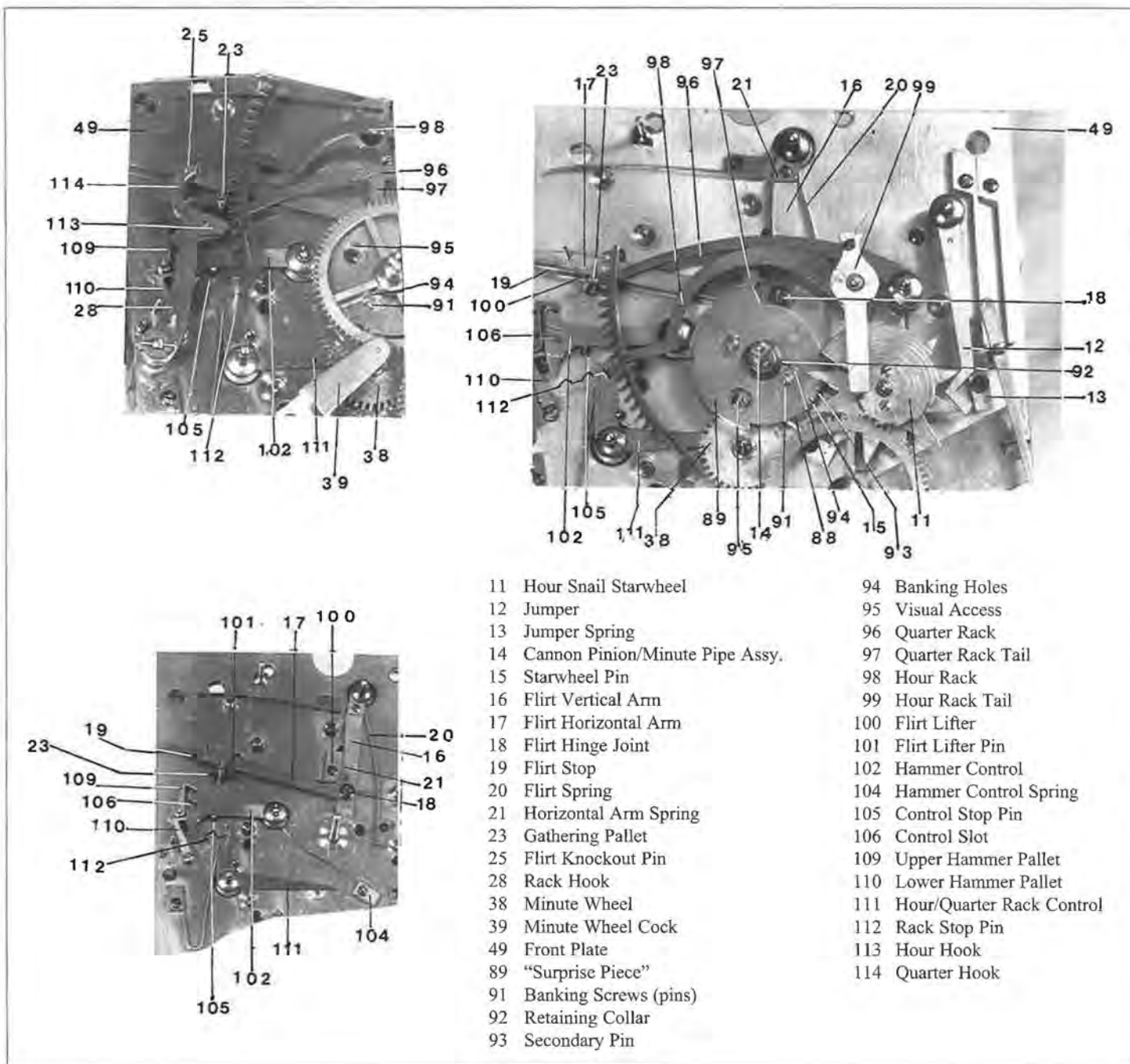


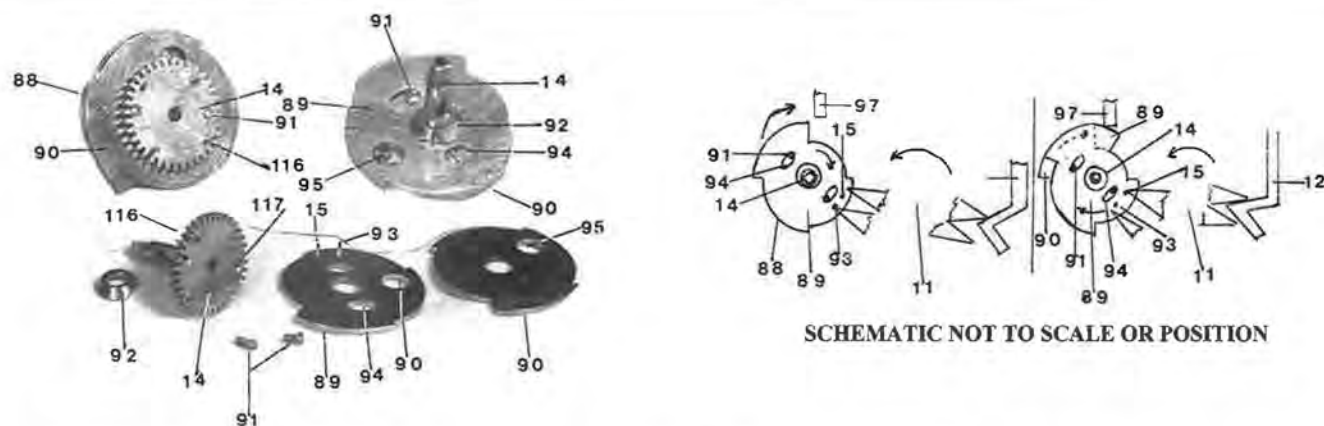
Figure 42.1. Strike Components

Simultaneously, the strike train is released. The locking lever (33) and the rack hook (28) are connected through the lock lever/rack hook arbor (32) as in a typical French clock. Lifting the rack hook to release the rack also unlocks the strike train. Conversely, when the rack falls forward on completion of the strike, the locking lever is returned to the path of the locking pin (117). On contact, the train stops.

At this moment the flint knockout pin is still engaged with the step (19) in the flint. This prevents the rack hook from engaging the rack.

Behind the horizontal arm of the flint is a spring lever, which I call the flint lifter (100). A pin, which I call the flint lifter pin (101), is attached to the left end of the flint lifter. The arm lifter (22) portion of the gathering pallet actuates this lifter. This arm lifter contacts and lifts the flint lift pin (101) and thereby the flint horizontal arm. This action releases the flint knockout pin from the step, allowing the rack hook to engage with the rack.

The hammer pallets (109) (110) are controlled by the hammer control (102). The position of the control determines which hammer will strike. The hammers can strike



