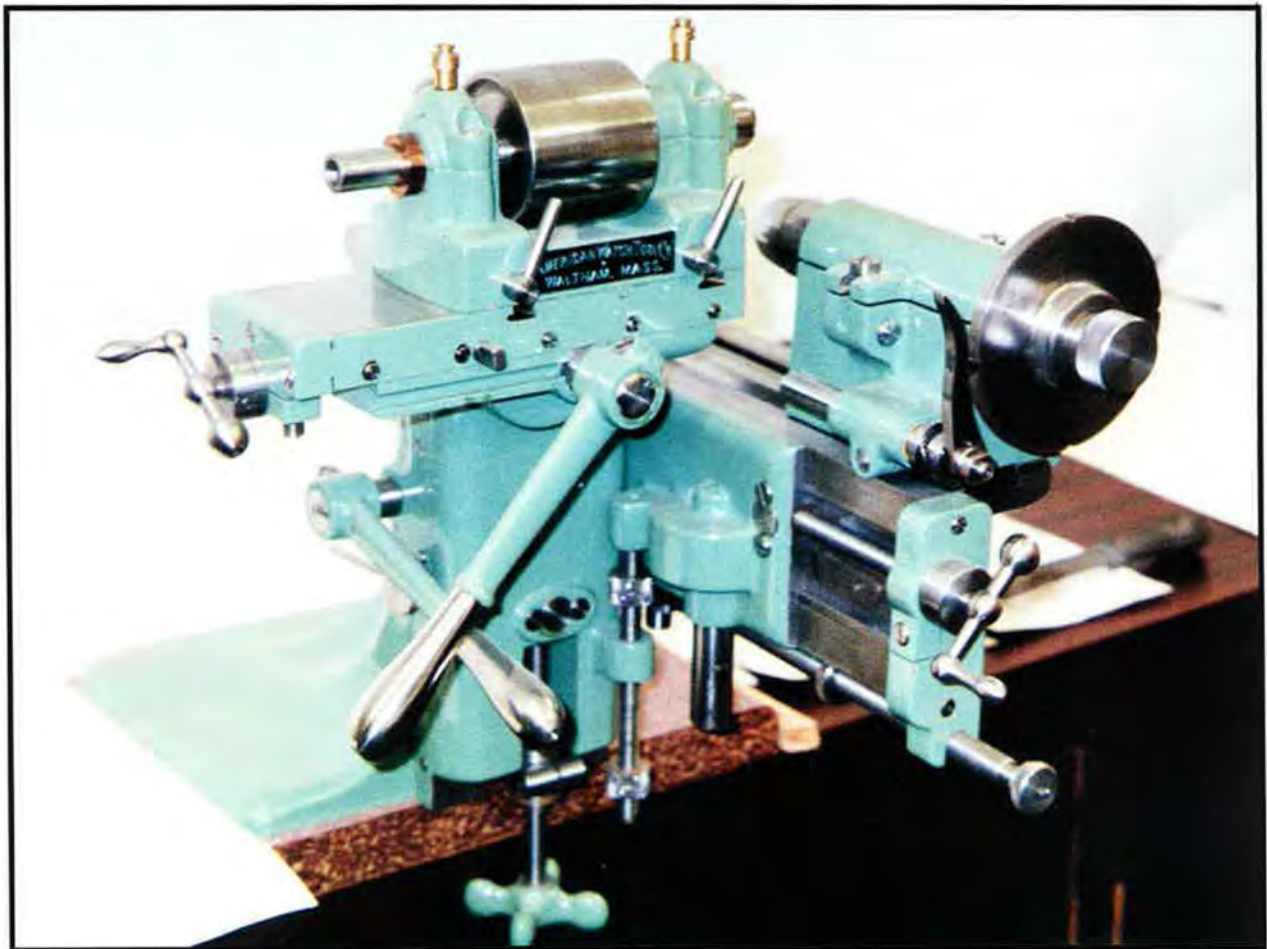


HOROLOGICALTM TIMES

May 2002



American Watchmakers-Clockmakers Institute

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COVER:

A restored American Watch & Tool Company Milling and Gear Cutting Machine is our feature.



President's Message

Robert D. Porter, CMW

Your AWI Directors and Committees have been very busy since the annual meeting last August. They have been working in a concerted effort with Executive Director Jim Lubic, the office staff, and other members to do the important work that makes AWI function so well.

The Nominating Committee, chaired by Alice Carpenter, has put together a fine slate of candidates to run for the Board of Directors. It will be very difficult for our members to select three candidates for office from this group of highly qualified AWI members from all over the United States and Canada. AWI and its members will be the ultimate winner regardless of who wins this election.

The Constitution and Bylaws Committee, chaired by Jim Door, has been busy bringing all elements of the AWI Constitution and Bylaws into alignment with the reduced number of Directors that was approved by the membership. Jim and his Committee do a fine job for us.

Gerald Jaeger's Certification Committee is working hard to make sure the material in the AWI Certification Exams will continue to reflect the skills needed by the modern horologist to prosper in an ever changing business climate.

Ron DeCorte's Education Committee is working with Jim Lubic, Laurie Penman, the Certification Committee and Jerry Faier's Technical Committee to provide specialized bench and home study courses in areas that will enhance our members' earning power. AWI also plans to offer several short courses to help prepare candidates to take the certification exam in the discipline of their choice.

The AWI Website Special Committee, chaired by Jack Kurdzionak, has completed its work in enhancing the usefulness and professional image and quality of the AWI website.

Your Board of Directors has recently approved a new Strategic Planning Special Committee to be chaired by Mark Butterworth to review the current state of AWI, and to assist in the introduction of organizational growth and changes to AWI.

(Continued on Page 25.)



Executive Director's Message

James E. Lubic, CMW

At press time on April 25th we received news of the death of Harold (Hal) Herman. Hal was an AWI Fellow, Past President, and the first editor of *Horological Times*. A complete obituary will appear in the June issue.

It's time to start making plans to attend this year's AWI Annual Convention. We are in the process of putting together a fantastic group of presenters, and recruiting suppliers for our trade fair. The details as we know them at this moment appear on page 50 of this issue.

The container that our Receptionist/Secretary Melanie Frye is using for the entries for the Witschi New Tech Handy drawing could use a few more names. Presently this project has inspired seven members to recruit 11 new members. One member has recruited four new members, and another has recruited two. The odds are still pretty good if you recruit and sponsor a new member that you could be the lucky winner of a Witschi New Tech Handy. As mentioned in the past, Tony Voight of Witschi Electronics USA will draw the winning name at this year's convention. So get out there and recruit a member for AWI and possibly win a New Tech Handy.

Don't forget, June 30th is the last day that you can use your \$15.00 coupon that you received with your membership renewal. The coupon can be used to purchase AWI books, videos, discounts on Bench Courses/Continuing Education, or classified ads in the *HT*. Minimum \$30.00 purchase required, including shipping cost.

I'm sorry to report that we recently had to cancel the Introduction to American Pocket Watches course that was scheduled in the Los Angeles, CA area due to lack of registrations. We have two other classes that are not receiving the response that we thought that they would or should; one in New York City and the other in Philadelphia, PA. These are classes that, according to our survey information, had enough interest to warrant scheduling these courses in these areas. Please check the schedule on page 46 and get registered as soon as possible. If we don't have the minimum registrations 30 days prior to the scheduled date we are forced to cancel the class. This policy is necessary to prevent the Institute having to pay course-related expenses when attendance is below 8 – the break even mark.

If you would like to have an opportunity to work on a very fine and not so run-of-the-mill clock, there is space available in all the Riefler Clock Courses which are being taught by Laurie Penman at AWI. Again see the schedule on page 46.

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Questions & Answers

Question

I am sending photos of some unusual clocks I have come across recently. I am hoping that you may be able to shed some light on these clocks.

The first photo is of a rather large clock, about 10-11 feet tall. It has a wooden bell striking clock movement and music box. The dial is porcelain and has paintings of Washington, Franklin and Jefferson on top of it. The painting at the top behind the carved wooden figures is of Napoleon on a horse.



The photo below shows what is behind the dial. The movement has brass gears between the wooden plates with steel pivots turning in brass sleeves. It reminds me of the early Black Forest clocks. However, the hand shaft is in a different place.



I know the American wood works with wood gears were made between 1800-1840. Is this type of movement of similar vintage?

The music box apparently plays different tunes as the music barrel's center shaft has grooves allowing the barrel to be shifted over slightly and held in place by a lever. Unfortunately in the short time I was allowed to view this clock I was not able to get the music to play. I got the barrel to turn but no music. I hope to get a chance to repair this clock/music box in the future. Anything I can tell the owner about it might convince them to invest some money to restore it.

Both the music box and clock movement are weight driven. The

weights are open top tin cans filled with lead and rocks, etc.

Above the movement are five carved wooden figures. The positioning of their hands indicates that at one time they might have been holding musical instruments. Their limbs are not animated but when the music barrel turns the figures twist back and forth.

Due to the unusual size and nature of this clock I cannot believe it was mass produced for the general public. Could this be a one-of-a-kind piece? This clock is currently residing in a mansion filled with valuable antiques.

The photo at the bottom of this page shows the dial of an old bell striking movement. If you look closely the numbers 10, 20, 30, etc., are in reverse order on the seconds bit. When running, the second moves counterclockwise even though the other hands move normally.

The numbers on the dial unfortunately were repainted by the owner but she assures me she duplicated what was originally there. The

(Continued on page 18.)



