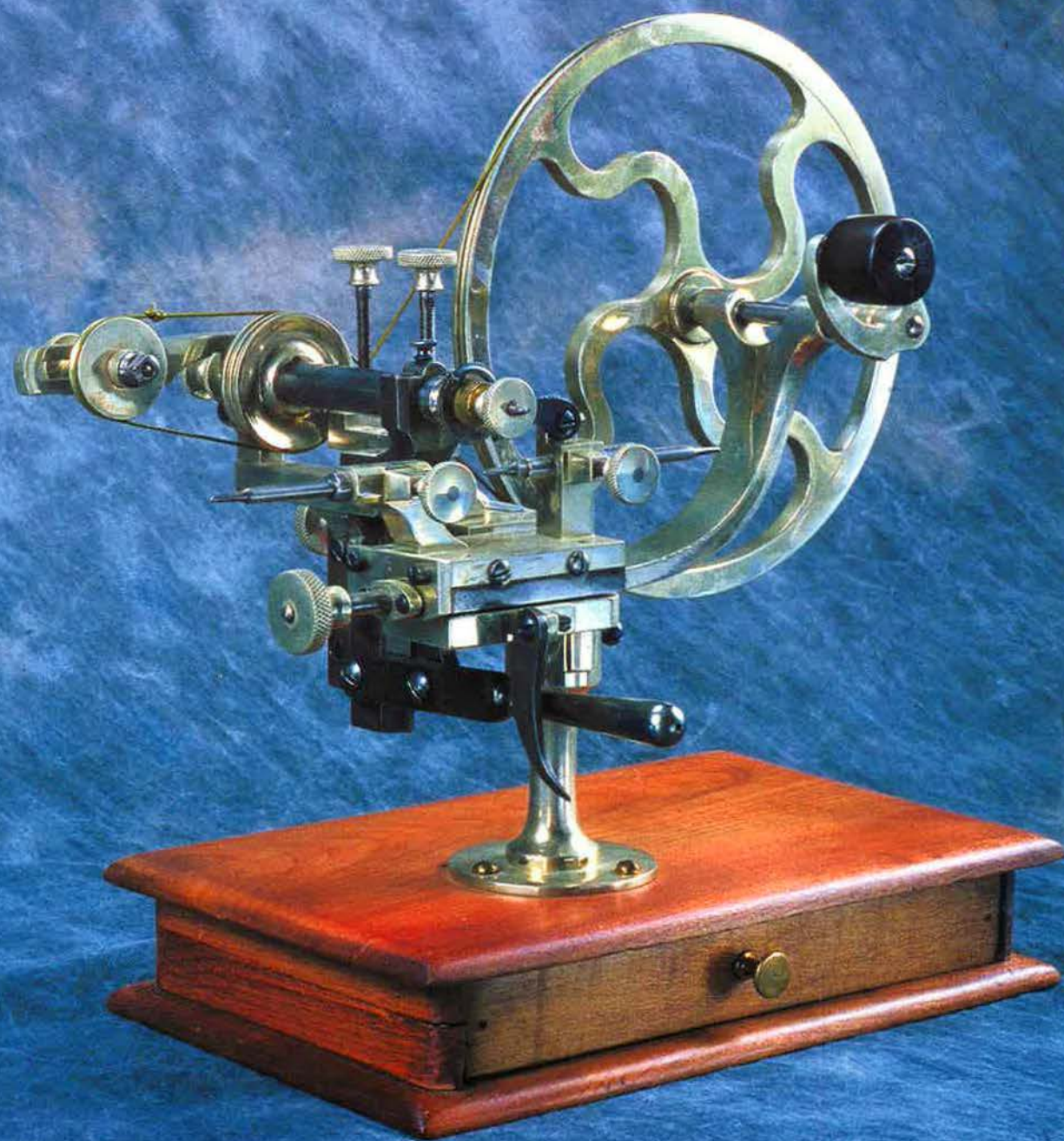


HOROLOGICAL TIMES

June 1999



American Watchmakers-Clockmakers Institute

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HOROLOGICAL TIMES (ISSN 0 145-9548) 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 \$14.63 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.

CONTENTS

VOLUME 23
NUMBER 6
JUNE 1999

FEATURE ARTICLES

- | | |
|--|----|
| A Gear Cutter Centering Device for the Watchmakers' Lathe,
By Robert D. Porter | 10 |
| Round 'em Up, By Ron DeCorte | 12 |
| A Simplified Gear Train Calculation Procedure, By David J. Carlson | 30 |

COLUMNS

- | | |
|--|----|
| Technically Watches, By Archie B. Perkins | 14 |
| The Winding and Setting Mechanisms, Part 13 | |
| A Practical Course in Clock Repair, By John P. Kenyon | 20 |
| Movement Removal and Inspection | |
| Repeater, Petite and Grande Sonnerie Clocks, By Leo A. Jaroslaw | 26 |
| Carriage Clocks, Part 44 | |

DEPARTMENTS

- | | |
|---|----|
| President's Message, By David A. Christianson | 2 |
| Executive Director's Message, By William J. Ewbank | 2 |
| Questions & Answers | 4 |
| Ask Huck, By J.M. Huckabee | 6 |
| Battery of Information, By Ewell D. Hartman | 8 |
| AWI Material Search | 19 |
| Material Matters, By Peter W. Eckel | 24 |
| From the Workshop, By Jack Kurdzionak | 34 |
| Affiliate Chapter Report, By Dennis Warner | 36 |
| New Members | 41 |
| Classified Advertising | 44 |
| Bulletin Board | 48 |
| Advertisers' Index | 48 |

EDUCATION

- | | |
|--|----|
| The 1999 REC Meeting and Watch Training Seminar | 38 |
| Education Update, By James E. Lubic | 42 |
| Bench Courses/Project Extend | 43 |

SPECIAL INTEREST

- | | |
|--|----|
| Board of Directors Election Results | 13 |
|--|----|

COVER

This month's cover feature is a rounding up tool.
Photography by Malcom J. Wilson



President's Message

David A. Christianson

Tony Riggio, National Service Director for Tourneau, our nation's largest retailer of premium watches, is spearheading a meeting in New York City in mid-June.

Dubbed "an important watchmaking forum," the meeting will bring together the U.S. representatives of the Swiss and Japanese watch manufacturers; Mr. Antoine Simonin, Director of the Watchmakers of Switzerland Training and Educational Program (WOSTEP); and AWI's President,

Executive Director, and Education/Technical Director.

The purpose of this meeting is to introduce the Swiss Watch Industry in the United States to the American Watchmakers-Clockmakers Institute; to show them our facilities and our capabilities; to show them the technical quality of our certified members; and to show them the AWI Academy of Watchmaking and the opportunities that their support of our Academy would have for training the future watchmakers that the U.S. watch industry so desperately needs.

At the same time, Tony is also trying to, in his words, "revive our Industry Advisory Board (IAB). This liaison with industry (both Swiss and Japanese) will broaden the partnership between AWI, the manufacturer, and our current watchmakers ... to strengthen the industry's ability to service manufacturing concerns and the consumer most effectively and efficiently." Tony's goal is that the IAB will work toward "developing an awareness of watchmaking as a sound career choice, as well as the recruitment of individuals to our trade."

These two initiatives have the potential of having a tremendous impact on watchmaking and repair in North America in the near future and AWI is proud to be an integral part of these efforts.



Executive Director's Message

William J. Ewbank

Last fall, when AWI began its annual dues cycle, your membership renewal application had a checkoff for those of you who desired to be placed on a national referral list. I am pleased to report that nearly a thousand of you decided to allow AWI to place you on its public national referral list. We are now ready to begin the second phase of this operation. Within the next few weeks those of you who agreed to be on the public referral list will receive a questionnaire from our headquarters

office. This short questionnaire will be asking a list of very basic informational questions about you and your business. For example, we will be asking you to confirm the business address, telephone number, fax number, e-mail address, what you specialize in for repair or sales purposes, your certifications and credentials. You will also have an opportunity to write a brief description (no more than twenty-five words please!) of yourself or your business to attract clients and customers.

As all this information is being compiled, we will be working with our internet service provider, Productivity OnLine from Cincinnati, to develop a new page in our web site to provide a geographic directory of every watchmaker and clockmaker in the national referral list. The internet is the perfect vehicle for AWI to get current information out to the public about where they can find a professional watch or clock repairer. We have probably all read stories about the explosive growth of the internet. How many of us are truly aware of the true implications of internet commerce? Did you know that e-mail has exceeded the volume of first class postal mail this year? Did you know that since AWI went on line a little over two years ago that our e-mail traffic has grown to scores of messages a week, and that our members now communicate with us more via e-mail than through any other source? Did you know that the biggest single source of new members for AWI is through persons who register through our internet web site?

Our new referral directory will help you get your message out to the world. Each member who agrees to be listed in the referral directory will be allowed one free link to the AWI web site. This means that if you have your own internet home page, every person who looks up AWI under key words like "horology," "watchmaking," and "clockmaking" will be able to locate the referral directory and then actually link up to the member they find in the directory. It will be a quick, easy way for anyone in the country who is looking for a good watch or clock repair person to find the nearest AWI member. If you don't have your own home page and would like to develop a site, Productivity OnLine will be able to help. Instructions will be listed in the referral directory and will appear in an upcoming issue of *Horological Times*.

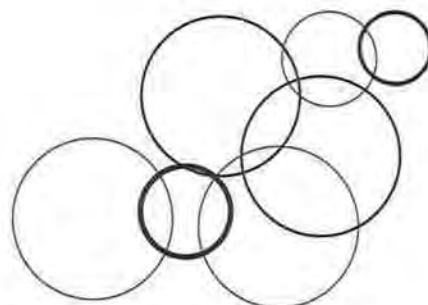
If you missed the dues check off, or decide that you would like to be listed in the referral directory, you may still request to be included. The most important thing to remember is that you must *ask* to be included. AWI respects its members' privacy. Your name cannot be listed until we receive your consent. For further information on how to be listed in the national referral directory, contact Nancy Wellmann at AWI.

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Questions & Answers

Question

I would appreciate any information you can give me on these clocks. One is a Herschede and one an Ansonia. I am interested in origin, maker, distributors, etc., that may help in giving an accurate appraisal of these clocks.

Daniel Barrett, Chesterfield, Virginia

Answer

On your clock, the crown between the orbs on the dial and name on the movement identifies your clock as made by the Herschede Clock Co. of Cincinnati (and later of Starkville, MS). (See Figure 1.) Mr. John Wanamaker, whose name appears on the case, was a very prominent jeweler in Philadelphia who sold this clock sometime after World War I, probably in the 1920s, but that comes from dated Herschede clocks that have come through my own shop.

A copy of a letter that details a phone conversation with Mr. Richard Herschede, grandson of the founder, confirms much of what is written here. This letter was published in the *NAWCC Bulletin*, August 1988, page 329.

Mr. Herschede (a watchmaker) began importing floor clock movements from England in 1885 and placed them in cases that he had made locally. In 1900 he began making his own movements.

Herschede clocks were primarily distributed through a network of retail dealers, beginning in the early days as jeweler friends of Mr. Herschede in towns in and around Cincinnati and growing after WWI to a national network serviced by a national sales force headquartered in the Herschede Clock Co. corporate offices.

On your porcelain table clock, it was made by the Ansonia Clock Company and was named the

Figure 1.



“Porcelain Crystal Regulator #2.” It was made around the first part of this century. The Ansonia clock illustration is from a page from the Ansonia Clock Company catalogue of 1914. (See Figure 2.) It uses the typical Ansonia round plate movement with an exposed Brocot pin jewel escapement. The top and base of the clock were made by the Royal Bonn Porcelain Co. (Germany) and, from your photo, is dated 1902. This means the case was made in 1902 and originally sold sometime after that. The Ansonia products were typically distributed through jewelry wholesale firms.

Just for historical information, the Ansonia Clock Company began in 1854 and ceased production sometime between 1914 and 1918, with its production equipment sold to Russia in 1920.

David A. Christianson



Figure 2.

New Items from Borel



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Ask Huck

Making Escape Wheels

Question

Escape wheels are frequently needed, but these all seem to have different shaped teeth. How can a shop afford an endless variety of cutter shapes?

Answer

Of all wheels, I believe the escape wheel is easiest to make. You have defined an economic problem, but there is a way around that. I cut most escape wheels with a saw.

About 30 years ago someone gave me a dull circle saw about 1-5/8 inch in diameter and 1/16 inch thick. It had very fine teeth. This was set up in a wheel engine and converted to a 16-tooth, chisel-tip saw. Grinding was done with a thin stone driven at high speed. It has since been sharpened many times and has cut hundreds of escape wheels.

I make two trips around the wheel—one for the forward face of the tooth, the other for the back side. Sometimes a third trip may be needed to clean out the tooth root area.

Any wheel that has straight tooth lines can be cut with a saw. If I were making the saw again, more teeth would be cut, simply to reduce the frequency of sharpening.

Tooth angle is set up by visualizing the tooth being extended across the wheel as a geometric chord.

I usually cut a stack of three or four wheels at the time. This saves clean-up of cutter flash, and often the back-up wheels find a use. That use may be for similar clocks, or back-up pieces for making smaller wheels.

Those who desire to delve into wheel making will find escape wheels a good place to begin.

Measurement Tools Needed to Build a Clock

Question

What measurement tools are needed to build a clock? Will I need a surface plate, height gauge, dial caliper, rules, square, micrometer, and possibly others?

Answer

The tools named are useful, but not of absolute necessity. In building a clock movement the problems are insignificant as compared to high production with interchangeable parts. I have all the tools named and many others, but they are the result of my years in industrial work.

If you are thinking about construction details, obtain a copy of *How to Build a Regulator Clock* from AWI. This design was deliberately made to ease the need for complex measuring equipment. A further design objective was to keep the critical tolerance pieces to a minimum for construction ease.

Indeed, escapement parts have close tolerances, as do pivot center distances. Second hand position, center shaft, and winding arbor location is critical if the movement is being built for a ready-made dial.

You should be able to handle the Regulator project with a 1-inch micrometer, a 6-inch vernier caliper, a 6- and 12-inch steel scale, a small square of about 6 inches, and a yardstick.