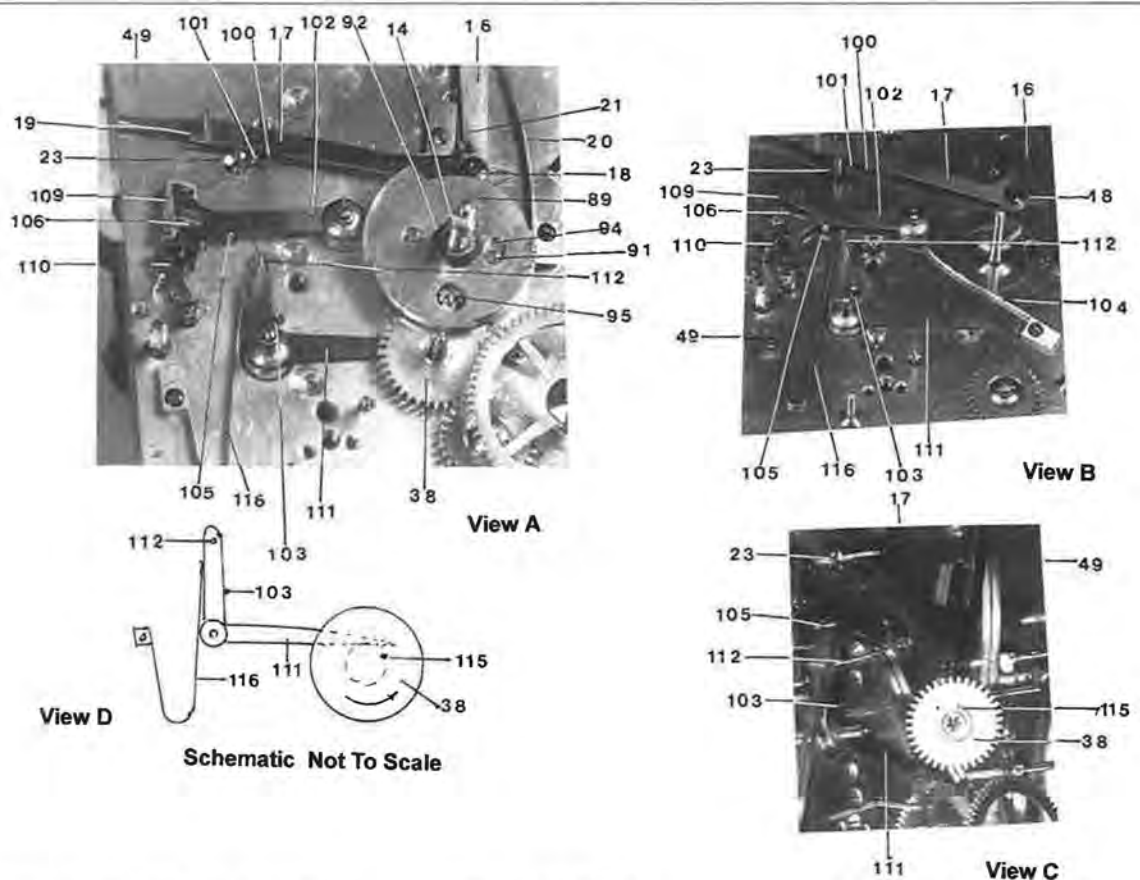
- 11 Hour Snail/Starwheel Assembly
- 12 Jumper
- 14 Cannon Pinion/Minute Pipe Assy.
- 15 Starwheel Pin
- 88 Quarter Snail

- 89 "Surprise Piece"
- 90 Lower Snail
- 91 Banking Screws (pins)
- 92 Retaining Collar
- 93 Secondary Pin

- 94 Banking Holes
- 95 Visual Access
- 97 Quarter Rack Tail
- 116 Quarter Lift Pins
- 117 Banking Screw Threaded Holes

Above: Figure 42.2. Quarter Strike Snail Components

Below: Figure 42.3. Strike Control Details



- 14 Cannon Pinion/Minute Pipe Assembly
- 16 Flirt Vertical Arm
- 17 Flirt Horizontal Arm
- 18 Flirt Hinge Joint
- 19 Flirt Step
- 20 Flirt Spring
- 21 Horizontal Arm Spring
- 22 Arm Lifter
- 23 Gathering Pallet
- 24 Gathering Face

- 38 Minute Wheel
- 49 Front Plate
- 89 "Surprise Piece"
- 91 Banking Screws (pins)
- 92 Retaining Collar
- 94 Banking Holes
- 95 Visual Access
- 100 Flirt Lifter
- 101 Flirt Lifter Pin
- 102 Hammer Control

- 103 Rack Control Stop Pin
- 104 Hammer Control Spring
- 105 Hammer Control Stop Pin
- 106 Control Slot
- 109 Upper Hammer Pallet
- 110 Lower Hammer Pallet
- 111 Hour/Quarter Rack Control
- 112 Rack Stop Pin
- 115 Hour/Quarter Rack Control Lift Pin
- 116 Hour/Quarter Rack Control Spring