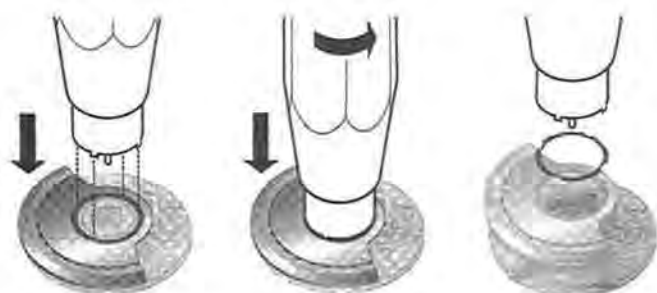
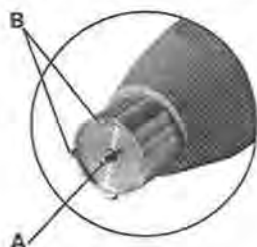
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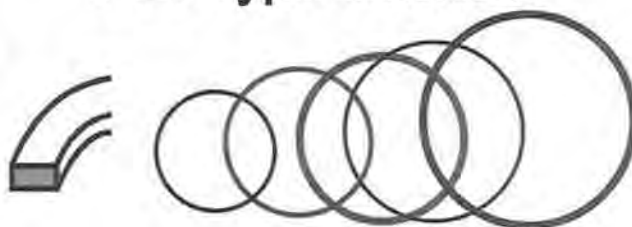
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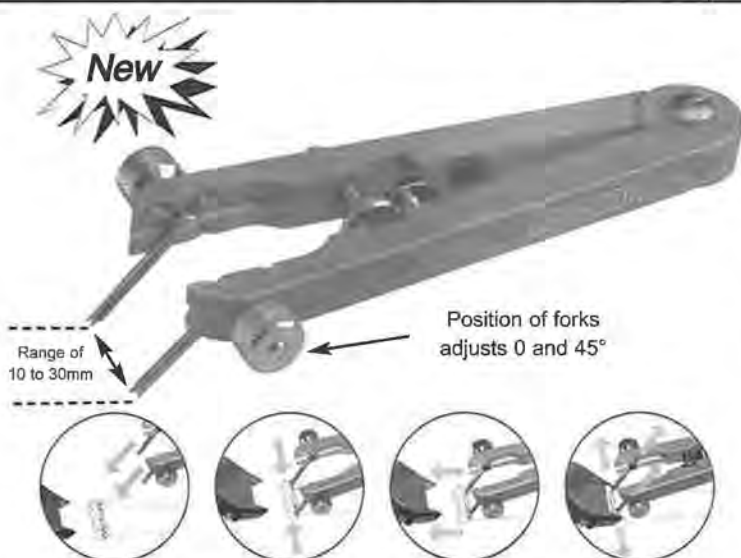


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CMC, FAWI, FBHI

Ask Huck

Mainsprings for the Connecticut Clock

Question

Do you replace the mainsprings of the American clock when you service it? How do you determine if it will soon break? How do you determine if the spring is sufficiently strong to power the movement for eight or more days?

Answer

I measure the spring strength with a yardstick, and check for probable breakage by eye and feel. A spring that passes those tests is returned to service. In fact, I trust that evaluation as much as I trust a "new spring" that has never powered a clock.

I wipe the spring clean, inspect the edges for a bur, or an indication that the spring may have a problem. And I pull the spring between my fingers to check for rough spots, or a change in its development curve. Passing these tests, it is cleaned and returned to service.

The strength test is measured with a yardstick, but over the years I've gained enough experience to check the strength by visual inspection. When the spring is cleaned, lay it flat and observe its loose diameter and its development curve.

A spring that has 8-10 or more inches diameter has sufficient strength to power an 8-day movement about 10 days. This measurement does not include the last turn of the outside end.

Should your job pass the above test, and fail to run for a total of 9-10 days you have a workmanship problem, not a spring problem.

I wind the spring fully tight and then let it down about 9-10 turns and test the movement for an hour or so.

Be careful with these springs. They can break and wreck the clock, or wreck you.

Straightening Bent Clock Arbors

Question

A mainspring broke in a Connecticut clock. It expanded against the 2nd shaft and bent it. Is it safe to straighten that piece? How is the job accomplished?

Answer

This is somewhat a common thing when the spring breaks in an American clock.

These arbors were made from steel rod, or wire stock, and are in the mild steel hardness. In fact, the arbors are not much different from a common steel nail, and can be straightened as if it were a nail. However, you should be very careful because it may have been straightened previously.

There is a "safe way" to do the job that almost eliminates breakage. Cut a small wood block and some notches that will accommodate the wheel and pinion, in the end-grain. Lay the arbor in place. With a brass punch and small hammer, drive the "high side" of the arbor down against the block. The block prevents overforming. Spin the arbor between thumb and forefinger tips and observe your success. You should get good success in just a few tries.

With reasonable care and patience you can achieve a perfect result. This is a job that the repair person can learn with great ease.

Now if your clock was built by our English or French friends, the arbor is almost certain to be hardened. And, if it didn't break when the spring broke, it will break now. Touch the arbor with a fine-cut file. Unless it cuts very easily, it must be fully annealed first.

You may find wheel tooth damage and/or other arbors bent in the same clock. Give each piece a careful inspection.



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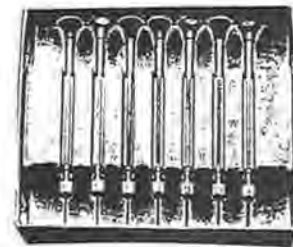
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Letters to the Editor

Editor's Note: As promised in the March "Letters to the Editor" we are presenting two different viewpoints, a Pro and a Con, from the AWI Board of Directors in response to Mr. Tom McRoy's letter regarding the reopening of the AWI Academy of Watchmaking. We are reprinting Mr. McRoy's letter followed by the Pro and Con statements.

Dear Editor:

When voting for officers to serve on the AWI Board of Directors, we, the members, place our trust in their judgement to do what is best for the membership. However, when important motions such as Jim Lubic's motion to open a WOSTEP program is disapproved, I think the members are entitled to an explanation from each of the board members for the reasoning behind their vote.

I am dismayed at the fact that the board sees fit to keep the AWI behind the times and does its members a disservice by not taking advantage of an opportunity that may not come along again.

When 5% of the watches produced account for over 50% of the dollar value of all the watches imported into the United States, it is only logical that those performing maintenance and repairs have training of the same standards of which that watch was produced. One needs only to look at the success of the ISO standards to prove this point.

Approval of Mr. Lubic's motion will allow the AWI to continue to be in the forefront and an important part of the watchmaking industry in the United States. It is clear by the industry's positive response to Mr.

Lubic's proposal that it is time to move ahead and in this direction.

Tom McRoy
Chicago, IL

Pro Statement

As Directors we have the responsibility to manage the assets of AWI for the best benefit of our members that we can. We have inherited a fine building with a fully-equipped, state-of-the-art educational wing.

To rationally evaluate the proposal to reopen our AWI Academy, we as members and Directors need to review the facts and put our own prejudices and preconceived ideas aside:

1. The educational wing, a full 21% of our building, is sitting there sucking up our members' money for its continued presence and giving nothing in return.
2. The state of horological training in the U.S. has changed dramatically in recent years. The number of schools has dramatically declined.
3. The Swiss WOSTEP program of training is the only program recognized by the watch industry. Period. It's a fine program. It could be better. It is certainly as good as anything the U.S. has to offer.
4. The watch industry has made it known that they are willing to support 4 or 5 WOSTEP accredited schools. There are 11 watch repair schools in the U.S., of them 5 are WOSTEP accredited. AWI is one of these 5. Three of the 5 have been substantially endowed by industry to insure their continued operation:

North Seattle Community; Okmulgee State in Oklahoma; and the Rolex school in Lititz, PA. For whatever reason, St. Paul Technical has elected not to continue their WOSTEP program of horological instruction. The remaining schools have chosen not to seek WOSTEP accreditation, mainly because of their ties with state or community sponsorship that makes it difficult or impossible to meet the WOSTEP criteria.

5. Several of the industry brands, both Swiss and Japanese, have shown an interest in endowing a watch repair program at AWI; enough to make it self-sufficient.
6. The proposal to seek industry support and reopen our Academy stipulated that the Academy would be a separate entity from AWI, controlled by a Board of Governors, of which 60% would be AWI representatives and 40% would be from industry. The Academy would pay for the use of our educational facility, our administrative costs, wear and tear and consumption of our watch repair/making equipment and supplies. And...the proposal stipulates that we would only open the Academy when 100% funding is in place.
7. Our Strategic Plan calls for the reopening of our Academy.
8. Our Mission Statement states that AWI is "dedicated to preserving and promoting the highest degree of workmanship" as well as setting the standard of excellence in horological education.

9. AWI members have shown through the years that they are unable to come to Harrison in sufficient numbers and at sufficient times to financially support our educational facility by themselves.
10. AWI has the recognized certification program in the world.

By reopening the Academy with industry support, AWI would:

- A. Provide industry with a much needed school to help train future watchmakers.
- B. It would give AWI members access to state-of-the art training, by allowing members to sit in on classes conducted at our school.
- C. Through our universally recognized certification program, AWI members could gain access to brand-specific repair parts, training and technical literature.
- D. AWI would have the opportunity to set the standard in horological education in the U.S. by example.
- E. Most importantly, AWI would free up substantial funds that would be used to supplement and increase member programs and benefits. Such things as traveling workshops, video instruction, Internet instruction, and other distant education opportunities would be possible.

It is a win-win situation. How can our Directors *not* want to reopen our school with such potential interest and support?

Afraid of a Swiss takeover of AWI? The academy would be structured to prevent such an eventuality. But the big question is: What would they do with such an organization of watchmakers and clockmakers? Ask the 3 schools that have been endowed by industry. They have no restrictions other than to follow the WOSTEP program of instruction. Even the Rolex school allows their graduates to seek

employment wherever they wish. They just want to train quality watchmakers in this country.

No professional organization can be successful unless they have a relationship with the industry of which they are a part. AWI has gone to great lengths to develop a dialogue with the watch industry. We're beginning to have a viable relationship with this industry.

Wouldn't we be competing with our other watchmaking schools in this country? Yes. But not all students will want to travel to Harrison, Ohio, to go to school; no more so than all are flocking to the Rolex school in Pennsylvania. Part of the WOSTEP plan is a regional concept, directing potential students to the WOSTEP school nearest to their home.

And what about the other AWI affiliate schools that are not part of the WOSTEP program? AWI will be in a better financial position to help them with technical training, knowledge dissemination and skill development to enhance the value of their own chosen programs.

David A. Christianson,
CMW, CMEW
AWI Director

Con Statement

Does the USA need more schools of watch repair? How are we, at AWI, going to change the educational environment by opening our own school? We would be simply entering a competition with other schools that are already struggling to attract a shrinking student base. What advantage is there in this endeavor for AWI or its membership? I am at a loss to find a rationale for this. There has been no research into the actual need for a new school. No one has cited any studies that will show there is an untapped source of students who would attend our institution.