I recommend the Regulator book to everyone because it gives a step-by-step plan for making a clock movement. It will give insight on how an abstract design is ushered into a functional reality.



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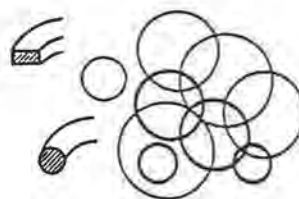
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Battery of Information

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Ultra-Thin Quartz Movements

In Gary Crichton's recent article on lubrication of quartz watches, he pointed out that the ETA 210.001 movement wins the comeback prize. I would like to include its sibling, the ETA 210.011 in this contest. The latter is the same basic movement with the additional torque load of a calendar mechanism.

A customer brought me a high-grade, 18-karat watch, with the ETA 210.011, complaining that no one had been able to make it run properly in the seven years since it was new. I noticed that someone had replaced the battery with an S64 (SR712SW); this movement requires an L36 (Renata-44).

The replacement battery was two-tenths millimeter thicker than it should have been, causing it to protrude slightly above the bridges of the movement. Since the watch was a very thin model, this caused the battery to put pressure on the movement when it was cased. A further difference was the fact that the original was a 2.0-volt lithium battery and the replacement was a 1.55-volt silver-oxide battery. If the *AWI Battery Number System* book had been consulted, it would have been obvious that this substitution should not have been made.

The lubrication of this movement became the next area of consideration. I talked with Dan Fenwick of SWTC, and he recommended that this series be cleaned well, not oiled, and that the triangular dial washer be exchanged for a round one. Unfortunately, this particular watch did not perform properly either "dry" or with light lubrication.

Knowing that this movement could have been distorted either by improper handling or by the incorrect battery, its replacement seemed to be the remaining option. I soon discovered that one distributor listed it as ETA 210.011, while another listed it as ETA 210.011-3. I talked with many persons and no one could tell me why the "3" was added to the caliber number. Knowing the "track record" of this series, I suspected some design changes had been made and so I

ordered one. There have definitely been some noticeable changes in the circuitry; hopefully the result will be improved dependability.

I replaced the movement, giving very careful attention to the minimal clearances of the hands relative to each other and the crystal. It is important to utilize the cannon pinion post which extends through the movement for proper support when mounting the hands. If thin quartz movements are not properly supported, cased, and serviced with the correct battery, the stator can be permanently distorted as it is made of a soft material which is not resilient. The watch is performing well as of this writing.

This Consumer Reports

The "Power Pen Battery Saver" is being introduced to our members by Esslinger & Co. Its declared purpose is "a battery cleaner that inhibits and removes oxidization on all types of batteries and terminals of battery powered products."

The "pen" has a felt-tip to apply a mixture of citrus and mineral oil. The citrus is a mild acid which cleans and neutralizes the hydroxide which may have leaked from the battery. The mineral oil prevents oxidation which can act as an insulator and thereby impedes the current flow between the battery and the contact.

Many of the battery replacement kits that are being sold include a fiberglass brush for cleaning contacts. The brushes disintegrate as they are being used, with tiny fragments falling into the watch. Some high-grade quartz watches have gold-plated contacts which can be easily damaged by the abrasiveness of fiberglass.

This pen appears to be the safest method of dealing with corrosion caused by battery leakage and at the same time leaving a moist protective layer. "Coating" the negative portion of a replacement battery and its contact may reduce contact problems and/or extend the useful life of the battery. I would like to hear your opinions and experiences with this or any new product related to watch batteries. ☺



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Robert D. Porter,
CMW

A Gear Cutter Centering Device for the Watchmakers' Lathe

Part 1

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Figure 1 pictures a 22-jewel, 16-size, Hamilton 4992B pocket watch. This fine watch ordinarily has a sweep second hand driven by an intermediate wheel attached to the extended upper pivot of the third wheel. The extended pivot was broken off, and the intermediate wheel was missing. Our job is to repivot the third wheel and make a new wheel to restore this watch as nearly as possible to its original configuration.

The ratio required between the 12-leaf sweep pinion and the missing wheel is 7.5 to 1, meaning that the sweep pinion will rotate seven and one-half revolutions to one of the intermediate wheel; $7.5 \times 12 = 90$ teeth required for the intermediate wheel. The center distance between the sweep pinion and the 3rd wheel measured 7.65 millimeters. We need to determine the module value of this gear set. The rule is: Twice the center distance 15.30 (7.65×2), divided by the total number of teeth in this gear set 102 ($90 + 12$), gives us a module value of 0.15 .

Now that we know the module, we can determine the pitch diameter of the missing wheel by multiplying the module ($.15$) times the number of teeth in the wheel (90) to get a pitch diameter of 13.50 millimeters.

The pitch diameter of a gear is an imaginary reference circle from which the addendum (curved part of the gear tooth) and the radial dedendum are calculated. The pitch diameter is the line of action between a pair of gears.

The module ($.15$) times the double addendum value (3.434 , derived from British Gear Standard 978 - Part 2 - 1952) equals 0.5151 millimeters, which is added to the pitch diameter of 13.50 mm to get a major diameter of 14.02 millimeters, the gear blank size.

The module ($.15$) times the double dedendum value (3.140) equals $.471$ millimeters, which is subtracted from the pitch diameter of 13.50 mm to determine the minor or root diameter of the gear; $13.50 - .471 = 13.03$ millimeters, minor diameter. Then, the 14.02 mm major diameter, minus the 13.03 minor diameter, $= .99$ mm, divided by 2 , $= .50$ millimeters, cutter working depth. We now have all the information we need to make the 90 tooth intermediate wheel.

Luckily, I had a $.15$ module commercial cutter on hand, so a gear cutter wouldn't have to be made. We will look at a useful gear cutter centering device in Part 2 to make this job easier and more accurate. ☺



Figure 1.

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Ron DeCorte,
CMW

Round 'em Up!

On this month's cover we are featuring a "rounding up tool," also known as a "topping tool" or "topping engine." For those of you who are not familiar with this tool, and I hope there are at least a few of you out there who aren't, let me try to explain the "real" story behind this fascinating machine.

In the late 19th and early 20th century the American watchmaking industry was the largest producer of watches in the world, this was mainly due to mechanical innovations of mass production. However, there was a shortage of people who wanted to engage in this type of work, so someone at one of the watch companies had the bright idea to employ some people who had a lot of time on their hands, cowboys.

Now we all have the image of a cowboy as always being busy chasing strays. (They actually only did that at the saloon after they had been paid.) The truth

is that they actually spent most of their time sitting in the saddle moving along at a "cows pace." So in effect they had a lot of idle time on their hands and hence the "round 'em up tool" was

born. The cowboy would place the tool in his lap, hold the reins with one hand and crank away, turning out beautiful little watch wheels that they collected in cow skin bags for delivery and shipment at the next major town. Some of the cowboys actually had special wooden bases made that were shaped like their favorite girl, but that was a bit risky for our cover!

OK, on a more serious note. This tool, used to finish the teeth on watch wheels (gears), was most likely invented in the 19th century and was used by almost every watch factory until the early part of this century for finishing all watch wheels (but

not pinions or steel winding wheels). I've seen a couple of these tools with badly broken and/or abused cutters that looked like someone had tried



to use them on either a pinion or a steel wheel, a big no-no with these tools.

Let me explain the process in simple terms. First the teeth of a watch wheel are cut on either a brass, or sometimes gold, wheel blank. In some cases only straight slots were cut to represent the number of teeth and establish the proper spacing but no addendum was shaped. Next the wheel is fit onto the finished pinion by either riveting or with a friction-fit collar. The wheel is now trued in the flat and is ready to be finished. The wheel and pinion are now set between centers and a special cutter is used to "top" or form the finished profile of the teeth (addendum), and bring the wheel to exact size for proper depthing with the associated pinion. Besides finishing the wheel teeth, this process also ensures absolute "truth" (concentricity) between the wheel and pinion, a very important part of a good running watch.

Photography by Malcom J. Wilson

@

OK buckaroos, we would like to see more articles and pictures of tools, and other horological subjects, for use in the magazine and possibly as cover material. For those of you who haven't noticed we are trying to make the magazine very horologically friendly and that means we need your help. Since I was asked to be the chairperson for the *Horological Times* Committee, about two years ago, we have made some major changes that have met with very positive member approval. We can't do this all on our own, we need the membership to contribute articles and material for publication. Remember, this organization and magazine belong to the membership and should reflect the needs and interest of the members above all else. We have even established an annual "new writers contest" that will award \$500 for the best new writer each year. Sorry Fred but you've been around far to long to be considered "new," ask your wife!

So "round 'em up" and send 'em in, articles that is. Let's make this an even better magazine!

Board of Directors Election Results

The tabulation of ballots in AWI's 1999 Board of Directors Election has been completed. Five directors were chosen from a slate of twelve candidates. Those elected to serve three-year terms are: David A. Christianson, Jim Door, Ewell D. Hartman, Gerald G. Jaeger, and Marshall F. Richmond.

Tabulation on the Proposed Amendments to the AWI Constitution were not complete at press time. The complete list of amendments and the voting results will appear in the July issue of *Horological Times*.



David A. Christianson
Kendallville, IN



Jim Door
Kennewick, WA



Ewell D. Hartman
Richmond, VA



Gerald G. Jaeger
Sheboygan, WI



Marshall F. Richmond
Milan, IN



Technically Watches

Pocket Watches and Their Maintenance Part 13

The Winding and Setting Mechanisms (Continued)

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

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The Elgin Negative Winding and Setting Mechanism

Figure 1 shows a half-section view of the Elgin winding and setting mechanism. The ratchet wheel and click are not shown; however, the main wheel is shown in position on the barrel bridge. The main wheel is sometimes called a crown wheel by other companies. The reason this wheel is called a crown wheel is that one set of teeth extends outward from the flat surface of the wheel.

The Elgin main wheel has a bearing surface around its hole in the barrel bridge for the flat under side of the main wheel to work against. The main wheel washer is the bearing for the hole in the wheel. The main wheel washer seats onto a shoulder in the barrel bridge and is held down with the main wheel screw. The main wheel screw has left-hand threads which prevents the screw from loosening up when the

watch is wound. The distance between the end of the washer and the shoulder on the washer determines the freedom or end shake of the main wheel.

The crown teeth of the main wheel work in the teeth of the beveled winding pinion. The beveled winding pinion has a short tube opposite its ratchet teeth. The pinion with its tube has a straight hole that works on the winding arbor sleeve.

The winding arbor sleeve has a square shoulder near its center to fit in a groove in the watch plate and barrel bridge. This prevents the sleeve from shifting endwise during the winding and setting operations. The winding arbor sleeve has a square hole through its center for the full length of the sleeve. This hole fits the winding arbor square. The square on the winding stem also works in the square hole against the end of the winding arbor. The winding and

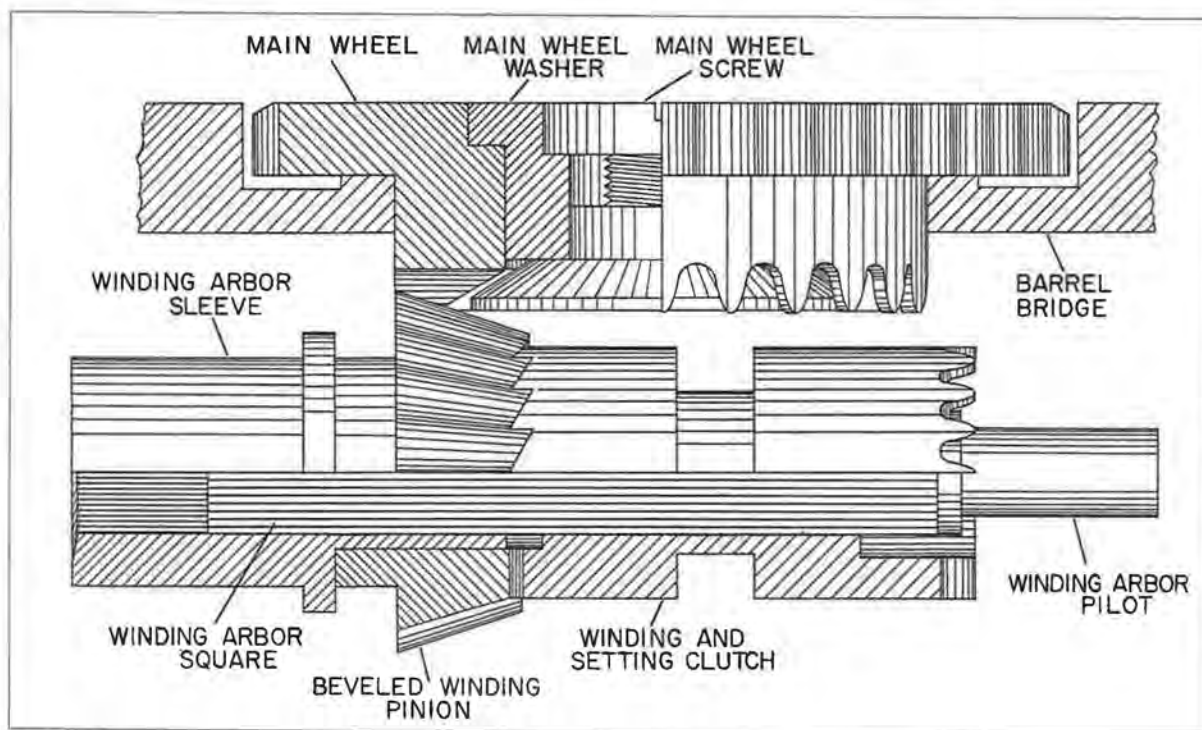


Figure 1.

setting clutch also has a square hole for its full length to fit the square of the winding arbor. One end of the winding arbor has a round pilot that works in a bearing hole between the watch plate and the barrel bridge.

The Operation of the Elgin Winding and Setting Mechanism

Figure 2 shows a view of the winding and setting mechanism from the inside of the lower plate and how the winding stem and sleeve held in the watch case operate the winding and setting mechanism. The sleeve is threaded into the pendant of the watch case and can be adjusted up or down in the pendant to adjust for stem depth. The winding stem goes through the spring arms of the sleeve. The stem has a boss near its center that the spring arms of the sleeve go over when the stem is shifted from the winding position to the setting position or vice versa. The stem has been pulled into the setting position in Figure 2.