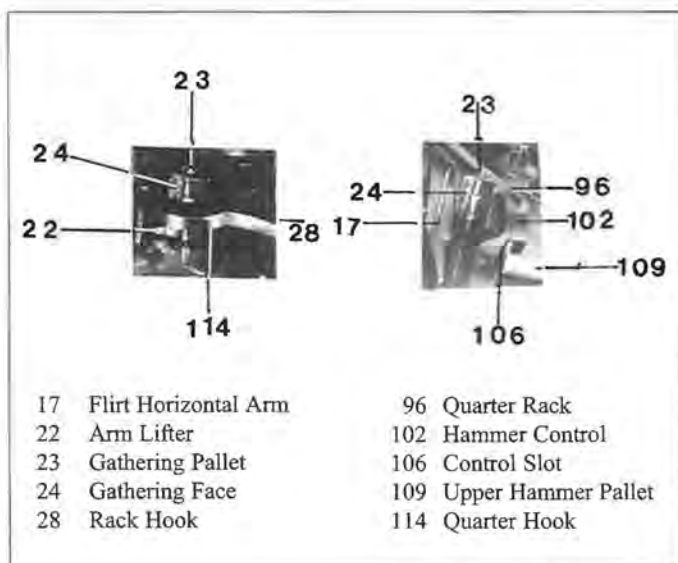


Figure 42.4. Gathering Pallet - 2 Views

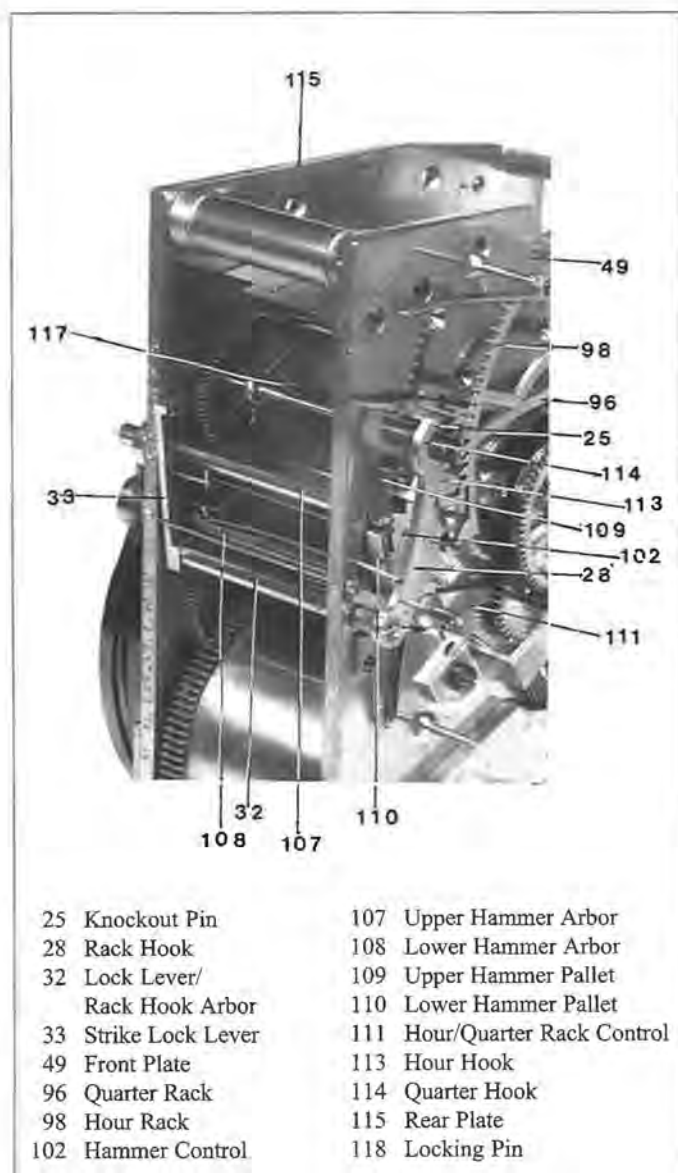


Figure 42.5. Strike Control - Hour Mode

only when the hammer pallets are above, below, or in the control slot (106).