I request the members of the board put aside their initial thoughts on this matter and examine the watch material dealer network here in the USA. Not too many years ago every city of any size had at least one dealer. Boston, a medium-sized city, had 10

dealers in 1971. Now it has one that is just surviving. Do you think that anyone with a half-million or so to invest would put those dollars into opening a new material dealership in any city in this country? I don't think that is going to happen. In my conversations with some of the more successful dealers, I have come away with the impression that many more of the remaining ones are going to either disappear or be purchased by one of the three big houses. As large as this country is with its 300 million people, it is going to be served by three or four giant supply houses and a handful of smaller regional ones. Do these suppliers know something that we here at AWI are still ignoring? I think they do.

There just is not a very large market for the education we would be trying to sell. If the market were as large as we wish it were there would still be hundreds of supply houses and a watchmaking school would be in every major city. Boston even had five watchmaking schools after WW2. They are all long gone. Why should AWI consider making an investment in the educational business that has a high probability of failure?

AWI should stick to what it is chartered to do by its constitution, do what it knows and does best. Those things are serving the membership with: A. The best horological magazine in the world. B. Making certain that magazine has timely articles to keep its membership up to date on current trends in the watch and clock world as well as all of the changes in horological technology. C. Providing continuing education for its members. D. Providing technical advice to members.

Jack Kurdzionak, CW
AWI Director

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J. Malcolm Wild,
FBHI

American Watch Tool Company Milling & Gear Cutting Machine

During my research on later machines used in wheel and pinion cutting, my friend in Pennsylvania, David Lindow, a very good clockmaker, said he had noticed a small machine in a very dirty and distressed condition at a local tool dealers, which looked extremely interesting. Further investigation proved the small milling or gear cutting machine was made by the American Watch Tool Company and had previously been in use at K & D Manufacturing, which produced staking tools. It had been purchased by a father and son along with other machines as their requirement was to produce dental burrs. The machine in question was surplus to requirements and was subsequently purchased by David Lindow on my behalf (Figure 1).

When the machine duly arrived in the UK it was in a sad state of repair with many parts missing, but the true potential could be seen. Regrettably I did not take any photographs when the machine arrived.

The history of the American Watch Tool Company has been well documented in *Waltham Industries* by Edmund L. Sanderson and a copy of the relevant section on machines that were manufactured by the American Watch Tool Company is reproduced in an excellent reprint of an original trade catalogue circa 1890. This was published by Ken Roberts Publishing Company in conjunction with Adams Brown. This small catalogue covers the many lathes and accessories produced as well as the small bench milling machine shown in Figure

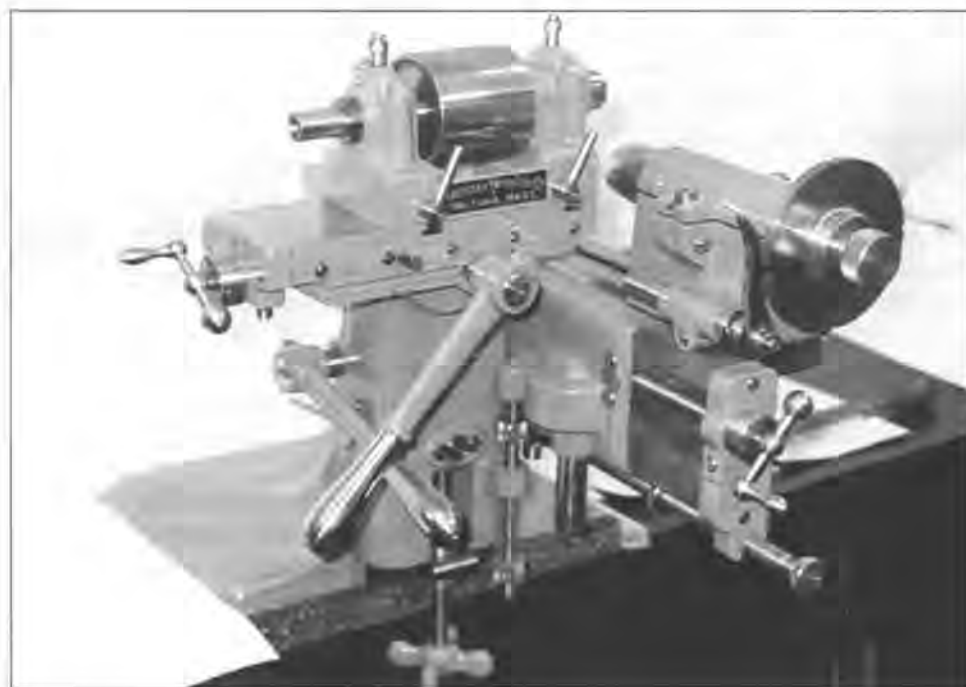


Figure 1

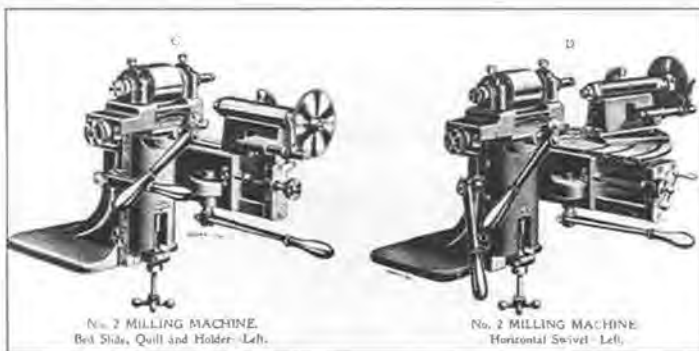


Figure 2

2. It is excellently produced and until recently was available from Adams Brown Co.

Manufacture of the lathes commenced in 1872. Co-founders were George F. Balou, John E. Whitcomb and Henry N. Fisher. These were previous employees of the Waltham Watch Company who saw a potential market for the production of small precision machines. Mr. Balou left the company in 1874 and in 1876 Ambrose Webster joined the partnership and the name the American Watch Company was taken.

The addition of Mr. Webster to the partnership produced new design ideas and the now famous Webster-Whitcomb or WW lathe was born. This was originally designated the 1½ size, being between the original No. 1 and No. 2 lathes. With its distinctive rigid lathe bed it proved so popular that the previous lathes were discontinued (Figure 3).

The bed section of the American Watch Tool machine is shown in Figure 4.

As anyone who has used this type of lathe will appreciate, its excellent qualities are far superior to the Swiss or German style watchmakers lathes with its 'D' bed construction available at the time.

The Webster-Whitcomb partnership was to survive some 40 years, producing many precision machines.



Figure 4

The rebuilt milling and gear cutting machine shown in Figure 5 was completely stripped down. Whilst many parts were missing it was obvious the machine had been extremely well designed and made; the slides were in very good shape considering the machine was approximately 100 years old and had seen some abuse in its life. As well as the usual two axis slides and vertical height adjustment of the table found in most milling machines, there is a facility for angular movement of the milling spindle headstock.

New bearings were produced for the main spindle and the spindle was built up with hard chrome and re-ground. One of the main handles was missing and a casting was taken from the original and machined up, Figure 6. A number of the adjusting screws for the slideways were damaged and proved difficult to remove. These were



Figure 3

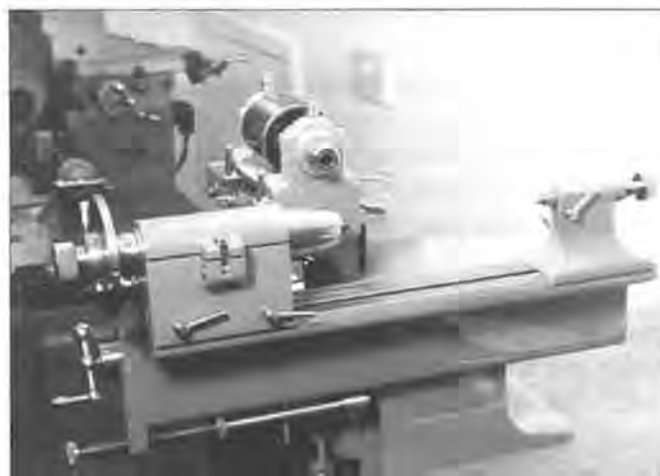


Figure 5



Figure 6

eventually replaced. The vertical capstan style handle was missing and this was replaced by a spare, originally from a Lorch lathe, which can be seen in Figure 1.

Only one notched division plate was with the machine when it arrived. Various plates were machined and then notches cut on a dividing head mounted on a Bridgeport mill. When all the missing components had been made, the machine was painted (Figure 7).

Automotive body filler was used to fill all the castings, then a primer was applied. Finally the finish was applied by aerosol paint. Many of my small machines have been restored in this manner. If one is fortunate enough to own a spray gun and compressor this can be used but aerosol paint cans purchased from your local automotive suppliers are excellent and most companies will mix the colour you require.

All steel items were polished either by hand or in the lathe.

Included with the machine were two tailstocks, Figure 8, and a good range of collets. These proved to be special as the nominal body diameter was 15 mm and thread diameter of 13 mm x 1 mm pitch. This size is not shown in the reprinted Hardinge Bros catalogue c. 1913. Many of the screws were metric sizes. Perhaps some serious tool collector or historian on American horological machines can comment on this, when in fact the metric system is still not totally accepted in the USA some 100 years later! Various mandrels for the headstock to hold cutters were also enclosed.

A most useful feature for the operation of the slides is the option of using either screw feed or lever feed. To use lever feed the feed screw nut is released. Also fitted are stops to all slides. These are features usually found on much later machines such as the Aciera F1 (Figure 9).

The restoration of the American Watch Tool Company milling and gear cutting machine proved very worthwhile and extremely important as a piece of American watchmaking history.

I would be pleased to hear from anyone with similar machines manufactured by this company.