The end of the winding stem works against the square end of the winding arbor to shift the winding and setting mechanism from winding to setting positions.

The round end of the winding arbor works against the end of the setting lever. The other end of the setting

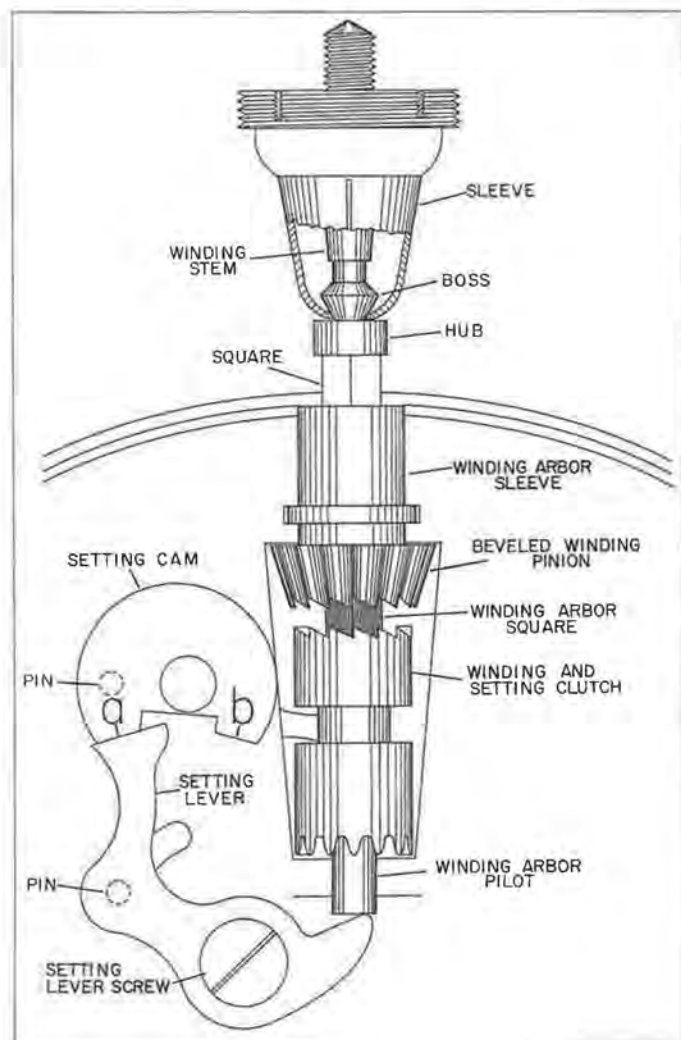


Figure 2.

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lever works on the incline planes of the setting cam. When the setting lever is on incline plane "a," the mechanism will be in the setting position. When the setting lever is on incline plane "b," the mechanism will be in a winding position. The pin on the setting lever goes through a slot in the plate and works against the setting spring. A pin on the setting cam goes through a large hole in the plate and works against a spring on the clutch lever.

Figure 3 shows the winding and setting mechanism from the outside of the lower plate. The mechanism is still in the setting position. Note that the regular teeth on the end of the winding and setting clutch are in engagement with the minute wheel teeth and the minute wheel teeth are engaged with the cannon pinion leaves to allow the watch to be set. This illustration also shows the pin in the setting lever being held by the setting spring and the pin in the setting cam being controlled by the clutch lever and its spring.

The end of the clutch lever that works in the slot of the winding and setting clutch moves the clutch from winding to setting positions when the stem is pushed in or pulled out. The setting spring has an extra arm extending from its base that works against the setting spring cam. The setting spring cam is a device used to shift the winding and setting mechanism from the setting position to the winding position for running the watch out of the case for timing purposes. The setting spring cam is shown in a normal position for operating the watch in its case. The case holds the cam in this position. The cam can only be shifted when the watch is out of the case. When this cam is pivoted counterclockwise to its stopped position, then the mechanism can be shifted to the winding position when the movement is out of the case. When this movement is removed from its case, the pressure of the winding stem against the end of the winding arbor is removed which

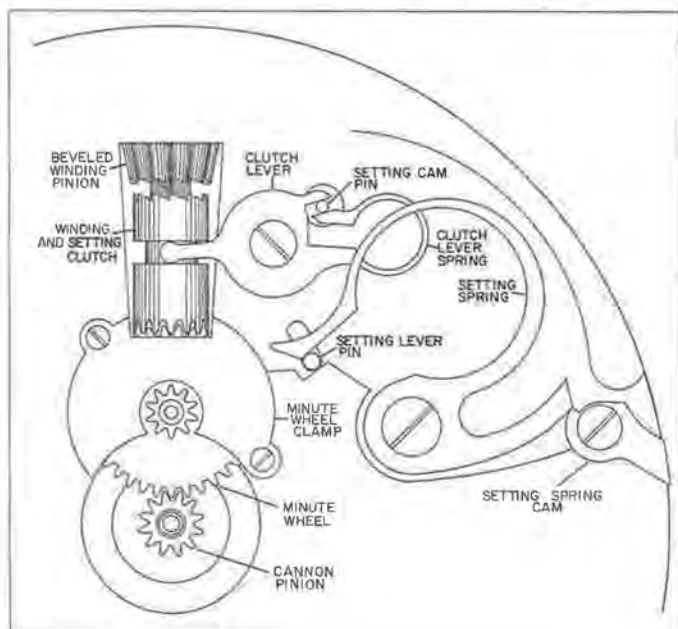


Figure 3.

causes the winding and setting mechanism to automatically shift to the setting position. This position will cause the watch to stop in a short time. Therefore, to run the watch out of the case for any length of time, the mechanism must be shifted to the winding position.

Figure 4 shows the Elgin winding and setting mechanism from the inside of the lower plate. The mechanism is in the winding position. The winding stem has been pushed in causing the spring arms of the sleeve to snap over the boss on the stem so they are above the boss. In the setting position shown previously, the spring arms were below the boss on the winding stem. Note that in the winding position (Figure 4), the clutch teeth and winding pinion teeth are engaged for winding the watch. The end of the setting lever has shifted on the setting cam from incline plane "a" to incline plane "b."

When the winding stem was pushed in to shift the mechanism to the winding position, the winding arbor was also pushed downward. The pilot end of the winding arbor, which works on the setting lever, shifted the end of the setting lever to incline plane "b" of the setting cam. The pin on the setting cam caused the clutch lever to shift the clutch to go into mesh with the winding pinion.

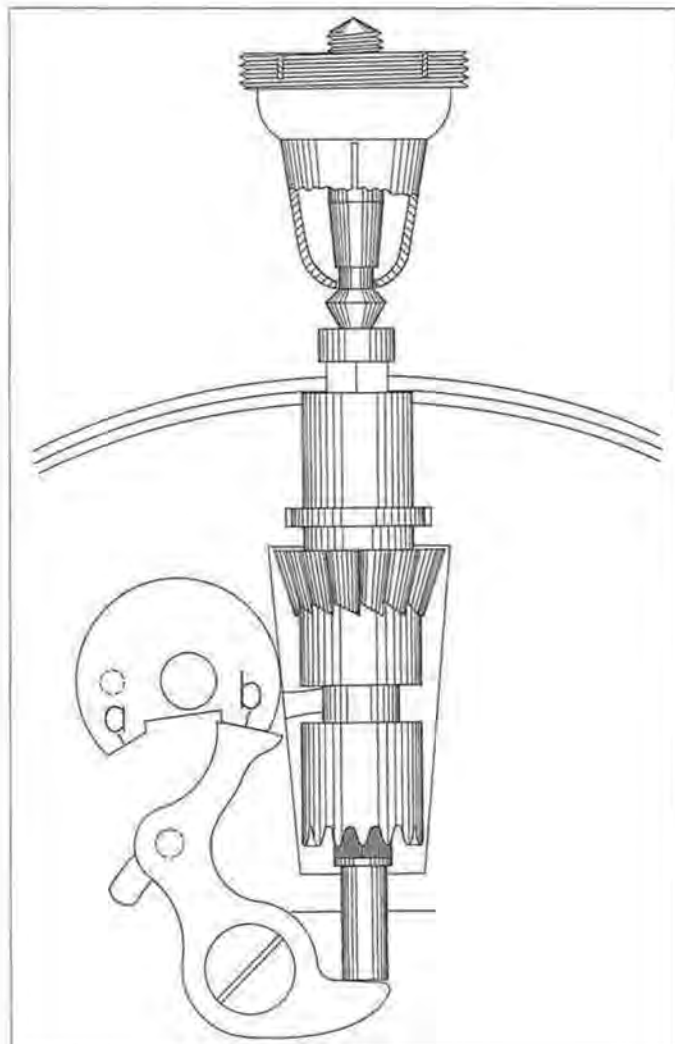


Figure 4.

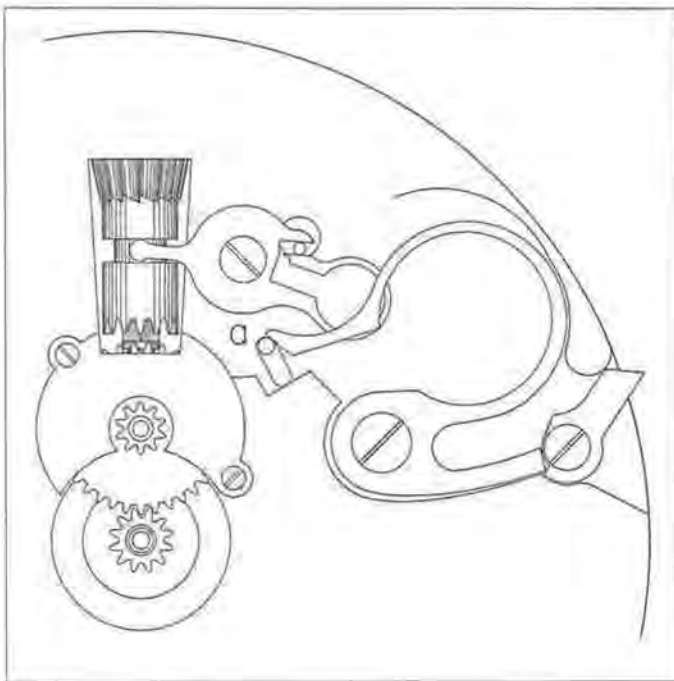


Figure 5.

Figure 5 shows the Elgin winding and setting mechanism from the outside of the lower plate when the mechanism is in the winding position. This illustration is also used to show how the setting spring cam is shifted

counterclockwise against its stop when shifting the winding and setting mechanism to the winding position for running the watch out of the case. The mechanism does not shift into the winding position automatically when the cam is shifted to the position shown. After the cam has been shifted counterclockwise to its stop, then pressure is applied on the end of the winding arbor square with a bench key or screwdriver blade to shift the mechanism from the setting to the winding position. When this is done, the setting spring releases its pressure on the setting lever pin shown at "a," Figure 5.

The clutch lever, setting lever, and setting cam pivot around shoulders on the watch plate. The setting spring and setting spring cam pivot around shouldered screws.

"Winding and Setting Mechanisms" will continue.

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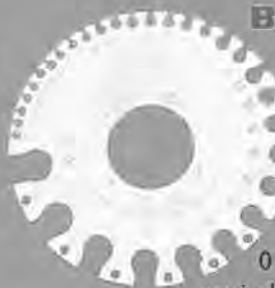
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John P. Kenyon,
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A Practical Course in Clock Repair

Movement Removal and Inspection

In clock movement restoration, a methodical approach is required to locate each problem, correct it, and then move on until all problems are rectified and the movement runs properly. A prerequisite for this agenda is a full understanding of each component, its operation, and its relationship to the other components of the movement.

Getting Started

It is good technique to examine a movement before removing it from the case. Ascertain that the hands are sufficiently clear from each other and from the dial. Determine if there is any jamming from inside the movement. Set the clock up on the bench or hang it on the wall, install the bob and give the pendulum a gentle swing to see if it is free or if there is binding.

After checking these things, remove the movement from the case for further inspection.

A 30-hour spring-driven clock movement, as shown in Figure 1, will be used for discussion. This type of movement is found in a wooden case, where it is held in place by four screws passing through brackets (A) that are fastened to pillars in the corners of the back plate. To remove the movement from the case, first remove the hands and dial. The minute hand has a squared hub that fits on an extension of the center arbor (B), where it is held on by a nut or a taper pin that is inserted into a hole through the arbor. The hour hand is fitted to a small tube that is friction-fitted to the hour wheel pipe (C). The dial pan is fastened to the case by three or four small screws. After removing the dial, with the clock upright, give the pendulum another

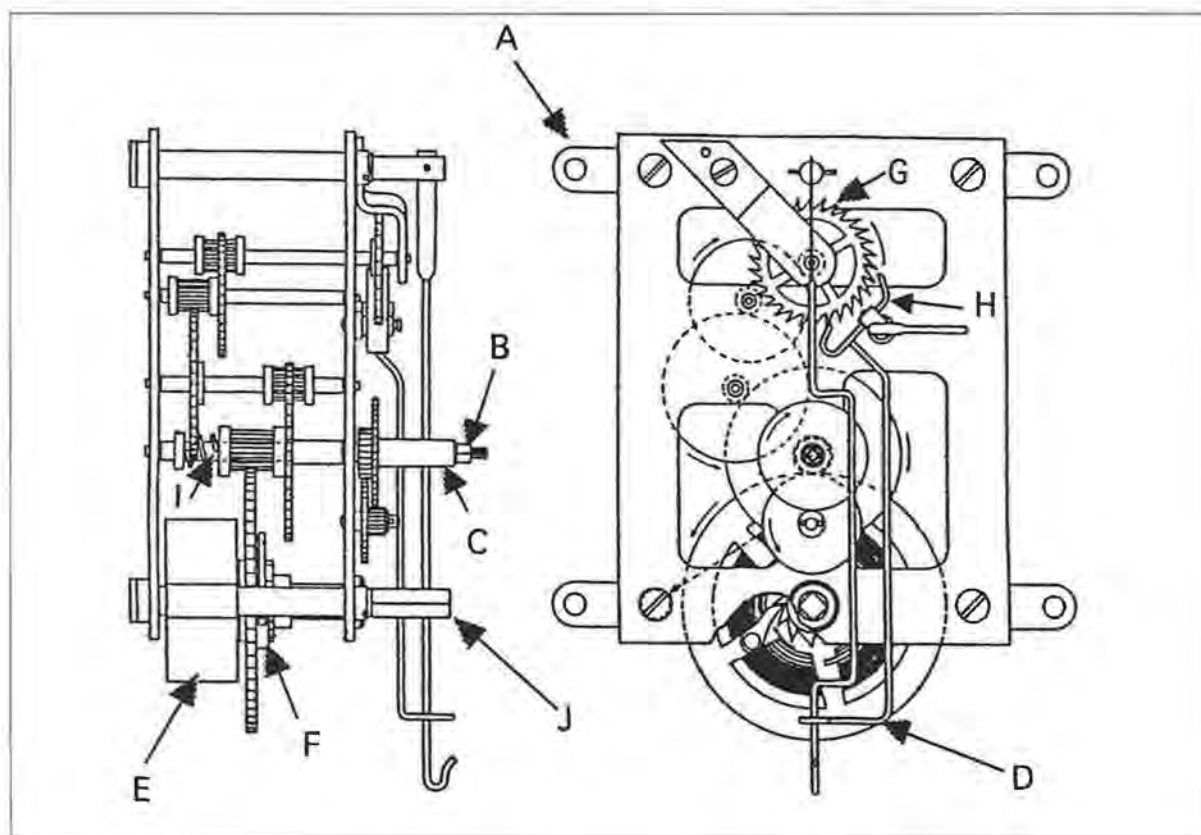


Figure 1. 30-Hour Clock Movement

gentle swing. If the movement starts running, observe the action of the escapement. Is it smooth and even? Next, remove the pendulum bob, then lay the clock down on its back and remove the four screws holding the movement to the back of the case.