For the hour strike the hammer control is in its lowest position. In this position the upper hammer pallet (109) is clear to move, while the lower pallet is blocked. Therefore, only the upper hammer and the lower pitched gong will be struck. The other positions of the hammer control and the resulting actions will be discussed later in the quarter strike section.

Shift from ting - tang to hour strike

On the hour, several events take place sequentially and almost simultaneously to change over from the quarter to the hour strike. 1-The starwheel/hour snail (11) is shifted by the first pin (starwheel pin (15)) on the surprise piece. 2-The next tooth on the starwheel intercedes with the secondary pin (93), thereby shifting the surprise piece into the hour mode. This position prevents the quarter rack from dropping. 3-The hour/quarter rack control lift pin (115) (Figure 42.3, view D) contacts and lifts the lower horizontal arm of the hour/quarter rack control (111). This rotates the rack control CCW. The vertical arm with its rack stop pin is now out of the path of the hour rack when it is released at lift off. The rack drops until stopped by its tail landing on a step of the hour snail. The hour strike is initiated.

This ends Part 42. In Part 43 we will discuss the operation of the quarter strike (sonnerie) system.

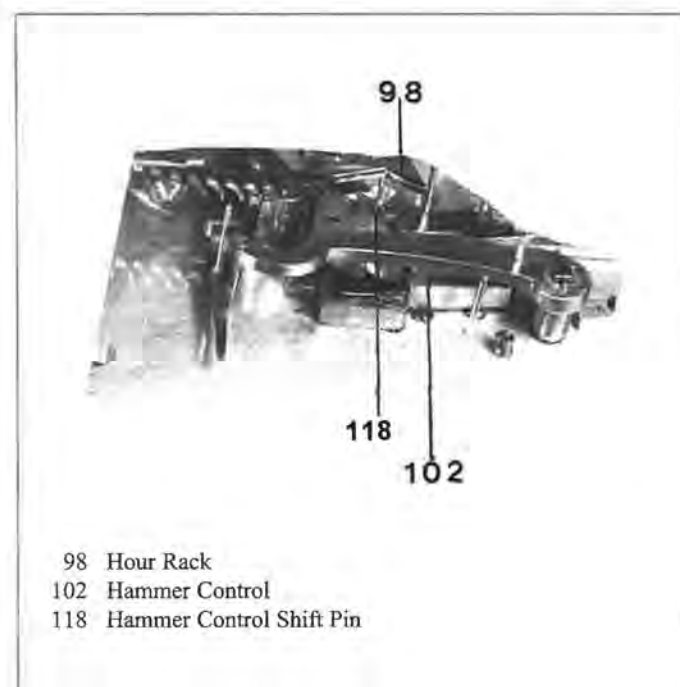


Figure 42.6. Hammer Control Details



Dennis Warner

Affiliate Chapter Report

The Minnesota Watch and Clockmakers Association is one of the most active and successful Affiliate Chapters that we have in AWI. They keep about one hundred members through active meetings and bench programs. A monthly newsletter, *Jewelers, Inc.*, keeps all informed of the happenings of the organization and includes educational and industry news.

They run many fine programs that other groups may like to implement. If you have any questions feel free to contact their group.

Thanks to President Janet Larson and Affiliate Chapter Delegate Ray Flood for composing the following article.

The Minnesota Watch and Clockmakers Association was founded in 1926 to represent the licensed watchmakers in the state. The association worked closely with the State preparing the educational requirements for the apprentices and the watchmaker licensing exams. With the closing of the state licensing requirement, the association continued as an organization for the continuing education of the watchmaker. This was expanded to include clockmakers and the logo and title of the Association was changed to reflect the new status.

There are three categories of continuing education, which are:

1. Clockmaking which includes repair techniques of the manufactured clocks by the current suppliers. Repair of antiques most commonly brought into the shops for service. Repair procedures, skills, and tools in use by practicing clockmakers.