Figure 7

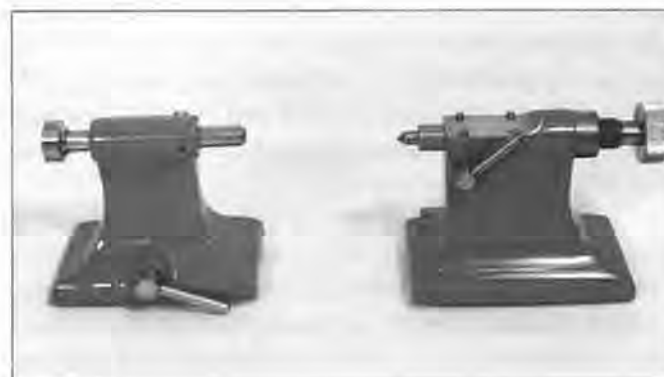
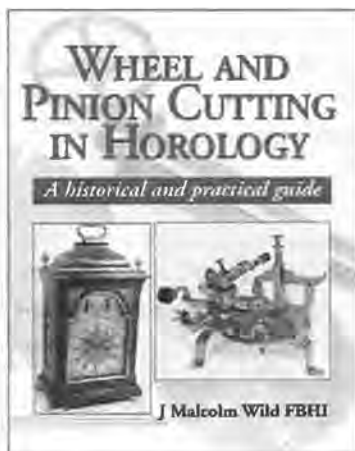


Figure 8



Figure 9

Book Review



Wheel and Pinion Cutting in Horology, A historical and practical guide, by J. Malcolm Wild, FBHI. The Crowood Press (UK), 2001, 253 pages, 555 photographs and line drawings, ISBN No. 1 86126 245 0 £30 (about \$50)

This new book by a familiar name in horology is a significant contribution to the literature and a recommended buy for anyone interested in horology. For the restorer, there are tips and techniques not discussed in any other readily available source; for the collector, there are historical insights into the manufacture of the earliest clocks; for the tool fanatic, there is a gold mine of information of early wheel and cutting devices and techniques. And even if you are none of these, a trip through the pages of Wild's new book will be a fascinating journey through the development of what is arguably the single-most important technology in clockmaking.

As the title promises, this is both a detailed guide to techniques used in manufacturing wheels and pinions as well as a historical review of techniques and tools that were used long before we became spoiled by CNC mills. The author's easy writing style and clear presentation complement the thoroughness of his approach to the subject, a subject that has long put fear into the hearts of the most avid bench horologist. A special note of appreciation should be added here for the author's attention to the quality of the photographs and drawings. Unlike what is often seen in books of this type, the illustrations are of exceptional quality throughout the book.

The book is presented in 11 chapters together with several end sections that add much to its overall value: a bibliography; a list of suppliers (all with addresses in the United Kingdom) of materials, tools, parts and clocks; seven appendices, references and an index.

The first chapter covers the early methods of cutting wheels, and presents historical insights into the evolution of the division plate and early wheel-cutting

machines, starting with Berthoud's *Essai sur l'horlogerie* in 1763. Interestingly, the earliest designs are not that different from wheel-cutting engines still in use today. Wild closes this first chapter with a glimpse also of not just the tools but the layout of the early clockmaker's workshop and examples of wheels in early English clocks.

A short next chapter discusses pinions and pinion wire. As the author notes, even those who readily attack the job of (brass) wheel cutting sometime blink before attacking the challenge of cutting a (steel) pinion. The early wheel-cutting machines would not have been successful pinion cutters because of the greater rigidity needed, and in the absence of early pinion-cutting machines that survive today, Wild suggests that early pinions were the products of the very tedious method of dividing, slitting, and filing. The availability of pinion wire in the eighteenth and early nineteenth century eased the chore somewhat.

Chapter Three continues the history of wheel- and pinion-cutting machines from the end of the nineteenth century. The separate German, Swiss, and American designs of these early machines are well presented with photographs and excerpts from the manufacturers' catalogues. Machines of the early-twentieth century, again beautifully illustrated, signaled an end to the development of these devices because the demand for them had begun to wane.

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Recognizing that most of us will never come to own a wheel-cutting machine, Wild, in Chapter Four, addresses the development of lathe attachments to accomplish the task. Although many of the photographs use the Myford Super 7 bench lathe for illustration, the practical hints offered in the chapter will be useful to anyone familiar with a small lathe. The reader is given a tour of the practical aspects of set-ups for wheel cutting, integrating the dividing head into the operation, and the design and construction of cutting frames and milling spindles with the rigidity needed for both wheel and pinion cutting. Wild even demonstrates his currency by including a discussion of the Bryan Mumford-designed electronically-controlled rotary indexer for the Sherline mill.

Chapter Five covers the theory of wheel and pinion tooth forms, but rather painlessly so. From the design of the sector (the proportional gauge) to the differences between cycloidal and involute gearing, the discussion is always clear, straightforward, well-illustrated, and useful. His line drawings describing the driving action of wheels and the explanation of the module and DP systems for the sizing of wheel and pinion teeth are among the best I have seen. The author properly (from my perspective) advocates the use of multi-tooth metric cutters such as those available from P. P. Thornton, if the budget allows.

With most of the preliminaries now put to rest, in Chapter Six, Wild begins detailed discussions related to the specific job of wheel cutting. The chapter is quite complete, starting with a discussion of the proper type of brass suitable to use and the design of a suitable mandrel for the blank. In almost every paragraph, the author offers small details, such as how to protect thin wheels, which can be appreciated by those who have fallen victim to the difficulties that he adroitly explains how to avoid. Another example is his full discussion, again complete with marvelous photographs, on the proper way of centering the wheel cutter, the use of division plates for indexing, and the use of a boxwood chuck.

Continuing with specific problems in wheel cutting that the bench horologist is likely to encounter, Wild offers the reader the valuable insights into the design and use of tools to meet the challenge. Cutting a recoil escape wheel and want to avoid purchasing an expensive cutter? He offers details on how to make your own fly cutter. The same can be said for dead-beat escape wheels. In both cases, his tables relating size to cutter dimensions will be invaluable to those who need the information. The chapter also includes step-by-step practical guidance on how to cut contrate wheels, crown wheels, going barrels, and ratchet wheels. While most of the book focuses on clockmaking, the end of this chapter offers a discussion that will be of value specifically to the watchmaker.

Chapter Seven is a replica of the previous

chapter, only now dealing with the intricacies of cutting pinions rather than wheels. Again, the author is quite thorough, starting with the various steels appropriate for pinions to details for cutting the blanks: turning speeds, feeds, rigidity of the work, and centering. Special techniques for small diameter pinions are also presented. Wild assumes nothing in his discussions on the proper procedures for producing solid pinions, replacing a pinion in an old clock, a quick review of turning between centers, and polishing and heat treating the final product. The chapter concludes with a practical guide to making lantern pinions and pinions for watches.

Chapter Eight is on wheel and pinion cutters. As an interesting aside, he offers some rationale for the relatively high cost of commercial cutters: there are 38 operations needed in their manufacture, in the roughing out process the carbide form tool must be resharpened after every ten cutters are produced, and in the finishing process only one cutter is produced between sharpening. For those who prefer to avoid the commercial cutters, the chapter provides instructions on making and sharpening fly cutters as well as multi-tooth cutters.

Chapter Nine discusses both the aesthetics as well as the practical aspects of crossing out wheels. The chapter even includes a description of how to make your own marking-out jig to guide crossing out. He concludes the chapter with practical advice on how to mount wheels onto collets.

No book on practical aspects of clockmaking would be complete without a discussion of replacing and finishing worn pivots, and such is the subject of Chapter Ten. The one thing that distinguishes this presentation from so many others is the clarity of the photographs describing the evaluation of damaged pivots and their replacement.

The final chapter, Chapter Eleven, is entitled Miscellaneous Operations, and properly so. Wild offers the reader insights into, among many interesting topics, the proper use of the depthing tool (a tool with which he has been identified for many years), the technique for making a rack and snail, and the manufacture of a Geneva stopwork. Having started the book with a discussion on early shop layouts, he concludes with views of several modern shops.

Among the six appendices, all useful, are ones on Swiss standard tooth design, British standards of (horological) gears, and the proper tooth form for wheels driving lantern pinions.

This is a complete text on a subject fundamental to clockmaking. It is presented in a clear, readable, and understandable way. It deserves to be on your bench or night table, and you deserve to have it there. I strongly recommend making the investment.

Anthony Hyder



AWI Movement Bank/Material Search Network

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

- 1W6** ETA 2790 *jump spring* (day of week), #A/7298
- 1X3** Movado 395, 11¼ ligne, automatic, *movement complete*
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If you can supply any of these items please contact: AWI Material Search Network, American Watchmakers-Clockmakers Institute, 701 Enterprise Drive, Harrison, OH 45030-1696. Toll Free: 1-866-367-2924, ext. 305; Phone: (513) 367-9800, Fax: (513) 367-1414 or E-mail: mhuff@awi-net.org.

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

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



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Fred S. Burckhardt,
FAWI

Our American Legacy

As told before, Tracy Baker & Company lasted only a short time. Eventually, both sold out to Royal E. Robbins and he changed the name to Appleton, Tracy & Company. Even though Tracy's name was used, he owned no interest in the company.

Appleton, Tracy and Company had to face the recession that spelled doom to the Boston Watch Company. The employees agreed to a 50% pay cut to avoid the plant closing. After a few weeks, it was decided a further cut had to be made. An employees' meeting was held and it was agreed they would work three-quarter time for half pay.

It was during this period, when Robbins was a major stockholder, that the Waltham Improvement Company suggested the two companies merge to increase both the capital and facilities of both organizations. After this was accomplished, the names of Appleton, Tracy and Company and The Waltham Improvement Company ceased to be. The new name of The American Watch Company took their place. The legislature approved this February 4, 1859.

Some of the leading men left the American Watch Company and formed a new watch factory in Nashua, New Hampshire. The company lasted about three years and was bought out by the American Watch Company.

After the absorption of the start-up Nashua Watch Company in 1862, the American Watch Company experienced a period of financial prosperity. The only competition at the time was the Howard Watch Company. There was a great demand for American watches. In 1859, virtually 100% of watches sold in America were Swiss imports. By 1883, the Swiss had only 40% of the U.S. market.

In 1885, the name was changed to The American Waltham Watch Company. The

company continued to prosper. It is interesting to note that by 1887, the Dennison case company was producing 50,000 watch cases a year for Waltham.

Between 1876 and 1885, the Waltham company won many medals at various exhibitions in the U.S.; Sydney and Melbourne, Australia; Paris, France; and England. The Grand Gold Medal was awarded to Waltham for their showing of twelve automatic machines in London.