Approach

The best approach is to inspect and make repairs to a movement before cleaning it, but this is not always possible. Some clocks have stopped running because they have not been serviced for many years. As a result, the oil has become dirty and gummy resulting in pivot holes and other parts that are barely visible. If this is the case, the movement must be disassembled and cleaned first; then, the individual components reassembled and checked out. It may be necessary to clean the movement before making repairs and again afterwards. For the purpose of this exercise, we will assume that the clock has been properly cared for over the years and can be inspected and repaired prior to cleaning.

Inspection

The most common stoppage problems are caused by increased friction, due to either lack of oil or dirty and gummed oil. If discovered in time, the movement can be cleaned and oiled and will then run as good as new. Insufficient lubrication eventually causes wear in the pivots and

pivot holes, resulting in a change in the depth of the wheels and pinions to such an extent that the train will stop due to improper gear meshing. Wear causes a pivot hole to become egg shaped, as in Figure 2. To test for a worn pivot hole, let the power completely off the main-spring, then turn the wheel back and forth to rotate the pivot in question, observing motion in the pivot hole. Pivots must be free, but not sloppy. Wear will be in the direction that is at right angles to the line of force as illustrated in Figure 3. There is no precise rule to indicate when a pivot hole needs a bushing. One "rule of thumb" states that a bushing should be installed if the wear equals one-third or more of the diameter of the pivot. Seasoned

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clockmakers develop a standard based on experience, taking into consideration the type of movement, pivot hole location, pivot size, pivot condition, thickness of the plates, and other factors. Many times when a pivot hole is worn, the pivot itself will be worn or scored. This damage cannot be accurately assessed until the movement is completely disassembled.

Observations

It is very important to make a careful observation of each component so that no problem or potential problem is overlooked. This takes time, but it is time well spent. There are no shortcuts in clock repair. A ten-minute shortcut may well result in a five- or six-hour repair later. Avoid this kind of frustration and take the time to do it right the first time.

In addition to pivot hole wear, some of the more common problem areas that can be observed after the movement is removed from the case, but prior to disassembly include:

1. suspension spring and crutch assembly (D)
2. mainspring (E)
3. click and click spring (F)
4. wheels (for bent or broken teeth)
5. pinions (for dirt, wear and damage)
6. escape wheel (G)
7. pallets (H)
8. warning pins (on strike trains)
9. levers (for misalignment)
10. loose parts
11. clutch (for proper tension) (I)
12. winding arbors (for wear) (J)
13. previous repairs

Other problems such as worn or bent pivots, broken or worn lantern pinion pins, mainspring deterioration and the like will be observed when the movement is completely disassembled.

Broken Mainspring

In a clock with a broken mainspring, special precautions must be observed when taking the movement out of the case. The mainspring may have exploded into many small, sharp pieces or it may have broken at an end. In the case of the exploded mainspring, be very careful of the sharpness of the pieces. They can be like razor blades! Use a glove and tweezers to pick them up prior to removing the movement from the case. If the mainspring is broken at one of the ends, it may be necessary to manipulate it one way or another to get a clamp (a radiator hose type clamp) around it prior to removing the movement from the case. In some cases a movement with a broken spring can be removed as is, with no difficulty. ***Always be alert for the danger of mainsprings.*** There is tremendous energy stored in a restrained mainspring. Uncontrolled, it can cut or break hands, fingers, jaws, and anything else that gets in the way. Have respect for them. Always observe safety measures when working with them. Wear a thick leather glove, use eye protection such as goggles or a face mask and use a mainspring winder according to instructions.

Protecting the Case

After the movement has been removed from the case, transfer the case from the bench to a designated storage area where it won't get bumped and scratched. Always store the dial face down in a safe place. Screws, pins and the like should be stored in a piece of cardboard with holes punched in it or in a small block of Styrofoam in proper sequence (they may not be interchangeable). Also, it is a good idea to make a sketch and some notes pertaining to the movement. The sketches and notes should be placed in an orderly file for later reference.

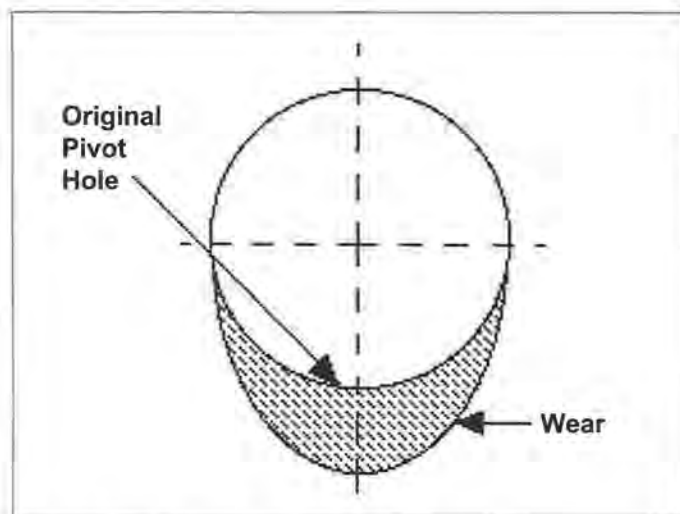


Figure 2. Pivot Hole Wear

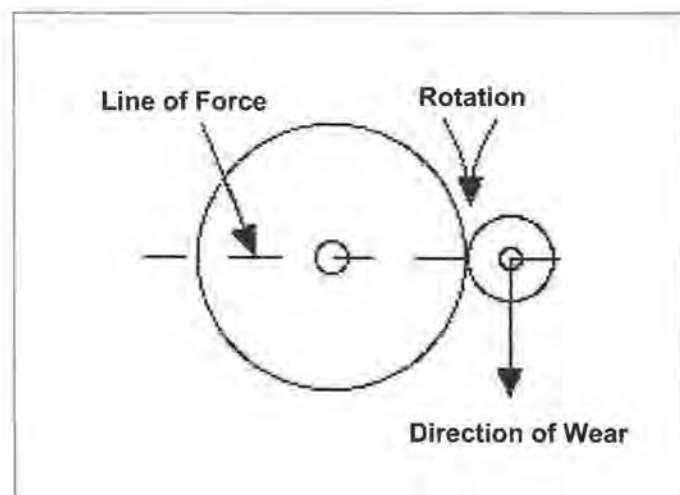


Figure 3. Direction of Pivot Hole Wear

AWI

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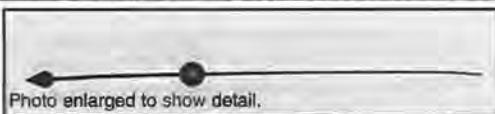


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Material Matters

Peter W. Eckel

I'd like to start out this time with a word of thanks to the Indianapolis Horological Association for their warm welcome. I was fortunate enough to be invited to their March meeting in, where else, Indianapolis to talk about material stuff. It was a great time and I had the chance to meet people I had only spoken to on the phone and also make some new friends.

The other great thing about a meeting such as the one I attended is that it tends to free me from the vacuum in which I normally work, because I get questions. You have no idea how much easier it is to write about a subject when you already know at least one person is interested. So my hat is off to Rudy of Rudy's Watch Repair for suggesting that I write about generic parts.

To generic or not to generic, that is the question. Well that rather blatant rip-off of Shakespeare is my little way of introducing you to my take on generic parts. When you think about it, generic parts have been with us for a long time. Every time you installed a Germanow Simon or American Perfit crystal you were using a generic part, in fact both the Bestfit® 100 staff and 200 stem systems were and are essentially generic parts systems. To this mix you may include the recent mineral glass crystals in all the varied thicknesses. We sell generic parts at our material house but the reasons for this are varied and might not be what you would expect. Generic parts are sold for a number of reasons that I hope to expand upon as I go along. These reasons include price as compared to genuine factory parts and availability when factory parts are difficult or impossible to obtain.

Price is the reason that always springs to my mind when it comes to the word generic and maybe yours too. I remember the big generic food craze some years back when you would shuffle down the grocery store aisle and see black-and-white boxes of cereal, and the like, at a reduced price. The logic of the reduced price in that situation was the lack of advertising expense. There were items that I found to be perfectly interchangeable with the big name items and others that were not. It seems today that to be more attractive to consumers the "generic" brands have

been replaced with "house" brands. The choice is still the same however, name brand or house/generic brand.

Price is a significant advantage in generic watch parts. As we in the industry have watched the price of genuine crystals rise for example, manufacturers overseas have responded by producing crystals for Seiko®, Pulsar®, and Lorus® to the exact specifications of the originals. I have been selling and installing these crystals for years now and have found them to be an excellent fit and of high quality. There are now a few Citizen numbers available in generic versions also. The problem for all of you is that not all crystals are available in generic and so when you price out a job you need to use the genuine price as a guide just in case the crystal you need is unavailable in generic. Using this strategy of using the worst case scenario for your pricing and sometimes getting the advantage of a lower-priced generic will contribute to your bottom line. This is important for two reasons. The first is of course the house payment and car payment you have every month, and the other is a little more selfish on my part. If all of you are not profitable enough to stay in business, I will be out of business too. You may expect to save anywhere from 20% to 50% of the cost of a genuine when you are able to purchase a generic replacement.

Although price is important to everyone, the price is totally irrelevant if you can't get the parts at all. This stems (excuse the pun) from two problems. First is the problem of obsolete or discontinued parts for still popular movements. The second results from manufacturers who have somewhat or very restrictive policies about who is favored enough to be allowed to purchase parts from them. The problem of discontinued parts is something I touched on in a previous column. Almost anything in the world can be produced as a generic if the demand for that part is strong enough to warrant the expense of fabricating molds, etc. to produce them. The main problem is that even though you may need this part a couple of times a year, that along with everyone else's needs only amounts to a relative few, not nearly enough to prompt a manufacturer to invest the time and capital needed to produce it. That I'm afraid leaves

us all out in the cold except for shopping with those specialty suppliers who were foresighted enough to buy up these parts while they were still available. They must be rewarded with a higher price when they have what no one else does.

The other and more troubling reason that generic parts are produced is the problem of obtaining parts that are still available from manufacturers who are quite selective about their distribution policies. These policies leave many small but very competent watchmakers hanging out to dry when trying to get parts. The biggest market for generic parts, if ads in our own *Horological Times* is any indication, is that for Rolex® parts. Many material houses sell generic Rolex® parts to serve that part of the industry that has been left unable to obtain the genuine material. This is a unique situation because the reason for this part of the industry has much less to do with price than it does availability. We sell generic Rolex® parts and the prices are generally cheaper for some of the staples such as plastic and sapphire crystals; however, if you have an account with them then you are probably paying similar prices for genuine movement parts as are being paid for generics from us and others. There are also generic Tag® loc-down crowns available but again it's the availability not the price that drives the production of generics.

OK, generics or if you prefer "imitation" parts exist and provide a cost savings or are a method of obtaining parts that may not be widely available from their original sources, but what about quality? A part, genuine or generic, is worthless if the appearance is not acceptable or if it just plain will not fit. This is where all of you reading *HT* can and do play a very important role. Since most material people, myself included, are not trained watchmakers, we do not normally install, with the exception of crystals, all the parts we sell. We need your help to police which parts are of merit and which are not. The reason for this is that there are many manufacturers of generic parts, particularly in Asia. They remind me of the movie *The Good, the Bad and the Ugly* because as with anything else each has its own level of quality control or lack thereof. So if you order a generic part from your material house and you are not happy with the fit or finish, it is imperative that you let us know. The only way we can weed out the bad and the ugly is with your feedback. In fact, we not only need to know that something is wrong, we also need to know what exactly is wrong so that the manufacturer may correct the problem or so we can drop them like the proverbial hot potato if they are unwilling to make it right.

So, whether you use generics often or not at all, I hope I have been helpful in explaining the ins and outs of a rather important segment of our industry. Until next time keep those screwdrivers turning and those tweezers tweezing.

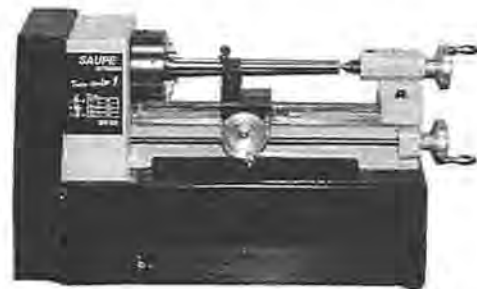
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Leo A. Jaroslaw

Repeater, Petite and Grande Sonnerie Clocks

Carriage Clocks, Part 44

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Introduction

In Part 43 we covered the sonnerie or quarter strike system operation. In this Part 44, we will conclude the series on carriage clocks. We will cover the mode shift and then conclude with the grande sonnerie operation.