2. Watchmaking with emphasis much the same as for clockmakers, as stated above.

3. Business subjects such as accounting, law, marketing, advertising, and customer relations.

The most successful of these in 1998 was the Watch Forum. These sessions were held in the evening hours to allow as many as possible attendees to get away from sales and/or the

bench. A presentation was made each month and lasted approximately an hour and a half to two hours. Nearly all presentations were made by local sales and service watchmakers. Instructors for the most part were members of The Minnesota Watch and Clockmakers Association. A partial list of these forums is as follows:

1. Idiosyncrasies of Quartz Watches by Donn Krueger. This meeting covered demonstrations of testing, decisions on repair or replacement of movements, and peculiarities of some of the most popular quartz movements.

2. The Fine Points of the Lever Escapement by Robert Nelson, CMW and AWI Fellow. Bob's presentation was the essence of the lever escapement bench course which he has taught all over the United States for AWI. It included trouble analysis, repair steps, theory, and lubrication of the lever escape mechanism. It was a very special treat for the Minnesota watchmakers.

3. Goldsmithing for Watchmakers by Steve Inlou. This presentation was a demonstration of replacement of hinges on pocket watches, dent removal, and the replacement of lugs on a customer watch and case work.

4. Measurement and Diagnostic Tools by Richard Redman. Mr. Redman was an IBM



Richard Zielike of Edina, MN takes the final test of the Dead Beat Escapement class. Note the small number of tools required for the course: straight edge, files, calipers, and a compass (not shown). The testing device with a mounted escape wheel is shown near Richard's hand.

technician in instrument repair before opening his shop of watch repair in Rochester, Minnesota. His presentation covered not only Witschi equipment but also his oscilloscope. He described printout patterns of oscilloscope analysis of problem movements.

5. One of the sessions not presented by Minnesotans was by Antoine Siminon of WOSTEP who gave an evening presentation to all interested horologists in the five-state region. He presented the status and his forecast of the future worldwide shortage of competent mechanical watch technicians.

For the Clockmakers there were two bench-course-type presentations which were:

1. A one-day presentation by Robert Ockenden, CMC, on Ships' bell clocks. Attendees were asked to bring to the class problem movements for show-and-tell and for diagnosis and help. The focus of the day's work was on the escapements, determination of how the strike count was achieved, the synchronization and coordination of the ships bells and trouble analysis.

2. The highlight of the clock continuing education was a two-day AWI bench course presented by Jerry Faier, CMC. The first day covered the history, function, and theory of the Graham invention, commonly called the "square escapement" or the dead beat. The dead beat name comes from the total lack of movement of the escape wheel after lock. The first day's activities also included drawing with simple instruments (a six-inch straightedge, and a simple compass) an escape wheel and the pallets.

In Mr. Faier's original course layout a pallet would have been transferred to steel, cut to shape, drilled for an arbor, and given an initial polish. Reducing the class time by one day the cutting was not done. During the second

day a pallet was fitted to an escape wheel and the steps of adjustments were made.

Attendees were asked to bring to class samples of dead beat escapements for evaluation. A number of movements including a Swedish clock were brought. Handouts included the five basic terms and definition of lock, drop, lift, run, and draw.

As a direct result of a presentation by the Minnesota State Attorney General's office an effort was put together by the Association to create an amendment to the state statutes to give the watchmaker and clockmaker legal relief for the clocks and watches abandoned by the owners. There are thousands of watches stored in safes all over the state which customers have orphaned. The amended law is stated so that the clocks and watches might be sold to satisfy the repair bill.

Proposed legislation from both the House of Representatives and the Senate was held in committee last year due to the pressure of other legislative acts. The bills have been scheduled to be introduced again this year.

Yearly the Association has held a convention and business meeting. These have been, for as long as anyone can remember, in Minneapolis. This year a mini-convention was organized for St. Cloud, Minnesota. It has long been a wish to be able to take activities of the Association to the members. The purpose of this convention was technical education mixed with a social program. A spouses-only function which had not been a part of the usual convention for a long time was presented and spouses visited a botanical garden near St. Cloud. Social events included a golf tournament and an evening dinner with live music for dancing.