At one time, Waltham made the most expensive watch in the United States. It was the "Premier Maximus Certificate Watch." The selling price was \$750. It was a 16-size and Waltham claimed that it was equal if not superior to any watch made in the world. The following was taken from some of their advertising literature: "Description, Twenty-three Diamond, Fine Ruby and Sapphire Jewels; Three Pairs Diamond Caps, Raised Gold Settings; Balance, Pallet and Escape Pivots running on Diamonds; Jeweled Mainwheel Bearings; Red Gold Caps on Pallet, Escape and Fourth Bridges; Accurately Adjusted to Temperature, Isochronism, and Five Positions, and carefully timed in its case at the factory; Compensating Balance, Meantime Screws; Patent Breguet Hairspring Hardened and Tempered in Form; Patent Detachable Balance Staff; Bronze Train; Double Roller Escapement; Sapphire Jewel Pin permanently driven into the roller; Recessed Steel Escape Wheel with Gold Hub; Exposed Red Ruby Pallets; Tempered Steel Safety Barrel; Patent Micrometric Regulator; Steel Parts Highly Finished with Rounded Polished Corners; Patent Winding Indicator showing on the dial the number of hours, up to twenty-four, the watch has run since last winding; Fine Glass Hand-Painted Dial of the most modern and artistic design."

From 1906, the name changed to The Waltham Watch Company. Through the remaining years, the company had its ups and downs. Finally, due to the lack of investments and skilled labor, the Waltham Company gasped its last breath. In 1957, after producing 35 million watches, Waltham stopped making watches and became the Waltham Precision Instrument Company. The Waltham Watch Company name was sold to the Hallmark Watch Company who imported movements to use with the Waltham name.

Waltham had done more for the horological industry in America than any other watch company. Not only has America benefited, but all parts of the world where watches were sold or made. Other watch companies were offshoots of Waltham. Some of Waltham's employees were hired away to build machinery and start plants for the new enterprises. Credit must be given to all those associated with the early struggles of this great American company.

Edward Howard returned to Roxbury in 1857 and one year later, after paying off his creditors, assumed both the watch and clock business in which he had been engaged before his association with Waltham. Albert Howard, his cousin, came with the firm, E. Howard and Company.

With some 15 employees, most whom came with him from Waltham, work was started on tools and machinery. In about one year's time, watches were ready to put onto the market. Howard's main concern was that his watches be of superior quality.

In 1861, the name became The Howard Clock and Watch Company. Slow times with the watch sales were balanced out with clock sales and the other way around. Times were hard and the company found itself in financial difficulty. Money was borrowed on an inventory of completed movements worth about \$17,000. In 1863, the directors of the company thought it would be best to close the factory, sell the assets, pay off debts and divide whatever, if any, was left.

Fortunately, the property didn't sell. A new company was formed under the name of The Howard Watch and Clock Company and production once again commenced.

Between the years 1857 and 1903, the company produced approximately 900,000 watches. In 1903, all rights to the name "Edward Howard" were transferred to the Keystone Watch Case Company.

Howard watches earned the reputation of manufacturing superior timepieces. Edward Howard lived long enough to finally bring his dream to fruition, establishing a company that produced an American precision watch.

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Questions & Answers

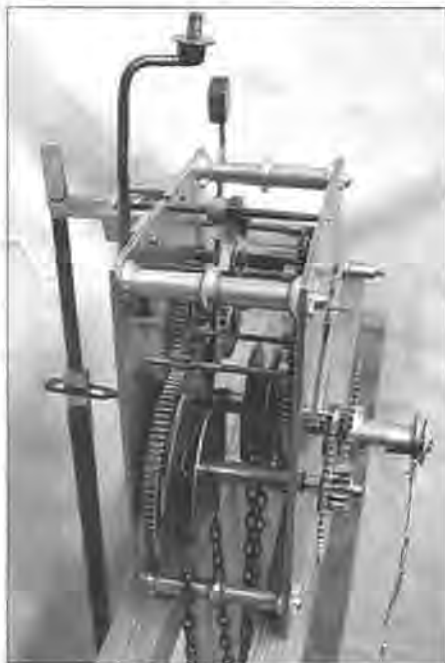
(Continued from page 4.)

rest of the dial is original.

No one I have talked to has ever heard of a clock like this. Is this truly unusual? I have worked on several clock movements very similar to this but have never noticed the second hand going in reverse; something a clockmaker is bound to notice.

The photo below shows the movement of the clock that has the second hand moving counterclockwise.

It is a 30-hour striking clock



driven by one weight on a continuous chain. I believe that is called the "Huygen's Fall."

The pallets are set up like the English Bell Strikers I typically work on where the entry and exit pallets are at right angles to each other.

I have more pictures of both of these clocks. If someone thinks they can help me gather information on these clocks it would be greatly appreciated.

Michael Gainey
Columbus, OH

Answer

Your *wooden bell striking clock with music box* is called an "organ clock," made in the Black Forest area of Germany. Such clocks date from the 1850s to 1890s and often have American themes painted on the dial and/or American melodies from the music box (many times made to order for the American market and even for individual clients).

I've been trying to reconcile the images depicted on the clock. All four individuals were contemporaries (although Franklin died before Napoleon had advanced very far into the French military ranks). Franklin and Jefferson were emissaries to France. Washington and Napoleon were great generals. Napoleon, Washington and Jefferson were heads of State. All four were noted statesmen. But why these four individuals were grouped together on the clock still alludes me.

The clock is certainly an interesting piece and surely would be considered rather unique and rare.

Your *antique English bell-strike movement* is, too, quite interesting.

As a general rule, 30-hour floor clock movements have a 3-wheel time train, while 8-day ones have four and usually five arbors in the time train.

From your photo the clock is of the 30-hour variety which was common in England 200-250 years ago. The clock would have been driven by a fine textured rope cord (rather than the chain that it has now) forming an endless loop called a Huygens loop, as you so correctly noted. The loop would have had a driving weight and a smaller counter weight to maintain tension on the loop.

The white painted dial and simplicity of the movement design indicates that it was provincial-made (i.e., made outside London in the "provinces"). The majority of these clocks were made for customers in the villages and rural areas of Britain, made by a rural maker to accommodate a market of limited means and

rock bottom prices. Making clock wheels and crossing them out was the most time consuming and therefore most expensive part of building a clock movement. So the only way to effectively reduce the cost of a clock was to reduce the number of wheels to a bare minimum. With a 3-wheel time train and a simple motion works driven directly from the main wheel arbor, your example would represent the bare minimum necessary to make an accurate timepiece for its day, using the wheel cutting equipment available to the rural clockmaker of the time. Simpler designs could be made but required larger wheels with greater numbers of teeth that were beyond the capability of the machines commonly used on a daily basis.

With this design, though, the second hand attached to the escape wheel would turn in a counterclockwise direction (Figure 3) a compromise acceptable for a far more affordable clock than those made in London at the time.

David A. Christianson,
CMW, CMEW
Technical Editor

Following are two responses from members regarding the March "Questions & Answers" column with Cameron Spicknall's query on a wrist chronograph and on the term avigation.

I just received my March issue of *Horological Times* and read your "Questions and Answers" column on the avigation chronograph with interest. Here's a little more information on the word avigation.

In 1928 the Elgin National Watch Company gave a presentation watch to one of the two Army Air Corps officers to make the first flight to Hawaii. As detailed in the July 1928 issue of *The Watch Word*, the watch factory's employee newsletter, the watch was engraved:

"To Albert F. Hegenberger in appreciation of his contributions to the new science of aviation and his successful application of this science in his flight from California to Hawaii, June 28-29, 1927. Presented on first anniversary of the epochal flight. Elgin National Watch Company."

The article also mentions that the Chief Engineer of the Elgin Aircraft Instrument Division "mapped out the course and assumed responsibility for the selection, adjustment and arrangement of the avigational equipment. Lt. Hegenberger, as commander of the flight, also performed as pilot, avigator, radio operator and flight engineer."

So it would seem from this article that, although the word was new, it was in fairly general use at that time, at least in aviation circles.

Perhaps also of interest, as noted above, Elgin had an Aircraft Instruments Division which was responsible for making aircraft clocks, compasses and ball bank indicators. All the aircraft instruments carried the name AVIGO on the dial. In addition, Elgin made a watch that was marketed specifically to pilots called the AVIGO. As one of the Legionnaire series of robust men's wristwatches, it was released to the public in December of 1928, and was frequently given to leading flyers of the day.

While I have been trying to determine the precise origin of the word AVIGO as used by the Elgin Watch Company (Aircraft Instrument division doesn't fit) with no luck, I suspect AVIGO is somehow derived from (or understood to be derived from) the word aviation.

*Peter Lamborghini
Redding, MA*

Thank you to Robert Barnes who helped us by identifying this movement as a Lemania calibre "C". He found this on page 115 of the Swatchchild 1946 material catalog #355. We certainly do appreciate those of our membership who are so willing to add to our knowledge of our profession. ☺

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Mark Butterworth

The Modern German Clock Movement

Part 24

Pendulum Length

While I was realizing that I needed to start thinking about the next article, I received an e-mail from a fellow member from Calgary, Alberta, Canada by the name of Murray Falk. He stated that there is a lot of confusion over the measurement of pendulum length and pointed out that the length as measured in the most common catalogues such as S. LaRose, Inc. in the U.S. and H & W Perrin in Canada do not correspond with that derived from information on the back of a clock movement such as Hermle or even the latest Regula cuckoo movement. The question "How long is the pendulum?" can generate a lot of different answers. In addition, if one looks at an antique American time and strike by Seth Thomas, it will often have a pendulum length stamped on the rear plate such as $5 \frac{7}{8}$. What gives?

This discrepancy is due in part to history and also the purpose of the material house which supplied the catalogue as well as the manufacturers of the movements. Going back the farthest, the physicist will generally define the length of the pendulum as the distance from the center of a mass to a fixed suspension point. This mass also has a zero size and its connection to the suspension point is weightless. From this, there is a simple formula which tells us that the period of the pendulum (the time required to complete one cycle or over and back) is directly proportional to the square root of the ratio of this length divided by the gravitational acceleration. That is $T = 2 \times \pi \times \text{sq. rt. } (l/g)$ where T is the period or cycle (over **and** back) of the pendulum, $\pi = 3.14$ approximately, l the length, and g the acceleration of about 9.85 m/s/s . You will be happy to know we are not going to get any more technical than this, but I might point out that the value of "g" varies at different parts of the world depending on altitude and latitude. In general, it increases with increasing

latitude and decreases with increasing altitude. It is very different on different heavenly bodies and is about one sixth of the earth's value on the moon. As a result, a pendulum clock will not keep exactly the same time in these different places and will run much more slowly on the moon. In addition, one can see that a pendulum four times as long will have twice the period or run half as fast ($2 = \text{sq. rt. of } 4$). This formula also tells us the obvious, longer pendulums run slower. It turns out that the clockmakers' "seconds pendulum," that is one which requires one second to move from one side to the other (a half-cycle) is approximately one meter long for a theoretical pendulum. This formula was the inspiration for the compensating pendulum. The idea of which is that the overall length of the pendulum stays the same whether the temperature is constant or increases or decreases; both the mercury and the gridiron pendulums are examples of this. While the length of the pendulum rod increases with the temperature, the expanding mercury expands upward.