Petite Sonnerie - Silent - Grande Sonnerie Shift (Figures 44.1, 44.2, 44.3, and 44.4)

There are several methods for shifting between the various modes of operation. We will cover the system used in the Badolette clock.

Control is by a long vertical lever, which I call the mode shift lever (3). The lower part of this lever extends through a slot (122) in the baseplate (2) of the clock. This slot has three cutouts or notches. The lever (3) is formed in a spring load to stay in the notch in which it is

placed. Pushing against the spring load and shifting to another notch shifts the lever.

The first notch on the left, looking at the slot from the front of the clock, is the petite sonnerie (123). The middle notch (124) is for "silent" mode. The right notch is for "grande sonnerie" (125) mode. The spring loading, or tension of the mode shift lever (3) will hold it in the notch in which it is placed.

Petite Sonnerie Mode (Figure 44.2, View A)

In petite sonnerie mode (Figure 44.2, View A), the mode shift lever (3) is clear of all other components. Therefore, the hour and quarter strike can operate as controlled by their rack and snail components.

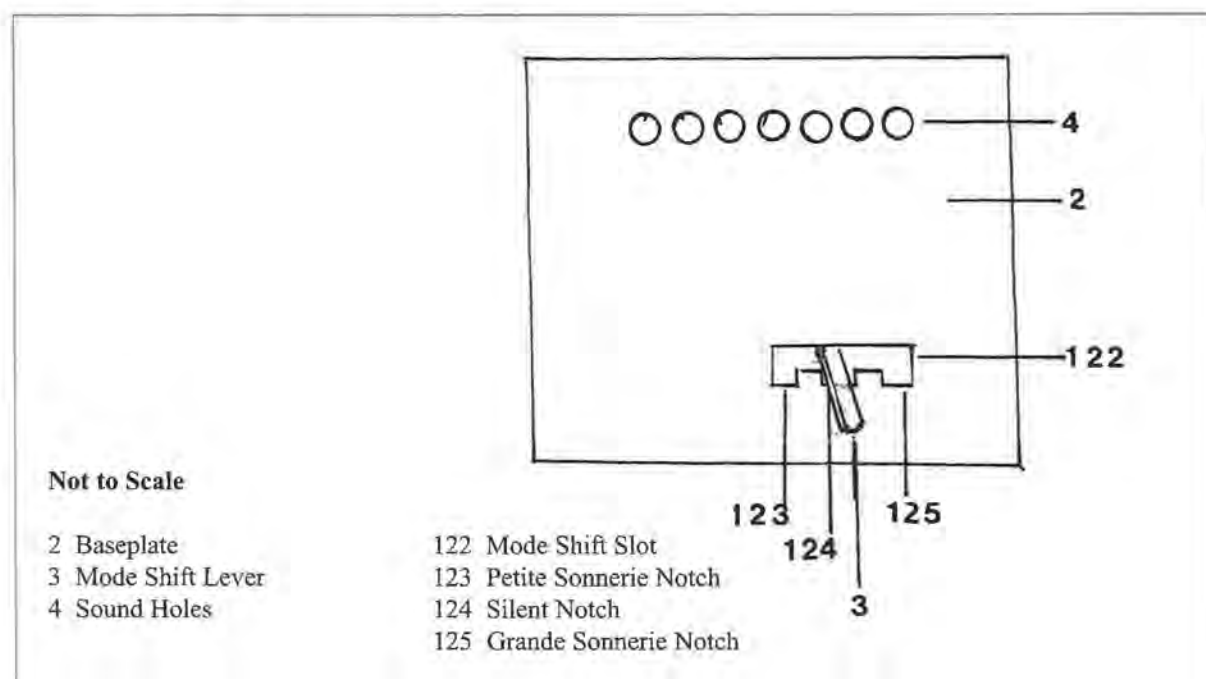


Figure 44.1. Baseplate Mode Shift Control

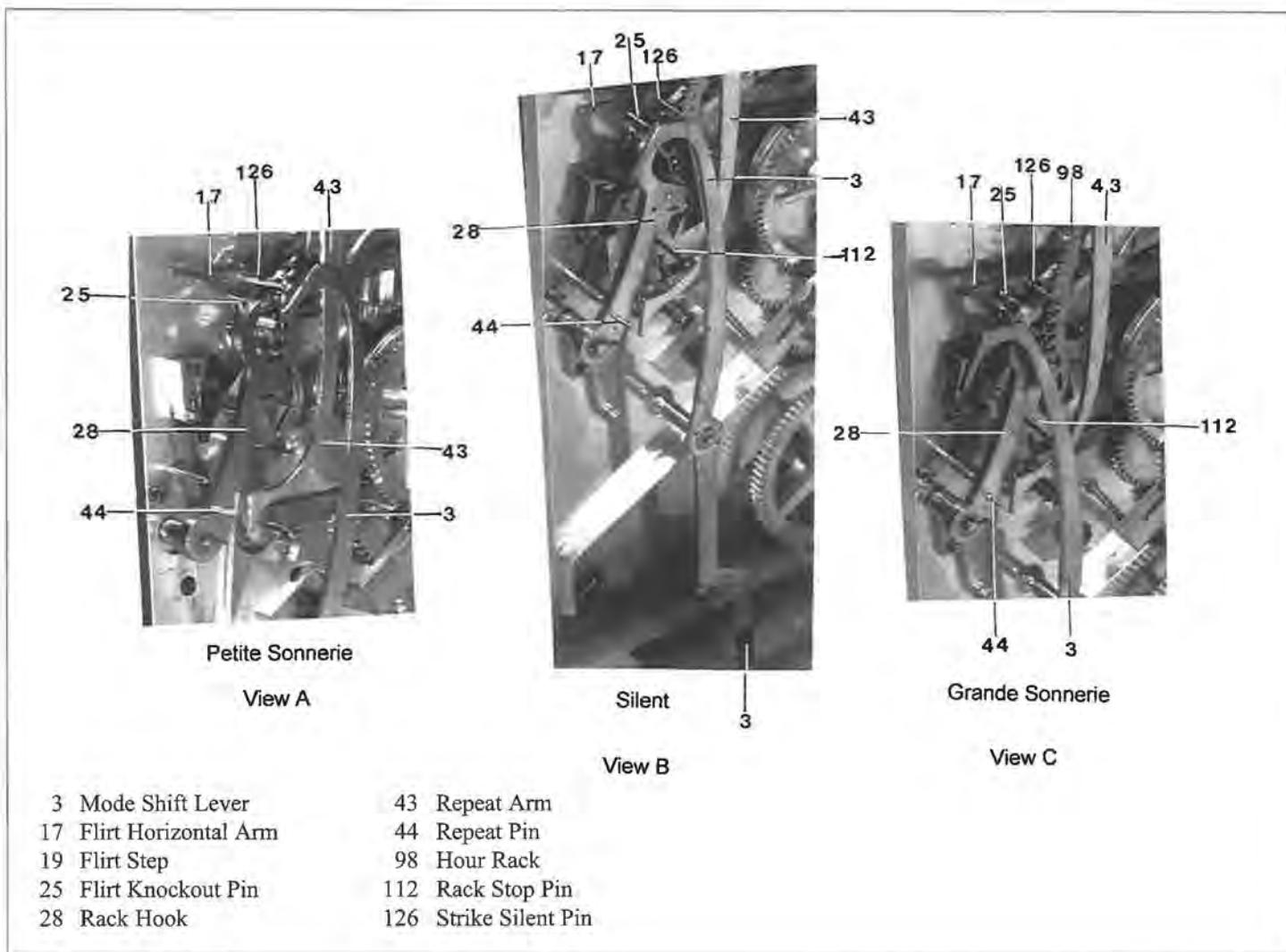


Figure 44.2. Mode Shift Components

Grande Sonnerie Mode (Figure 44.2, View C, Figures 44.3, and 44.4)

The grande sonnerie or “grand strike” differs from the petite. In each quarter the hour strikes the last hour first, as tang only. Then the system shifts into petite and strikes the quarters as ting tang. On the hour, as in the petite sonnerie, the current hour is struck as tang only.

Shifting the mode shift lever (3) into the grande sonnerie notch (125) results in several actions. The lever (3) contacts the rack stop pin (112), and shifts the hour/quarter rack control (111) counterclockwise. This action bypasses the hour/quarter rack control lift pin (115) under the minute wheel (38), in effect, taking it out of the system in grande sonnerie.

This position is held in all cycles, as long as the mode shift lever (3) is in the grande sonnerie notch (125). In this position, the vertical arm of the rack control (111) and its stop pin (112) are now out of the path of the hour

rack when it drops. The drop is to the step on the hour snail for the past hour. The hour snail advances only on the hour. Therefore, at let-off of any of the three quarters, the past hour is struck.

Actually, at let-off both racks are released and drop. As the hour rack drops, the hammer control lift pin (Figure 44.4) (120) releases the hammer control (102) to drop. This is powered by the hammer control spring (104). Its stop pin (not shown) stops it. The hammer control is now set to allow the hour (tang) to strike. Simultaneously the strike train starts. The hour is struck.

Remember that the starwheel/hour snail (11) (refer to Figure 43.2., page 33, May issue *Horological Times*) is still in its last hour position. Therefore the hour struck is the last hour. As the hour is struck, the quarter rack is not being gathered. The quarter hook (114), at this point, is not in contact with its rack (96). As the hour strike nears completion, the hammer control lift pin (120) once again lifts the hammer control to a mid-position. Both hammer

pallets are blocked resulting in a “dummy blow.”

At this time, the strike train is still running. When the hour rack is fully gathered, the hour hook (113) drops into the hour rack slot (119). The quarter hook engages with the quarter rack (96) and the ting-tang (quarter strike) occurs.

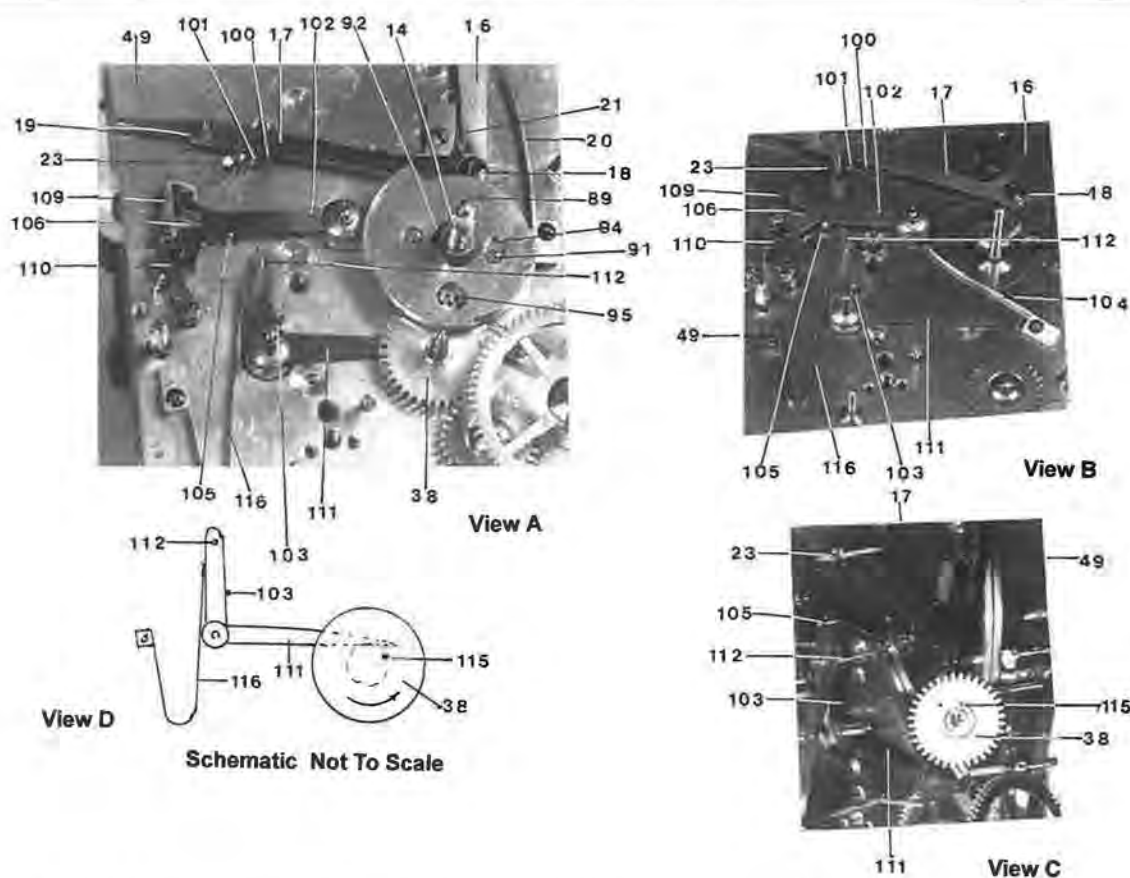
The same operation proceeds through the first three quarters. Since we are in grande sonnerie mode, let’s not forget that the mode shift lever (3) is still in the grande sonnerie notch (125). The lever (3) has also shifted the rack control (111) and its stop pin (112) out of the path of the hour rack to allow it to drop.

In petite sonnerie, this shift is accomplished by the hour control lift pin (115) under the minute wheel. (See schematic View D, Figure 44.3.)

On the hour, the starwheel/hour snail is shifted to the next hour. The surprise piece is also shifted so that the quarter rack drop is prevented. This prevents the ting-tang, and the next hour only is struck.

Silent Mode (Figure 44.2, View B)

In silent mode, the inclined plane at the top end of the mode shift lever (3) contacts and lifts the strike silent pin (126). This is a long pin extending out from the flirt horizontal arm (17). In this position, the flirt step (19) is lifted out of reach of the flirt knockout pin (25). The rack hook (28) is immobilized. The racks are not released, nor is the strike train initiated to run. Therefore, no strike either petite or grande sonnerie occurs.