The technical presentations included Fake or Real Rolex Watches by Charles Cleves of Bellevue, Kentucky. This was a big hit with both watchmakers and jewelers. Joseph Juaire, instructor at St. Paul Technical College, put together a session on correctly handling customers as they enter the store/shop. ☺



From right to left: Susan Wood, Minneapolis, MN; Milo Bresley, Bloomington, MN; and Curt Glessner, Waterloo, IA wait for class to restart. Note the Seth Thomas in front of Milo Bresley's work space.



Jerry Faier answers questions for Mike Mishou, St. Paul, MN and Harry Carlson, Minneapolis, MN. Mr. Carlson holding the dead beat demo device is with Kuemple Clock.



James E. Lubic,
CMW

Education Update

Repairing & Servicing the Sequential Chime Movement With Automatic Night Off

This new AWI Bench Course will help entice the skill and knowledge needed to repair and service triple chime movements with a sequential chime and an auto night off. A sequential chime changes on the hour, every hour, to a different chime in the auto-mode. An automatic night off movement on night off will shut off at a specific time and will return the sound at a specific time. It can be most annoying and frustrating when you clean and oil one of these movements and then it fails to operate correctly.

This course offers hands-on mechanical knowledge and part names or numbers. You will gain confidence by partial disassembly and reassembly of these movements. This course provides take-home literature that is necessary in providing service to these components.

Definitions

sequential chime - on auto-drive the chimes change automatically on the hour, every hour

automatic night off - on automatic night off the chimes and strike shut off between 10-11 PM and return at 7-8 AM

Tools Required for This Course

- Everyday clock repair tools
- Tweezers, watch and clock tweezers are best (there are some very small parts)
- Watchmaker & clockmaker screwdrivers
- Assortment of pliers (serrated and smooth, including needle nose)
- E & C Clip Pliers (do not buy these if you do not have them)
- Any other tools that are helpful with repairs: movement holders, etc.

The instructor provides a basic triple chime and the new Westminster. The sequential chime can be moved manually to operate

separate chimes and the auto night off can be set manually to run night and day. These movements are built by an affiliate factory of Howard Miller known as Kieninger. Howard Miller will release a manual on these movements soon. They also provided movements to AWI and offered future assistance if needed.

James E. Williams, CC, of Cortez, CO, is the instructor for this course. Mr. Williams also serves as AWI instructor for Cuckoo Clock Repair and Clock Case Repair.

AWI Academy

We are on the home stretch of the 1998-99 AWI Academy of Watchmaking. There is still time to register for the following courses:

Henry Frystak will be in Harrison teaching "Repair of the Bulova Accutron" April 19-23. Students will become competent in handling the Bulova Accutron Calibres 214, 218, 219, 221, and 230; learn proper cleaning, lubricating, and phasing techniques, and more.

Fred Burckhardt will be on hand May 12-14 for "Shop Management". Course topics will include: time management, staff, buying and selling, advertising, public relations, image building, store policy, sales and promotions, and more.

AWI members can attend the Academy June 1-4 and take part in the Certified Electronic Watchmaker and Certified Master Electronic Watchmaker examinations. The following week, June 7-11, testing will be conducted for Certified Watchmaker and Certified Master Watchmaker.

AWI Jewelry School

The AWI Jewelry School has scheduled its week-long "Introduction to Jewelry Repair" for May 3-7 or August 16-20. Please contact AWI if you are interested in learning the basics of jewelry repair. David A. Christianson is the instructor for this course.



EDUCATION

Bench Courses

To register for Bench Courses, please mail, fax or e-mail your registration and payment information to: **AWI Central, 701 Enterprise Drive, Harrison, OH 45030. Phone (513) 367-9800, Fax (513) 367-1414, E-Mail: Educate@awi-net.org** PLEASE NOTE: Registrations are limited and will be selected by the earliest date received. Please include a check or your Visa or Mastercard number, card expiration date, signature and phone number. Registrations cannot be taken by phone. All registration fee checks and charges are processed immediately upon receipt. **DEADLINE FOR REGISTRATION IS 30 DAYS BEFORE THE SCHEDULED DATE OF THE COURSE.** • Indicates Bench Courses held in conjunction with a convention.