Back to the subject at hand. Seth Thomas at one time used different movements in their mantle clocks, especially which were very similar in length. In order to lessen the chance of putting the wrong pendulum with the clock, the length of the pendulum rod (without the leader or hanger) in inches was stamped on the movement. Some of the most common were $3 \frac{5}{8}$, $5 \frac{7}{8}$, $6 \frac{3}{4}$, and $9 \frac{1}{2}$. The boxes containing the pendulums were marked, but in case of confusion the worker could simply measure the length of the rod. The Hubert Herr Cuckoo Clock Company actually uses the same method today and puts a sample stick in with each master carton of movements.

Next in the line of progression, comes the catalogues. Most of us in the U.S. grew up with the LaRose catalogue at the bench and how they did things became pretty much

standard. Historically they sold the clock movements complete with accessories for the clock builders. The clock builders sized up the project by the two things important to them, the position of the hands and the end of the pendulum. As a result, nearly every catalogue stated the pendulum length as measured from the handshaft to the tip of the pendulum. From a marketing point of view, considering who their target audience was, it made a lot of sense. Ironically, our sense of how we measure pendulum length came as a result of furniture makers who knew nothing about clocks!

Finally, we have seen large numbers of German clock movements coming in the shop with strange markings like P.L. 116 cm or simply 114 cm, both numbers in this case referring to a seconds pendulum. What do they mean?

First, it must be noted that these measurements are for what the manufacturers call a "theoretical pendulum." That means one will not likely get exactly the number stated because we are using "real," not theoretical pendulums. In addition, the clock companies are not talking about the same theoretical lengths as a physicist would. These pendulums can be wood stick or what we call lyre. The bobs can be small and light or large and heavy. As a general rule, because a lyre pendulum has a lot of metal in the form of the rods and lyre above the bob, it will always be physically longer for a given clock than a wood stick pendulum. A lyre pendulum with a small bob will be the longest of all. As an example, if a movement is marked 94 cm, the correct pendulum (tip to tip measurement only without the leader or hanger) for it will be about 32.5" if it is a wood rod, and about 35" if lyre.

Second, there was still not uniformity among the manufacturers. The following is a summary of the method of pendulum measurement among the major German companies:

1. Franz Hermle & Sohn: Suspension post to rating nut.
2. Urgos Uhrenfabrik: Same as above.
3. Kieninger Clock Co.: Suspension post to center of bob.
4. Jauch 1*: Handshaft to center of bob.
5. Jauch 2*: Suspension post to center of bob.
6. Regula: Suspension post to center of leaf.

* Note that there were two Jauch companies, both now out of business. The first was a major supplier to kit companies which helps explain why their pendulum length is uniquely measured.

I hope from this discussion it is realized that when clock repair persons are communicating with their supply houses or with each other, it is critical when specifying any type of length to state the beginning and ending points from where this measurement was taken. Measurements

are relative and useless without this information.

While discussing measurements, it is helpful to keep in mind that nearly every manufacturer measures handshaft length from the front plate of the movement to the very tip.

Finally, nearly all non-U.S. products are made to metric measure. Watchmakers learned to measure in mm, cm, and lignes long ago. It is time that those of us old dogs in the clock business learned some new tricks of measuring. The basics for our purposes are very simple.

- 1.) $1 \text{ cm} = 10 \text{ mm}$
 $1 \text{ m} = 100 \text{ cm}$
 $1 \text{ in} = 2.54 \text{ cm approx.}$

- 2.) Make life simple and go to the hardware store or your supply house and purchase a measuring tape about 2 or 3 feet that is in both inches and cm or simply metric, and also a metal ruler about 6 inches in metrics. Start measuring those items made to metric scale in cm and mm and they will make more sense to you and your supply house.

Final thought: *"Treat people as if they were what they ought to be and you help them become what they are capable of being."*—von Goethe.



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As a Clockmaker Turns

Saga of the Broken Pivot Part 2

Introduction

The objective of this series is to explore the broad scope of tools, arbors and skills used to replace a broken pivot. This is a hands-on demonstration of a wide variety of problems, tools, and techniques used to effect a high-quality result. The material is "fine tuned" to simplicity and time efficiency.

I will use six dozen hands-on illustrations. These are methods I have used over a half-century of proven success.

Annealing Considerations

Many arbors can be drilled without being annealed. Those that cannot be readily cut with a fine-pitch file must be annealed. Don't side step this process. A broken drill bit inside an arbor is a "total disaster."

Figure 13 shows the annealing tool and an arbor we will use for practice. The tool is a 1/4 inch diameter steel rod with an end hole that the arbor will just slip-fit into. Opposite tool end has another hole size. I wipe the rod bright with an abrasive pad to judge the heat process.

Never, ever, turn a direct flame on your arbor. Control is poor, and you will have fire scale on your piece.

The technique is shown in Figure 14. This tool is heated, flame removed, and the arbor slipped into the hole for a few seconds. Only insert the depth you desire to anneal. When you see blue exit on the arbor, pull the arbor away. I'll give some practice suggestions later.

Turn your attention to Figure 15. The tool was heated almost to dull red and the arbor inserted about 4 seconds. The insertion was deeper than needed in order to obtain illustration 16.

Arbor color change in Figure 16 indicates we will be able to drill that arbor 6-7 pivot diameters deep with ease. The arbor has no fire scale and will polish easily. I use hard pivot raw material, and leave the job arbor soft.

The larger arbor shown in Figure 17 needs a larger annealing tool. That tool must convey more heat for the larger arbor, and I would judge the heat needed to be low red on the tool. I'll give some practice suggestions later.

Working the Unusual

The wheel of Figure 18 is staked onto the pinion end. This means the wheel must be removed because it will sink the heat applied

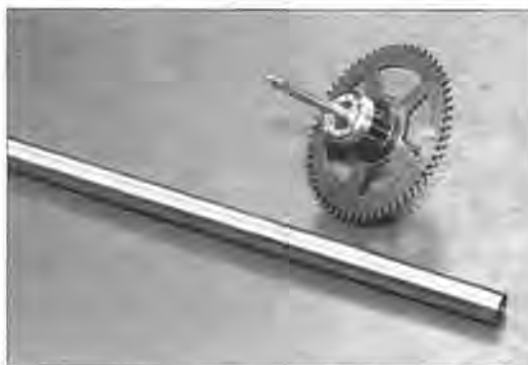


Figure 13. The annealing tool and a typical pivot and arbor example.



Figure 14. Annealing tool has a deep hole that the arbor will just slip in. The tool is a steel rod.

to the pivot region. A flat end hot rod is used to anneal this type of job.

Another more complex job is shown in Figure 19. Remove the start wheel and anneal with the tool in our first example.



Figure 15. The tool is heated just beyond blue. Insert the arbor for a few seconds.

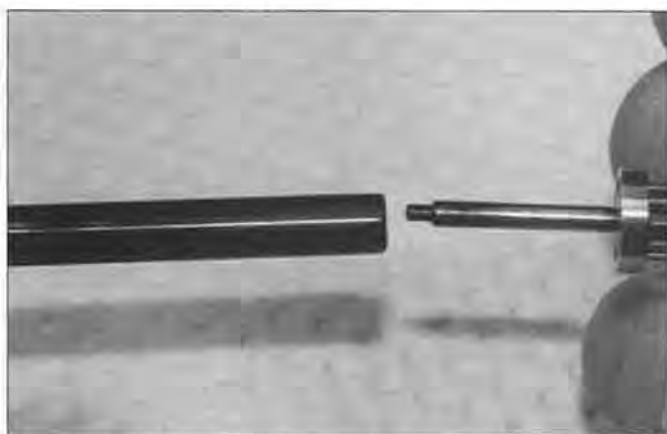


Figure 16. The arbor is now annealed for a depth that will be drilled.



Figure 17. A larger arbor needs another tool. Do not anneal into the pinion.

Here is how I remove the star wheel. Study Figure 20. Two parallel bars support the star. These bars are held together by two strips of paper masking tape. Place these across the jaws of a vise. A small hollow punch drives the arbor out of the star.



Figure 18. This one is unique. The wheel may need to be removed. A larger annealing tool with a flat end would be the choice.

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TWZ-301.18	3c	Stainless Steel	110mm (4 3/8")	14.75
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Figure 19. The star wheel must be removed, then the annealing tool is used.



Figure 22. This is one of the most complex examples to anneal. Use a larger tool with a flat end. Do not anneal into the pinion's functional region.

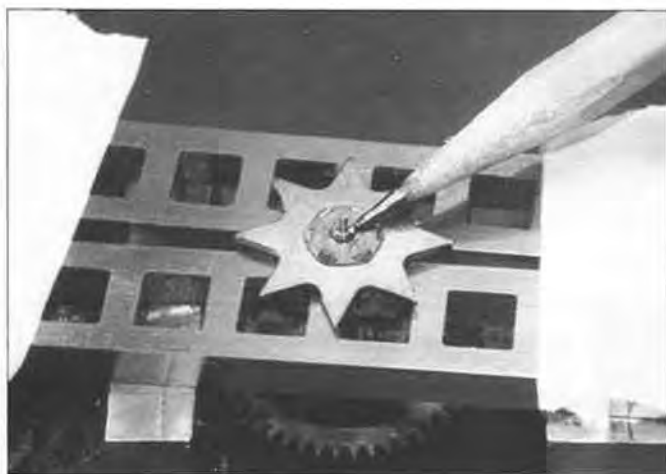


Figure 20. Star removal is easy. A pair of parallel bars across vise jaws is the support. Masking tape keeps the tools in place.