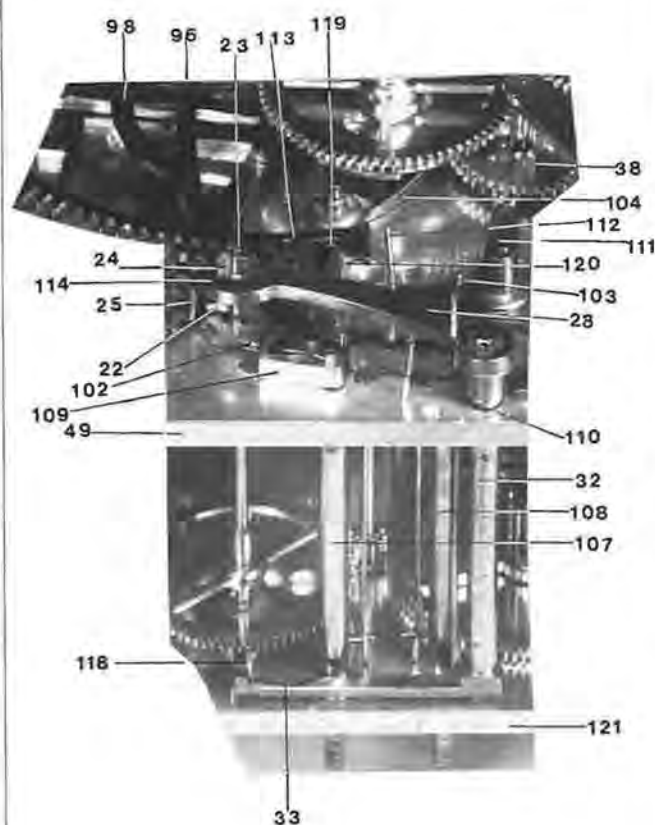


- 14 Cannon Pinion/Minute Pipe Assembly
- 16 Flirt Vertical Arm
- 17 Flirt Horizontal Arm
- 18 Flirt Hinge Joint
- 19 Flirt Step
- 20 Flirt Spring
- 21 Horizontal Arm Spring
- 22 Arm Lifter
- 23 Gathering Pallet
- 24 Gathering Face

- 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 44.3. Strike Control Details



- | | |
|-----------------------------------|-------------------------------|
| 22 Arm Lifter | 104 Hammer Control Spring |
| 23 Gathering Pallet | 107 Upper Hammer Arbor |
| 24 Gathering Face | 108 Lower Hammer Arbor |
| 25 Knockout Pin | 109 Upper Hammer Pallet |
| 28 Rack Hook | 110 Lower Hammer Pallet |
| 32 Lock Lever/
Rack Hook Arbor | 111 Hour/Quarter Rack Control |
| 33 Strike Lock Lever | 112 Rack Stop Pin |
| 38 Minute Wheel | 113 Hour Hook |
| 49 Front Plate | 114 Quarter Hook |
| 96 Quarter Rack | 118 Locking Pin |
| 98 Hour Rack | 119 Hour Rack Slot |
| 102 Hammer Control | 120 Hammer Control Lift Pin |
| 103 Rack Control Stop Pin | 121 Rear Plate |

Figure 44.4. Strike Control - Quarter Mode

Conclusion

This completes the description and operation of all three modes of this clock. The components have also been covered. Reassembly of other carriage clocks should be no problem, if good notes, sketches, and possibly photos are taken when disassembling these clocks.

There is one critical assembly point that I should mention. This is the timing of the minute wheel to the cannon pinion. Both have a prick punch mark, which have to be lined up. When assembling, engage the minute to the pinion while viewing through the visual access hole (95)

in the quarter snail. Engage, view, and re-engage as necessary until the two-prick punch marks line up. This adjustment is critical. It times the shifting of the hour/quarter rack control in time for the changeover from quarter strike to hour strike, in petite sonnerie. It is bypassed by the action of the mode shift lever (3) in grande sonnerie.

The clocks we have discussed primarily in this series are basically of French/Swiss design. The English and American carriage clocks accomplish some actions differently with appropriate components. With the knowledge obtained in this series, understanding the English and American differences should come with no real difficulty.

This completes Part 44 and the series on carriage clocks. In Part 45, we will discuss a large Seth Thomas hall clock. It has a Westminster quarter strike on four bells, and the hour strike on a gong.



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A Simplified Gear Train Calculation Procedure

David J. Carlson

Calculations involving the time train, power train, and motion work can be important tools when servicing a watch or clock. For example:

- Set a clock or watch to rate directly without a tedious zeroing-in process.
- Find the length of a missing pendulum.
- Solve winding and running time problems.
- Determine the characteristics of missing gears.

The method proposed is straightforward for the many types of gear train systems encountered in the field. The three-step procedure involves counting certain wheel teeth and pinion leaves and the use of a basic hand calculator. The process is readily integrated into the cleaning and overhaul operation.

To demonstrate the three-step calculation procedure, the movements from three clocks will be evaluated: a Hermle Westminster Chime clock, an Ansonia kitchen clock, and an antique cuckoo clock.

Example 1: A Hermle Model 340-020 Movement

The Hermle movement is a contemporary three-train spring-powered Westminster Chime movement with a balance wheel escapement. A schematic of the time-related gear train is shown in Figure 1. Except for gear count and the omission of the 2nd wheel and pinion, the gear train could also represent most 30-hour watches.

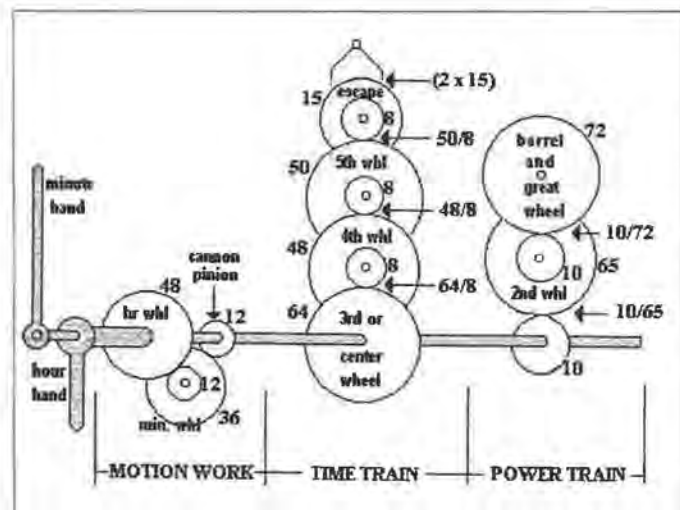


Figure 1. Hermle Movement Schematic

Time Train

The time train is the heart of any timepiece. The minute hand at one end and the escapement at the other bound it. Of the three components of the gear train, the time train is the one most often calculated.

Step 1: Identify the Time Train. The key to time train identification is to trace the most direct path from the minute hand to the escapement through the gear train in Figure 1.

Step 2: Form the Fractions. The first gear in the time train identified in Step 1 is the 3rd or center wheel. Imagine that power is supplied to the escapement by using the minute hand as a crank. The center wheel drives the 4th wheel pinion and so forth until the last interface, the escape wheel drives the escapement. For each gear interface in the time train starting with the center wheel, form fractions with the driving gear in the numerator and the driven gear in the denominator. (Each of the interfaces and the resultant fractions is identified in Figure 1 by an arrow). The table lists the gear interfaces in order.

Driving Gear	Driven Gear	Fraction
Center wheel	4 th wheel pinion	64/8
4 th wheel	5 th wheel pinion	48/8
5 th wheel	esc. wheel pinion	50/8
Escape wheel	escapement	15/1/2 = (2 x 15)*

* The fraction for the escape wheel driving the escapement is 15 divided by 1/2 which equals 2 x 15. The 1/2 is based on the action of the escapement.

Step 3: Calculate the Beats-Per-Hour. To find the BPH, multiply the fractions together:

$$\text{BPH} = 64/8 \times 48/8 \times 50/8 \times (2 \times 15) = 9,000$$

Application: Knowing the beat rate allows the balance wheel rate adjustment to be set to 9,000 BPH thereby meeting the manufacturer's specification.

Power Train

The power for the seven-day running time is supplied by the power train. The minute hand at one end and the great wheel at the other bound the power train. The power source is a spring barrel or more properly named a

“going barrel” which describes the combination of a spring barrel and the great wheel.

Step 1: Identify the Power Train. The power train can be identified by starting at the minute hand and finding the most direct path from the minute hand to the great wheel/spring barrel.

Step 2: Form the Fractions. The 10-leaf center wheel pinion is the first gear in the power train. Once again, imagine that power is supplied to the great wheel/barrel by using the minute hand as a crank. The center wheel drives the 2nd wheel and so forth until the last interface, the 2nd wheel pinion drives the great wheel. The table lists the gear interfaces.

Driving Gear	Driven Gear	Fraction
3 rd wheel pinion	2 nd wheel	10/65
2 nd wheel pinion	great wheel	10/72

Step 3: Calculate the Great Wheel Turns. To find the Great Wheel/Barrel turns, multiply the fractions together:

Barrel turns for 1 day = $10/65 \times 10/72 = 0.21$ turns

Barrel turns for 7 days = $0.21 \times 7 \text{ days} \times 24 \text{ hrs/day} = 3.6$ turns

Application: The power train calculation is useful for the analysis of running time problems. For example, from full wind the spring barrel can be let down 3.5 turns and the clock should continue running. If the clock fails in this test there is a problem. For example:

- Spring is dry or dirty, turns are stuck together so the power is too low.
- Spring replacement is incorrect:
 - Too long or short.
 - Too strong. Length is correct but the thickness overfills the barrel.

- Too weak. Length is correct but improper thickness. Too weak to drive the escapement.
- Mechanical problems in the gear train or escapement. Friction is too high.

Motion Work

The gear train that drives the hour hand from the minute hand.

Step 1: Identify the Motion Work. Starting at the minute hand, the minute hand arbor passes through the hour pipe to the cannon pinion. The cannon pinion drives the minute gear (wheel and pinion) which in turn drives the hour wheel.

Step 2: Form the Fractions. The cannon pinion is the first gear in the motion work.

Driving Gear	Driven Gear	Fraction
Cannon pinion	Minute Wheel	12/36
Minute wheel pinion	Hour Wheel	12/48

Step 3: Calculate the Rotation of the Hour Hand. Multiply the fractions together:

$12/36 \times 12/48 = 1/12$ turn in one hour

$24 \text{ hrs/day} \times 1/12 = 2$ turns per day

Application: This calculation is most useful when a gear from the motion work is missing. In some special timepieces a 24-hour dial system is used. The motion work will then provide a ratio of 24:1 or 1 rotation of the hour hand per day.

Example 2: An Ansonia Kitchen Clock Movement

The schematic of the Ansonia movement is shown in Figure 2. The Ansonia movement is especially interesting because the time train and the power train jointly share part of the gear train.

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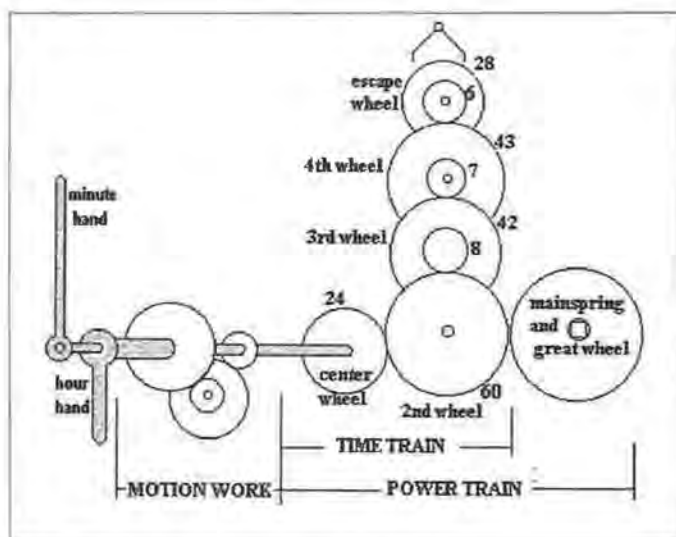


Figure 2. Ansonia Movement Schematic

Time Train

Step 1: Identify the Time Train. The time train starts with the minute hand and ends with the escapement.

Step 2: Form the Fractions. The first gear in the time train is the center wheel. Starting with the center wheel, form the fractions for each gear to gear interface.

Driving Gear	Driven Gear	Fraction
Center wheel	2 nd or int. wheel	24/60
2 nd or int. wheel	3 rd wheel pinion	60/8
3 rd wheel	4 th wheel pinion	42/7
4 th wheel	esc. wheel pinion	43/6
esc. wheel	escapement	$28\frac{1}{2} = (2 \times 28)$

Step 3: Calculate the BPH. Multiply the fractions together to find the BPH:

$$\text{BPH} = 24/60 \times 60/8 \times 42/7 \times 43/6 \times (2 \times 28) = 7224$$

Application: The Ansonia movement was received without a pendulum. The pendulum length was calculated from the BPH:

$$\text{Length in inches} = 39.14 \times (3600/\text{BPH})^2 = 39.14 \times (3600/7224)^2 = 9.7"$$

The customer decided that he wanted to use the movement in a wall case and asked if the pendulum length could be lengthened to approximately 18". After evaluating several possibilities, the least disruptive change in the time train was to increase the escape wheel pinion from 6 to 8 leaves. This change lowered the BPH to 5418 and increased the pendulum length to 17.3".¹

Power Train & Motion Work

Work on the movement only required calculation of the time train so the power train and motion work were not calculated.

Example 3: An Antique Cast Frame Cuckoo Clock

This movement was selected as an example because the gear train containing the time train is interwoven with the power train and motion work. The schematic of the Antique Cuckoo Clock gear train is given in Figure 3. The dotted line connecting the "minute pipe" and the "hour pipe" indicates that they share a common arbor and rotate concentrically on the front of the movement. Only Step 3, the final calculation, is shown for each component of the gear train.