DATE	CLASS	INSTRUCTOR	LOCATION	FEE
MAY 1999				
• 28	Seiko Kinetic Quartz Watch Repair	David Christianson	Boone, NC	\$75.00
JUNE 1999				
5-6	American Pocket Watches	Alice Carpenter	Austin, TX	\$130.00

Project Extend Courses

AWI's continuing Education Program offers one-week and two-week classes in various phases of watch & clock repair techniques. Work alongside recognized leaders in the field of horology. See how they handle the everyday situations we all encounter. All Project Extend classes are held in AWI's training rooms in Harrison, Ohio. Call or write for information and details for the classes that interest you! **DEADLINE FOR REGISTRATION IS 30 DAYS BEFORE THE SCHEDULED DATE OF THE CLASS.** To register for these courses, please mail, fax or e-mail your registration and payment information to: **AWI Central, 701 Enterprise Drive, Harrison, OH 45030. Phone (513) 367-9800, Fax (513) 367-1414, E-Mail: Educate@awi-net.org.** Please include a check or your Visa or Mastercard number, card expiration date, signature and phone number. Registrations cannot be taken by phone. All registration fee checks and charges are processed immediately upon receipt.

Academy of Watchmaking

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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			
12-14	Shop Management	Fred Burckhardt	\$150.00
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



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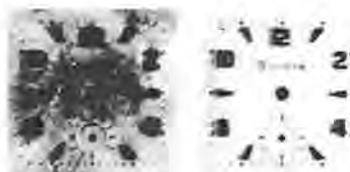
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WANTED TO BUY: Seitz #30664 endshake correcting tool (same as jeweling tool except it has a drum-micrometer instead of a lever). Also, Lorch 6mm lathe accessories. W. Steinbach, Ph/Fax (602) 839-7570.

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Buying pocket watches, cases and parts. Need Am. msp. & staff sets - crystals. Bob Niemeyer, 19844 S. SR 116, Spencerville, OH 45887; Phone (419) 647-4818.

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Top Midwest buyer of old movements, cases, crystals, dials, etc. is also buying running wrist and pocket watches, by the piece or collection. I'll travel or pay shipping. Cash settlement. Call Mike Bailey at (847) 741-1289 or write to P.O. Box 531, Elgin, IL 60121.

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BULLETIN BOARD

NEW REQUESTS

Heath, Hicks & Perkins Barometer

Lewis Kranick, Plymouth, WI, is seeking information on a Heath, Hicks & Perkins Barometer. It is English-made, circa early to mid 1900.

RESPONSES

Russian-Made Clock

Robert G. Rolfe, Rockville, MD, and Leo Alfred, Dublin, OH, have both supplied possible sources for Richard A. Osterman's search for a balance staff.

ITEMS STILL NEEDED

Swartchild Co. Material Cabinets

John Baxter, Columbus, OH, is seeking copies of cards to identify the contents of Swartchild Co. material cabinets. Some have cards to identify the contents. The assortments for which he needs cards are:

1. Assortment #498882 Stems Swiss
2. Assortment #449901 OE Stems, Set Bridges, Setting Levers Swiss
3. Assortment #499041 Fancy and Antique Pocket Crowns
4. Assortment #499041 Ladies Bracelet and Gents Strap Crowns
5. Assortment #498458 Hands

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.

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.

If you can answer any of the above AWI members' requests, please send the information to:

Horological Times
Bulletin Board
701 Enterprise Drive
Harrison, OH 45030
Phone (513) 367-9800
Fax (513) 367-1414
E-mail: donna@awi-net.org

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Regular Mineral Glass Crystals



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CKX-100 **\$65⁹⁵**
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Registrations (no preregistration after May 1)

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REGISTRATION: Valerie Phillips, c/o AWI, 1050 N. Lindbergh Blvd., St. Louis, MO 63132

QUESTIONS??? Call Gene Bertram at 314-822-2150 or David Warner at 314-227-4817

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No Refunds, Confirmations or Preregistrations after May 1, 1999

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