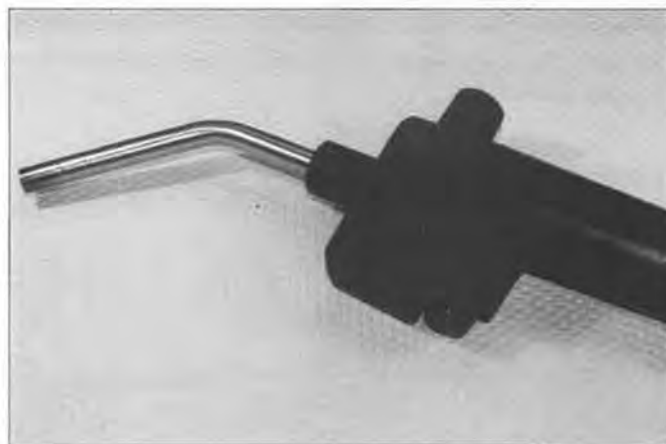


Figure 23. Hand-held propane torch that I use. It screws onto the 14-ounce propane container.



Figure 21. Annealing tool with two pieces of steel rod. A few minutes of practice will teach the ease of this task.



Figure 24. The hand-held grinder that is widely used in this series of pivot work.

Annealing Exercise

For those who are unfamiliar with the annealing process, I suggest you try this exercise.

Make up an annealing tool with holes to fit some common steel objects. Steel wire nails, steel wire, pivot raw material, etc. Clean off your tool and the object to be annealed. Watch the color changes, rate the color progress and the degree of fire damage on the tool. Do not expose your clock pieces to direct flame.

Select a round steel wire nail approximately the diameter of the arbor to be worked. Try several times with the nail. When you are pleased with nail result, the arbor job will be simple and easy.

The example in Figure 22 is probably one of the more difficult jobs. A flat-end heated tool on the arbor end is about the only solution. You may run color into the pinion, but stop before you reach the wheel track area that mates with it.

Other Tools

The hand-held motor tool of Figure 24 is widely used in my shop. This is the tool of choice that I used in this exercise.

One disclaimer on grinding: I show a thin grinding wheel held in a lathe collet. All of these photographs were long time-exposures. I cannot hand-hold a tool for a time exposure. Those jobs were done with this tool.

The torch of Figure 23 is my tool of choice for all of the annealing work.

Looking Ahead

Part 3 of this series will continue with a variety of lathe holding and driving techniques. It will relate how the various pieces discussed are held and driven during drilling. No one method or technique is a "fit all" for pivot work.

Another four dozen hands-on illustrations are awaiting your view.

President's Message

(Continued from page 2.)

John Kurdzionak is the Affiliate Chapter Director. The affiliate chapters are very important to the life of AWI. Chapter delegates collectively bring member concerns and suggestions that are important to their local Chapters to AWI for consideration.

There are several other very important Committees quietly working behind the scenes to assure that AWI functions like a fine watch. They are: the *Horological Times* Committee, chaired by Linda Chrysler; the Finance Committee, chaired by Fred Burckhardt—Fred also chairs the Publicity Committee, and the ELM Trust; the Perpetuation Fund, and Book Review Committees are chaired by Robert Porter; the Membership Commit-

tee is chaired by Terry Kurdzionak; and the Honor Awards Committee is chaired by Ewell Hartman. Tony Riggio is the Industry Advisory Board Director and helps AWI communicate with industry. Gene Bertram is our Parliamentarian.

These are just a few of the people who help with AWI activities. It is important to note that all the Directors, Committee members, and Affiliate Chapter folks are unpaid volunteers who contribute their time and talent for the benefit of every AWI member. I wish we had the space to name all those who contribute so much to AWI. Thanks for an outstanding job, everyone!



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Technically Watches

Pocket Watches and Their Maintenance Part 48

Timers for Sporting and Other Events

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Timers are made for use in timing mostly short events that last for seconds or minutes, although some timers are made for timing events that last for hours.

There are three grades of timers. The simplest grade of the three grades of timers is the stop watch. The stop watch gets its name from the fact that when the timing mechanism is stopped by pressing the crown, the balance wheel also stops. The balance wheel remains stopped until the mechanism is restarted by pressing the crown.

The second grade of timers has a higher grade of mechanism similar to the mechanism used in a chronograph watch. When this mechanism is operated, the balance wheel does not stop. The timer mechanism disconnects which stops the hands from moving.

The third grade and the highest grade of timer is the chronograph watch. The chronograph watch has an hour, minute, and second hand in addition to the timing mechanism and its recording hands that can be started, stopped, and returned to zero by pressing the crown or button on the edge of the case. The balance wheel continues to turn when the timer mechanism is stopped.

The Stop Watch (Timer)

Figures 1 through 4 show a stop watch and its mechanism. The dial and hands are shown in Figure 1. This stop watch has a 1/5 second dial and mechanism. The long sweep hand records up to 60 seconds. The small hand records up to 30 minutes.

Stop watches are made in 1/5, 1/10, 1/20, 1/30, 1/50, and 1/100 second models for timing a variety of events. The difference between these timers is the dial, train, and the number of vibrations that the balance wheel makes.

Figure 2 shows the back side of the movement. The slot in the lower plate that is shown at the bottom of the photograph at the edge of the balance cock and edge of the balance wheel is for the stop spring to work in. The stop spring is mounted at the end of the stop lever. The spring goes against the balance wheel and stops the wheel when the crown is pressed for stopping the mechanism.

Figure 3 shows the stop watch mechanism under the dial. View A shows the seconds heart and tube that carries the sweep second hand. This heart fits onto the 4th wheel pivot. View B shows the minute register heart which carries the minute register hand. This heart fits onto the center wheel pivot. This center wheel is offset from the center of the movement.

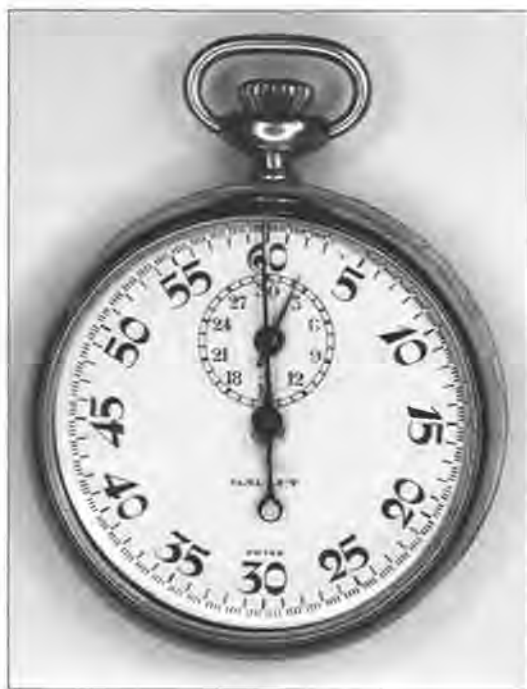


Figure 1



Figure 2



Figure 3



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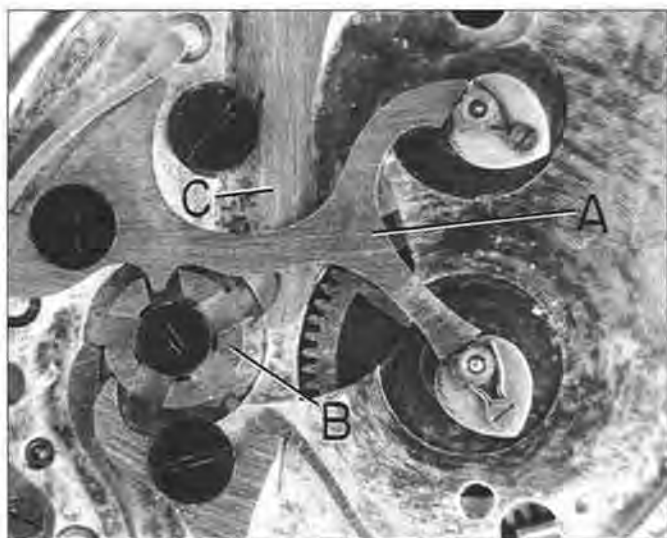


Figure 4

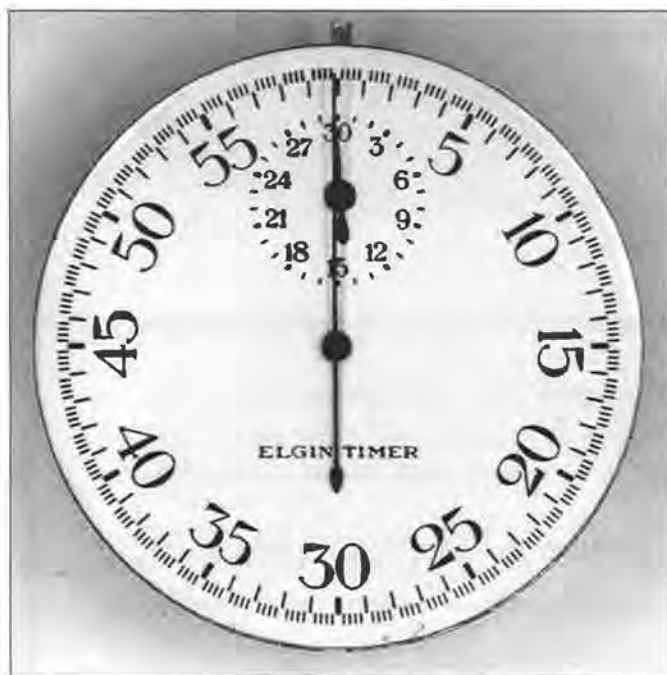


Figure 5

Figure 4 shows a close-up view of the mechanism under the dial. View A shows the hammer (fly back lever) with its two arms against the two hearts. The upper heart is the minute heart and the lower heart is the seconds heart. When the hammer is in this position, the two hands should be in a zero position. View B, Figure 4 shows the pillar wheel which controls the actions of the hammer and other levers in the mechanism. The pillar wheel is turned by the operating lever when the crown is pressed. The operating lever is shown in View C, Figure 4. A nib on the hammer near its base works on the pillar wheel to change the position of the hammer. The



Figure 6

hammer has three positions. These are the start, stop, and return to zero positions.

The Elgin Timer

The second type of timer that has a more refined type of mechanism is shown in Figures 5, 6, and 7. This timer happens to be an Elgin timer; however, other makes are similar to this one. The balance wheel of this timer does not stop when the mechanism is stopped by pressing in on the crown. Only the gearing disconnects when the crown is pressed, the balance keeps on vibrating.