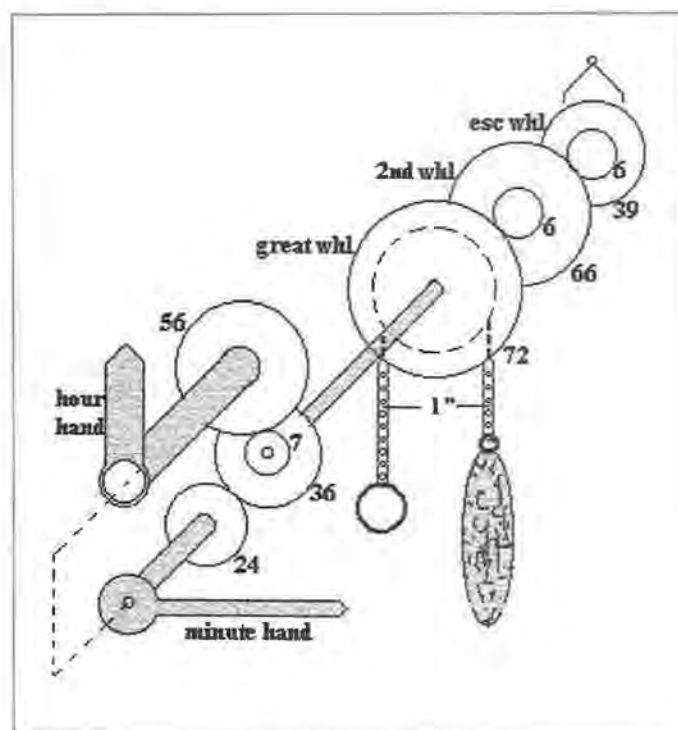


Figure 3. Antique Cuckoo Movement Schematic

Time Train: $\text{BPH} = 24/36 \times 72/6 \times 66/6 \times (2 \times 39) = 6864$ Beats

Motion Work: Turns of the hour hand = $24/36 \times 7/56 = 1/12$ Turn

Power Train: Revolutions of the great wheel per hour = $24/36 = 2/3$ turn

Application: One example of a use for the Power Train Calculation is to find the length of chain required for a 30-hour run time:

The great wheel is also a chain wheel that is powered by the weight shown schematically in Figure 3. The chain wheel diameter is 1", therefore the drop of the weight in 30 hours is: $2/3 \text{ turn/hr} \times 30 \text{ hr} \times (3.14 \times 1) = 63"$

This calculation demonstrates that this clock must have sufficient chain to meet the 63" chain fall and be hung high enough on the wall to clear the floor.

Procedure Summary

Step 1: Identify. Start with the minute hand and trace the shortest path through the gearing from the minute hand to the desired end point for the particular function desired. The end points are:

- Escapement** to count the **Time Train**
- Great Wheel** to count the **Power Train**
- Hour Hand** to count the **Motion Work**

Step 2: Form Fractions. Imagine that you use the minute hand as a crank. For the desired gear path selected in Step 1, form a fraction for each gear-to-gear transition (wheel to pinion, wheel to wheel, or pinion to wheel) using the number of teeth in the driving gear in the numerator and the driven gear in the denominator.

Note: Remember the last transition in the Time Train is the escape wheel driving the escapement. This fraction is $W_e/1/2 = (2 \times W_e)$. Where W_e is the number of teeth in the escape wheel.

Step 3: Calculate. Multiply all the fractions together to find:

- Time Train = Beats per Hour (BPH)

- Power Train = Rotation of the great wheel per hour *
* Multiply by 30 to find the rotations in 30 hours and 24×7 for the rotations in one week.
- Motion Work: 12:1 minute to hour hand turns ratio except a 24-hour timepiece which is 24:1.

Resources: A substantial amount of time train data is commercially available. Adams Brown², the maker and distributor of the Timetrax Counter Series, issues a book with their counters that contains a very useful compilation of many contemporary and older time train data. The book is available from them at a cost of \$5.95. The data can be downloaded free from the Internet at AdamsBrown.com. At this writing there are 30 single-sided pages.

Endnotes

- Horological Times*, July 1992, "Changing the Length of a Pendulum," pp. 47, 48
- Adams Brown Co., P.O. Box 357, Cranbury, NJ 08512



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From the Workshop

Whoa, Don't Throw That Used Rolex Crown Away

Wayne Lannon, past president of the Massachusetts Watch and Clockmakers Association, recently stopped me from throwing out a used Rolex crown. Of course he would not use it again as a crown, but it makes an excellent shield for the case tubes on Rolex watches while he polishes Rolex cases during an overhaul. He threads the used crown onto the case tube to protect the tube's threads from damage while the case is being polished. After the polishing is completed, he removes the used crown, cleans the case to remove the polishing compound and re-installs the original crown using new tube and crown washers, of course.

Four-Hundred-Day Protection

Owners of four-hundred-day clocks really like to show them off. They are very impressed by the highly polished brass components of the clock and they strive to keep them clean and shiny. Of course they usually use an abrasive cleaner for the shining of the brass parts. These abrasive cleaners really shine those clocks as well as leaving a powdery residue that gets into every moving part of the clock. It also strips away the clear lacquer coating the manufacturer put on the clock to protect the brass from oxidation. Sometimes the liquid component of the abrasive cleaners even causes some rust on the steel parts of the clock. The owners of these clocks should be admonished not to use any abrasive cleaner to polish these very decorative clocks. After you have completely cleaned the clock, you should polish the brass components to protect them from oxidation.

Bill Schroeder of Chicago sent in the

following suggestion for polishing the brass on four-hundred-day clocks: "Some use lacquer, some use wax to protect the brass finish on 400-day clocks. Not too long ago I posed a question about the solvents in the wax, when the glass dome is replaced, possibly affecting the oil used to lubricate the mechanism. I received an authoritative answer to the question from Tom Stratton of H.F. Staples & Company, Inc., Merrimack, NH. (Staples manufactures "Clear Bowling Alley Paste Wax," a product with 45% carnauba wax.) Tom explained the use of wax instead of lacquer on 400-day clock brass. He stated that the wax should be applied in a thin coat and that in 10-15 minutes after application, 90% of the solvent should be evaporated. Then, a good polishing should cause the elimination of the remaining 10%. To be sure, he recommended waiting an hour before replacing the dome. He further stated that two thin coats are much better than one thick coat and the protection afforded by even one coat should last a long time."

A New Twist

Dave Carlson of Indiana suggests the following procedure: When repivoting an arbor, especially in the smaller drill sizes (drills numbered 60 and above), the desired pivot wire may not be in stock. A convenient alternative is to use a piece of the shank of the drill which you used to drill the arbor. For example, I have made at least three pivots from the shank of a number 80 drill while still maintaining the usefulness of the drill. The replacement pivot is held in place by chemical bonding (Loctite® for example).

@

Join the Great AWI Famous Writers' Contest

Did you know that *Horological Times* is always looking for good new writing talent? The magazine's purpose is not only to provide a first-class technical journal to our members, but also to recruit and provide the opportunity for new talent to make its debut before a professional readership. If you have the urge to share your hard-earned knowledge with a continent full of your colleagues, the pages of *Horological Times* are the place for you to be.

Horological Times will pay the author up to \$200 for each original technical article that is accepted for publication. Articles are selected by the *HT* editorial staff and the *HT* Advisory Committee. Amount of the author's honorarium will depend on length, technical content and illustrations provided. The chromoline artwork for items selected for *HT* covers will also be framed for the contributing author.

Now for the big news! Next year's magazine survey will include a nomination question for the best new article of 1999. The winning writer will be eligible for a cash award of \$500. The runner-up will receive \$200.

Don't miss out on this opportunity. Get to work NOW!

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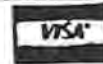
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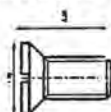


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Dennis Warner

Affiliate Chapter Report

What do Affiliate Chapters have to offer you? Is there a chapter near you? If there is one nearby, how do you contact it? If there is no existing chapter, how do you go about forming one?

The AWI local chapter gives its members an opportunity to acquire new friendships with others with similar horological interests and problems. Skills and methods are willingly shared. Tools and materials can be traded or purchased from members. The meetings are organized to impart technical information through speakers, demonstrations, and videotapes. The speakers may be professional or members who have diversified skills and knowledge. Demonstrations vary from watch and clock methods to related jewelry techniques. Videotapes are available through our members' private libraries or

obtained through AWI Headquarters on a lend basis. Historical and unique subjects are covered by an assortment of many tapes.

I do not walk out of a local meeting without the feeling of a learning experience. If you want to inquire about an existing chapter in your area call AWI Headquarters: (513) 367-9800.

If you find there is no chapter in your local area you can contact: Alice Carpenter, New Chapter Development Chairperson, at (252) 823-2944.

She will discuss the methods to be followed to establish a chapter and send you a "New Chapter Development Kit."

There is so much you can gain from being an active member. It is there for the asking.



The New Chapter Development Kit contains:

- Brochure, "How to Become an Affiliate Chapter of AWI"
- New chapter application form
- Copy of AWI's procedure for processing new chapter applications
- Sample copy of affiliate chapters' constitution and bylaws
- Sample of affiliate chapters' membership application form
- Listing of important contact people
- Guidelines for having AWI co-sponsor your first organized chapter meeting
- Samples of chapter newsletters
- 12 AWI membership brochures with applications
- 12 sample copies of *Horological Times*
- Sample listing of videos available on loan that are appropriate for chapter meetings
- Information on how AWI will help your chapter send a delegate to the annual Board of Directors Meeting

AWI Fiscal Year End

AWI's fiscal year end is June 30, 1999. Those parties who have provided goods and services to AWI up to and including June 30, 1999 must submit those claims or invoices to AWI no later than July 31, 1999. This includes chapter and individual expense reimbursement claims.

Claims or invoices received after that date will be subject to additional review by our accounting firm. They are also subject to not being paid by AWI.

Thank you in advance for your consideration and attention to this matter.

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Arnold Van Tiem

The 1999 REC Meeting and Watch Training Seminar

Hello everyone! A year has already passed since our last REC meeting. For those of you who are not familiar with the Research and Education Council (REC), it is the branch of AWI dedicated to the training and education of future horologists. To be a member of the REC, you must be a full-time instructor. Also, the watch or clock course you instruct must have a substantial number of hours devoted to horological instruction.

Many of the watch and clock schools that are in the REC are approaching 2,000 to 3,000 contact hours. If you are a horology instructor and want to belong to the REC, please call AWI Headquarters at (513) 367-9800. They will give you more information on school qualifications and on how your school can become an AWI member school.

This year there were a total of nine instructors in attendance. It was nice to see those instructors. The instructors who did not attend missed an excellent training course. The REC seminar/bench courses keep the instructor up-to-date on new innovations in the field. In turn, the instructors pass this information on to their students, our future horologists.

The instructors in attendance at this year's meetings/bench courses were as follows: Arnold Van Tiem, Career Prep Center, Sterling

Heights, MI; Toby Witherspoon, Kilgore College, Kilgore, TX; Steve Lange, Bishop State Community College, Mobile, AL; Joe Juare, St. Paul Technical College, St. Paul, MN; Ken Pell, Winter Park Tech, Winter Park, FL; Stephen Priesthoff, North Seattle Community College, Seattle, WA; Wit Jarochowski, Oklahoma St. University, Okmulgee, OK; Frank Poye, Paris Junior College, Paris, TX; and Jim Lubic, AWI, Harrison, OH. We had a very good turnout this year. Eight out of eleven U.S. REC instructors attended along with AWI's Technical Director and Instructor, Jim Lubic. Also, William Ewbank, AWI Executive Director, and Tom Bartels, NAWCC Executive Director, attended the REC business meeting for about two hours.

The REC annual business meeting was held on Friday, April 9, 1999. It began at 2:00 p.m. and ended at 6:15 p.m. The meeting went very well. Tom Bartels was representing the NAWCC and was interested in what the REC schools are doing. As you know, the NAWCC now offers watch and clock repair programs and opened their own school. Tom reported the NAWCC school is doing very well and currently has two full-time instructors and one part-time instructor.

All the REC instructors then gave a report on their schools. Almost everyone had good reports.

The meeting proceeded and it was good to hear that there are many job openings for watch and clock repair people across the U.S. In fact, Jim Lubic reported he has calls for jobs at a ten-to-one ratio. Ten jobs for every student. That's good news! This means there is a need for watch and clock repair schools to train our future horologists.

The next item covered was the election of the new REC Director and Secretary. These offices are for two-year terms. The new Chairman is Frank Poye and the new Secretary is Arnold Van Tiem.

There were other items discussed, but for the most part this ended the business portion of the REC meeting.



Frank Poye, newly-elected REC Director; Remy Waelchli, ETA; and Arnold Van Tiem, REC Secretary.

On Saturday and Sunday the REC had its annual bench course. This keeps the instructors up-to-date on new innovations in the trade. On Saturday, two other AWI instructors joined us. They were Tamara Houk and Chip Lim. This year we were very fortunate to have an excellent instructor from ETA, Remy Waelchli. Remy told us he will be retiring in January and that this will be his last training seminar for the

REC. Remy has given many training programs through the years. He will be missed. On behalf of the REC instructors, I would like to thank him for all his help through the years. He is not only an excellent instructor, he has been a very good friend.

On Saturday Remy presented a lecture on the "Swatch Group," formerly the "SMH" Group. Remy told us about the recent name change. He

also explained all the divisions of the Swatch Group. There are 14 different watch brands and 20 other divisions. The other divisions make the component parts for the 14 watch brands. The ETA Movement Division not only makes movements for the Swatch Group brands, it makes movements for other watch companies not in the Swatch Group.

Remy mentioned a few more interesting facts. The Swatch Group produces 95% quartz watches and 5% mechanical, yet the quartz watches only account for 55% of the revenue while the mechanical watches account for 45% of the revenue. As most people know, mechanical watches are usually more expensive than most quartz models.

After Remy's lecture on the Swatch Group, he then began the bench course on the new ETA 251.471, 10½ ligne chronograph movement used in ladies watches. Every instructor was given a movement and technical



Arnold Van Tiem, Ken Pell, Tamara Houk, Stephen Priesthoff, Frank Poye, Toby Witherspoon, Wit Jarochoowski, Chip Lim, Steve Lange, and Remy Waelchli, instructor.



REC Instructors working on the ETA 251.471.

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information sheets. We were then instructed step-by-step on how to dismantle and reassemble the movement. We also did a series of electrical tests on the movements. I found this to be a nice movement to work on. The plates and wheels were all metal and all the pivots were jeweled (23 jewels total). It has a total of four step motors for the time and various chronograph functions. Late Saturday afternoon we broke for dinner. Early Sunday morn-

ing we started up again and everyone finished assembling their practice movements. Remy then reviewed the movement functions and he concluded the bench course on that movement. He showed us pictures of a few more new ETA movements now in production and being used on new model watches.

As usual, Remy did an excellent job instructing us! On behalf of REC and AWI, I would like to thank Remy and ETA for all their help! ETA

has always supported REC schools by giving us free practice movements, tech sheets, and seminars. This has surely helped the REC schools train our future horologists! Once again Remy, best wishes in your retirement!

Please note the following updated list of the watch and clockmaking schools that belong to the REC.



American Watchmakers-Clockmakers Institute Research & Education Council (REC) Roster

ALABAMA

Bishop State Community College
Southwest Campus
Stephen Lange, Instructor
925 Dauphin Island Pkwy.
Mobile, AL 36605-3211
334-479-7476, Ext. 26
334-473-2049 (Fax)

FLORIDA

Winter Park Tech
Clock & Watch Repair School
Tom Bransford, Dept. Head
Ken Pell, Instructor
901 Webster Ave.
Winter Park, FL 32789
407-647-2900, Ext. 2293
407-975-2435 (Fax)
E-mail: pellk@ocps.k12.fl.us

ILLINOIS

Gem City College
Allen Linkey
School of Horology
7th and State St.
Quincy, IL 62306
217-222-0391
217-222-1557 (Fax)
**Home Study Course: Watch Repair

MICHIGAN

Career Preparation Center
Arnold Van Tiem, Horology Dept.
12200 15 Mile Rd.
Sterling Heights, MI 48312
810-825-2818
810-825-2839 (Fax)

MINNESOTA

St. Paul Technical College
Joe Juare, Instructor
235 Marshall Ave.
St. Paul, MN 55102
612-221-1408
612-221-1416 (Fax)
E-mail: jjuaire@stp.tec.mn.us

MISSISSIPPI

Jones County Jr. College
Elbert Lewis, Instructor
900 South Court St.
Ellisville, MS 39437
601-477-4075
601-477-4152 (Fax)

PENNSYLVANIA

Hiram G. Andrews Center
Harry Hlinzy, Horology Dept.
Office of Rehab.
727 Goucher St.
Johnstown, PA 15905
814-255-8371
814-255-3406 (Fax)

TEXAS

Kilgore College
Toby Witherspoon, Watchmaking Dept.
1100 Broadway,
Kilgore, TX 75662
903-984-8531, Ext. 220
903-983-8220 (Office)
903-983-8600 (Fax)
E-mail: witherst1@hotmail.com

Paris Junior College
Texas Inst. of Jewel Tech.
Frank Poye, Horology Dept.
2400 Clarksville St.
Paris, TX 75460

903-782-0361

903-782-0452 (Fax)

E-mail: fpoye@paris.cc.tx.us

www.paris.cc.tx.us/tijt/chron.htm

WASHINGTON

North Seattle Community College
Stephen Priesthoff, Horology Dept.
9600 College Way, N.
Seattle, WA 98103
206-526-0173
206-527-3635 (Fax)
E-mail: spriesth@scod.ctc.edu

OKLAHOMA

Oklahoma St. University/Okmulgee
Wit Jarochoowski, Watch Repair
1801 E. 4th St.
Okmulgee, OK 74447-3901
918-756-6211, Ext. 499
918-756-1315 (Fax)
E-mail: watch@osu-okmulgee.edu
www.osu-okmulgee.edu/watch.htm

CANADA

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Michael Plourde, Instructor
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819-379-2189 (Fax)

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CH-2000 Neuchâtel, Switzerland
032-29 00 30
032-29 00 35 (Fax)
E-mail: wostep@swissonline.ch



New Members

ALABAMA

Beezley, David R.—Heflin, AL
Courson, Stephen P.—Mobile AL*
Lange, Stephen E.—Mobile, AL*
Strickland, Bill—Albertville, AL

ALASKA

Clark, Richard L.—Anchorage, AK

ARIZONA

Hildebrandt, John J.—Glendale, AZ
Sponsor: Robert Ockenden—Golden Valley, MN

CALIFORNIA

Duncan, Gary D.—Roseville, CA
Nevarez, Jesse A.—Whittier, CA
Styre, Robert E.—Healdsburg, CA*

FLORIDA

Fuentes, Monica—Ft. Meyers, FL
Hallstead, Jean L.—Sanibel, FL
Hammock, Derwin L.—Panama City, FL
Preddy, Troy K., Jr.—Winter Park, FL*

GEORGIA

McGahee, Joseph G.—Comelia, GA
Pinon, Alfredo—Norcross, GA

IDAHO

Warth, Donald J.—Pocatello, ID

ILLINOIS

Molitsky, Michael—Plainfield, IL

INDIANA

Thomas, Howard D.—Indianapolis, IN*

LOUISIANA

Martinez, Manuel A.—La Place, LA

MICHIGAN

Krikorian, Tomas—Oak Park, MI

MINNESOTA

Dale, Lyman G.—Litchfield, MN*
Nelson, Robert D.—Stillwater, MN
Sponsor: Jeff L. Pomeroy—Minneapolis, MN

NEVADA

Wilson, Gerald A.—Las Vegas, NV

NEW HAMPSHIRE

Woodman, Mark C.—Fremont, NH

NEW JERSEY

Adoni, Ramon—Mountainside, NJ
Ianneillo, Peter J.—Wantage, NJ
Mazzatta, Carmen P., Jr.—Denville, NJ
Ng, Flora—Old Bridge, NJ

NEW YORK

Baldeo, Randolph—New Hyde Park, NY
Bell, Thomas E.—Bethpage, NY*
Hills, Alan—Dix Hills, NY
Irving, A. Marshall—East Setauket, NY
McGinnis, Robert C., Jr.—Lake Luzerne, NY
Sponsor: Robert Olson—Lake George, NY

NORTH CAROLINA

Gee, Thomas B.—Concord, NC
Sponsor: Joe A. Suther—Concord, NC

OHIO

Bosse, Jeffrey L.—Cincinnati, OH
Kiser, Michael L.—Greenville, OH*
Munroe, David O.—Cincinnati, OH

OKLAHOMA

Flissar, Wendy J.—Tulsa, OK
McGehee, Douglas—Tulsa, OK
McKaskle, Fern—Tulsa, OK
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OREGON

Acton, Tren L.—Grants Pass, OR

PENNSYLVANIA

Schnabel, Kenneth G.—Warminster, PA

TENNESSEE

Newman, Larry—Knoxville, TN

TEXAS

Brown, Mary L.—San Antonio, TX
Carter, Bobby G.—Odessa, TX
Kaplan, David—Plano, TX
Kaufman, Lenard M.—Arlington, TX
Thomas, Stuart—Arlington, TX

CANADA

Cheng, Paul C. Y.—Toronto, Ontario
Graham, Mike—Vaughan, Ontario
Shuttleworth, Les C.—Kelowna, British Columbia
Tsilingirian, Azniv—D.D.O., Quebec

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



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James E. Lubic,
CMW

Education Update

AWI is always looking for new talent to write articles for this publication. We also are looking for locations to schedule Bench Courses. As you can see from our recent schedule, we haven't had much luck lately. I am not sure why this is. It shouldn't be because of the price! A two-day Bench Course only costs \$130 per person. Maybe it's because the membership is not familiar with the process of how to request one. Maybe it's because we do not have a course that fits your personal needs. Could it be that our members' busy schedules prevent them from taking a two-day course? Do our members want

their training through videos or via the internet? As the Education and Technical Director, scheduling Bench Courses is one of my duties, and I would like to hear your comments. This topic is one that will be discussed at our annual meeting this month, so let us hear your thoughts.

Below is a list of the Bench Courses we presently have to offer. If you are interested in scheduling a Bench Course, please contact AWI Headquarters and we will make it as easy as possible to help make your request happen.



AWI Bench Courses & Instructors

Advanced Clock Repair
Ron Iverson
Citizen Quartz Watch Repair
Joseph Cerullo
Clock Case Repair
Jim Williams
Clock Escapements
Jerry Faier
Cuckoo Clock Repair
Jim Williams
ETA Products
Tamara Houk
Filing & Flat Polishing
Joseph Cerullo
400-Day Clock Repair
Ron Iverson
Hairspring Vibrating
Joseph Cerullo
Introduction to American Pocket Watches
Alice Carpenter
Introduction to Clock Repair
to be announced
Introduction to Quartz Watch Repair
to be announced
Mechanical Watch Repair
Jim Lubic
Micro Lathe Operations
to be announced
Mechanical Chronograph
Tamara Houk

Organize Your Work Habits

Robert Ockenden
Platform Escapements
Ron Iverson
Repair of the Atmos Clock
Gerald Jaeger
Repair of the Bulova Accutron
Henry Frystak
Seiko Kinetic Quartz Watch Repair
David Christianson
Sequential Chime
Jim Williams
Servicing ETA Quartz Chronographs
Tamara Houk
Striking Clocks
to be announced
Swiss Auto Quartz
Tamara Houk
Watchmaker/Clockmakers Lathe Courses
to be announced

One-Day Bench Courses

(Held in conjunction with Affiliate Chapter Conventions)

Adjusting the Lever Escapement
Jim Lubic
Basic Pocket Watch Repair
Alice Carpenter
Basics of Hairspring Vibrating
Joseph Cerullo
Clock Barrel & Wheel Repairs
Ron Iverson

Demonstrations of Watch Case Repairs (1 to 3 hours)

Charles Cleves
Flat Polishing
Joseph Cerullo
Introduction to Quartz Watch Repair
to be announced
Lathe Accessories (Slide Presentation)
to be announced
Modern German Three Train & Floating Balance
Ron Iverson
Platform Escapements
Ron Iverson
Repairing Cuckoo Clock Bellows & Music Boxes
Jim Williams
Replacing Balance Staffs
Jim Lubic
Seiko Kinetic Quartz Watch Repair
David Christianson
Sequential Chime & Night Shut Off
Jim Williams
Servicing the ETA Quartz Chronograph
Tamara Houk
Servicing the Seiko 5C23B Quartz Chronograph & Alarm
to be announced
Watch Case Finishing
Dennis Warner

Bench Courses

To register for Bench Courses, please mail, phone, fax or e-mail your registration and payment information to: **American Watchmakers-Clockmakers Institute, 701 Enterprise Drive, Harrison, OH 45030. 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. 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
JUNE 1999 5-6	American Pocket Watches	Alice Carpenter	Austin, TX	\$130.00
JULY 1999 • 25	Swiss Auto Quartz	Tamara Houk	Columbus, OH	\$65.00
SEPTEMBER 1999 25-26	Clock Escapements	Jerry Faier	Baltimore, MD	\$130.00
OCTOBER 1999 23-24	Swiss Auto Quartz	Tamara Houk	Springfield, NJ	\$130.00
NOVEMBER 1999 6-7	Clock Escapements	Jerry Faier	Dallas, 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, phone, fax or e-mail your registration and payment information to: **American Watchmakers-Clockmakers Institute, 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. All registration fee checks and charges are processed immediately upon receipt.

Academy of Watchmaking

INSTRUCTORS: James E. Lubic, CMW & Stewart Lesemann

DATE	CLASS	FEE
JULY 1999		
12-16	Basic Horology (Sawing & Filing)	\$250.00
19-23	Basic Horology (Horological Theory)	\$250.00
26-30	Machine Shop Practices	\$250.00
AUGUST 1999		
2-6	Introduction to Watchmakers Lathe & Cross Slide Practices	\$250.00
9-13	Cases, Bands, Crystals & Case Repair	\$250.00
16-20	Introduction to Watch Repair	\$250.00
23-Sept. 3	10-Day Lathe Program	\$680.00
SEPTEMBER 1999		
7-10	Mainsprings & Barrels	\$250.00
13-17	Time Train, Dial Train and Friction Jeweling	\$250.00
20-24	Drawing the Lever Escapement	\$250.00
27-Oct. 1	Adjusting the Lever Escapement	\$250.00
OCTOBER 1999		
11-15	Staffing, Truing & Polishing	\$250.00
25-29	Hairspring Vibrating & Timing Adjustments	\$250.00

DATE	CLASS	FEE
NOVEMBER 1999		
1-5	Automatic Mechanisms	\$250.00
15-19	Calendar Mechanisms	\$250.00
29-Dec. 3	21st Century Watchmaking	\$250.00

Jewelry School

DATE	CLASS	INSTRUCTOR	FEE
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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Send resumes no later than July 1, 1999 to:

American Watchmakers-Clockmakers Institute
Lathe Bench Course Instructors
701 Enterprise Drive
Harrison, OH 45030

BULLETIN BOARD

NEW REQUESTS

Fulton Crystal Company

Richard N. Hopson, Pflugerville, TX, is seeking a Fulton Crystal Company catalog which identifies these crystals.

Business Software

Cal Sanford, Abilene, TX, is looking for information on business software used in the everyday clock shop, especially in the areas of take-in procedure and repair records.

RESPONSES

Bulova Watchmatic Ultrasonic Cleaner

Ken Waldhorn, Huntington Woods, MI, sent in the operating instructions for the Watchmatic Ultrasonic Cleaner for Billy Best, Roanoke, VA.

ITEMS STILL NEEDED

Vibrograf Gradoscope GD 47

Steven J. Ksen, Reseda, CA, is seeking the owner's manual for a Vibrograf Gradoscope GD 47.

C&E Marshall

Hans Eckert, Orange, CA, is seeking conversion charts for Marshall stems. He is also looking for charts for the C&E Marshall 10-drawer cabinet.

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.

Glass Crystals

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

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

Advertisers' Index

Batt-Tronic	29
Borel & Co., Jules	5
Butterworth Clocks, Inc.	21
Cas-Ker Co.	inside back cover
Cowells	23
Esslinger & Co.	inside front cover
ETA	9
Fargotstein's	19
Gaber & Company	7
Germanow-Simon Corp.	39
Grobet USA-Vigor	37
Guenther's	35
Hayenga Co., Lubertus H.	31
S. LaRose, Inc.	23
Livesay's, Inc.	15
Maxell Corp.	back cover
McCaw Co., William S.	3
Microstamp Corp.	19
Smith Supply House	21
Somal International	37
Twin City Supply	25
Vibrograf U.S.A. Corp.	33
Witschi Electronics USA Ltd.	17
Zantech	11

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