Figure 5 shows the dial and hands of the Elgin timer. This is a 1/5 second timer. The sweep second hand turns one revolution in 60 seconds and the minute recording hand turns one revolution in 30 minutes. The balance wheel vibrates 300 times per minute or 18,000 times per hour.

Figure 6 shows the back side of the Elgin timer. This is the standard 16 size Elgin movement that has been modified to be used for a timer. The center pinion is hollow to accept the seconds wheel arbor.

Figure 7 shows the timing mechanism under the dial of the Elgin movement. This mechanism is designed like the mechanism on the back side of a chronograph watch. The timer mechanism is in a return to zero mode. The two branches of the hammer are against the minute and seconds hearts. The timer train is disconnected when the mechanism is in stopped and return to zero modes. When the crown is pressed to start the mechanism, the train reconnects so the hands can turn. The connecting and disconnecting is done by using a connecting pinion

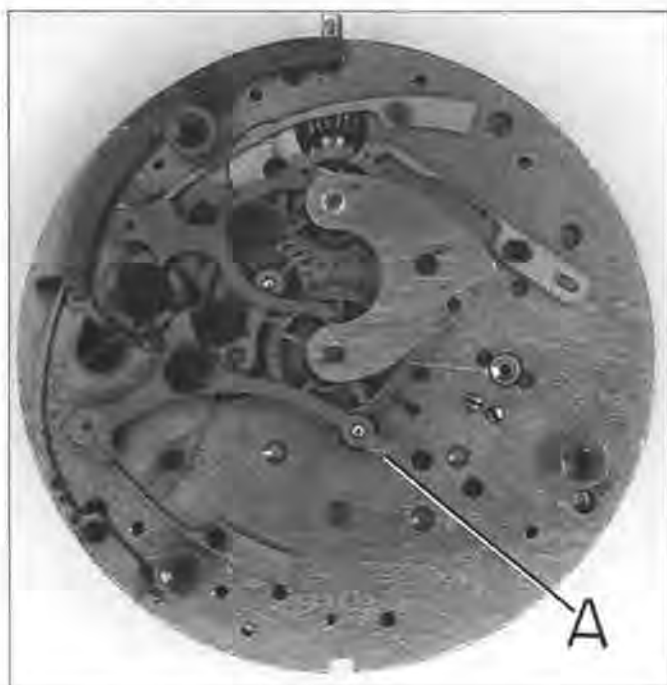


Figure 7

that is driven by the watch's 4th wheel. The other end of this pinion has a head of fine "V" teeth that connect into the seconds wheel to drive the timer mechanism. The course end of the pinion is supported by a small cock between the watch plates, and the fine end of the pinion is supported by the connecting lever. This lever is shown in View A, Figure 7. When the timer mechanism is started, the pillar wheel moves the connecting lever to swing the connecting pinion into mesh with the seconds wheel. When the crown is pushed in to stop the mechanism, the pillar wheel causes the connecting lever to swing the connecting pinion out of mesh with the seconds wheel.

A Swiss Timer with a Chronograph Type Timing Mechanism

Figures 8 and 9 show a Valjoux 24 timer. This is a very good quality timer which uses a chronograph type mechanism to operate the seconds and minute recording hands.

Figure 9 shows the back side of the movement and the chronograph mechanism. The balance wheel does not stop when the chronograph mechanism is operated. The chronograph train is connected and disconnected during the operation of the mechanism by pressing on the crown.

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Figure 8



Figure 9

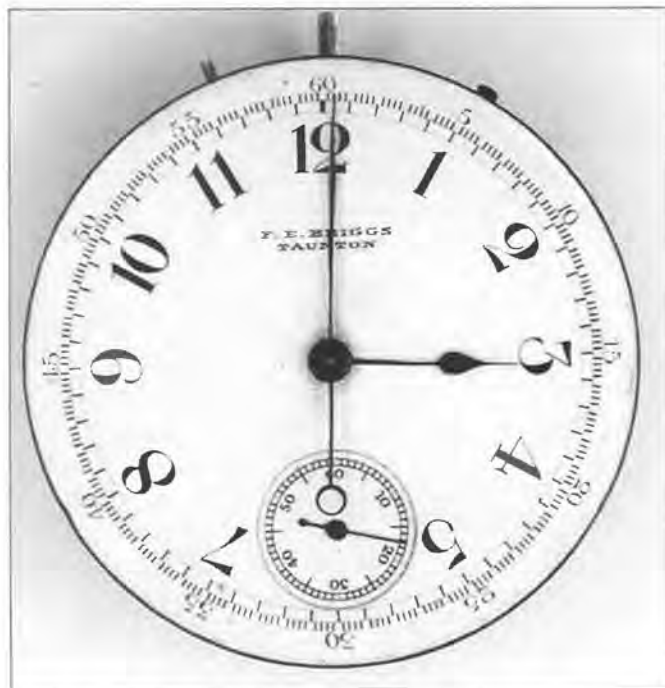


Figure 10

The Waltham Chronograph Watch

Figures 10 and 11 show the 16 size Waltham chronograph. The dial of this watch is shown in Figure 10. This watch has a sweep second hand that can be started, stopped, and returned to zero by pressing in on the crown. The watch does not have a small minute register hand that stop watches and timers have, but it does have an hour, minute, and regular second hand that a chronograph watch has. This is a 1/5 second chronograph.

Figure 11 shows the back side of the Waltham chronograph movement. The design of this chronograph mechanism is most unusual. The chronograph wheels have extremely fine teeth on beveled surfaces. The drive wheel is frictioned onto a long pivot on the 4th wheel. This drive wheel with 300 teeth drives a small 50 tooth double beveled intermediate pinion. The intermediate pinion floats between a pivot hole in the train bridge and the pivot hole in the upper bridge. The center sweep seconds wheel has 300 teeth and is driven by the intermediate pinion. When the crown is depressed to start the timing mechanism, the pillar wheel allows lever A that is under the center seconds wheel to move away from the shoulder of the wheel. This causes the center seconds wheel to go downward and connect with the intermediate pinion to drive the wheel.

When the crown is depressed the second time, this causes lever A to be moved by the pillar wheel toward the shoulder of the center seconds wheel. This action causes the center seconds wheel to be lifted so it is out of mesh with the intermediate pinion. This is the stop position for the mechanism. At the same time, when the

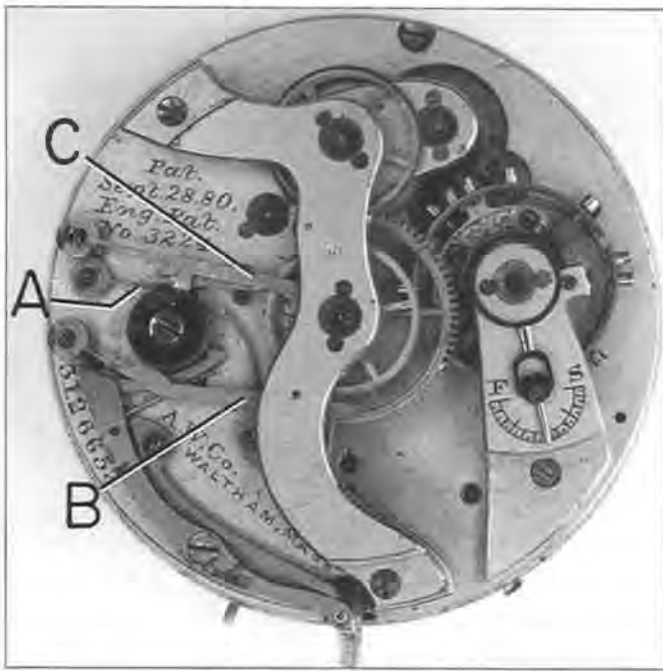


Figure 11

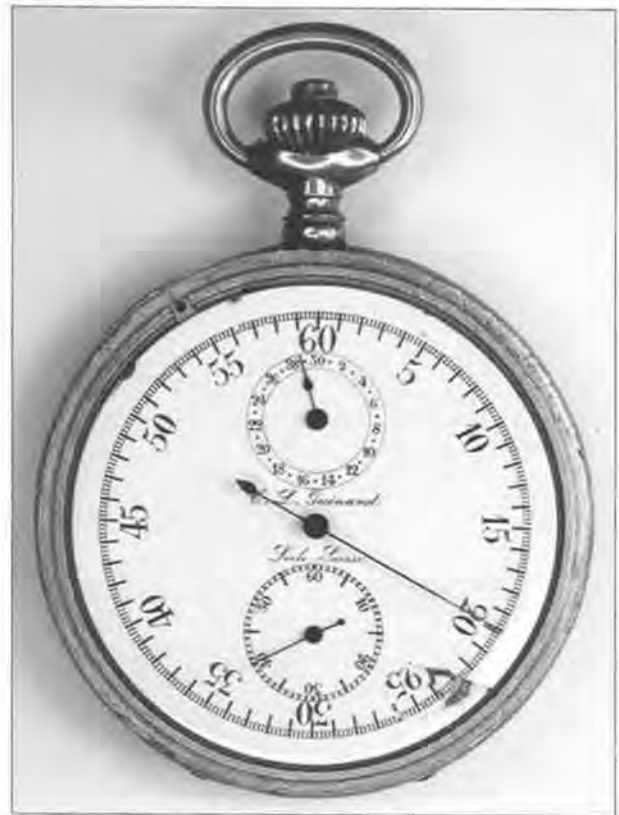


Figure 12

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Figure 13

mechanism is being stopped, lever B goes against the edge of the center seconds wheel to lock the wheel at its stopped position.

When the crown is depressed the third time, the pillar wheel causes lever B to move away from the edge of the center seconds wheel and, at the same time, lever C goes against the center seconds wheel heart. This action causes the center seconds hand to return to zero.

The Split Seconds Timer

Another more complicated timer is the split seconds timer. This timer is shown in Figures 12 through 14.

Figure 12 shows the dial and hands of this timer. *Note: The watch should have two sweep second hands, one hand is missing in the illustration.* This is a 1/5 second timer that records up to 60 seconds with the sweep hand and up to 30 minutes with the minute recording hand. This watch also has a regular second hand.

Figure 13 shows the timing mechanism on the back side of the movement. This mechanism is like that which is used on a chronograph watch. The button in the center of the crown is pressed for the start, stop, and return to zero functions.

The split seconds mechanism is situated under the dial of this timer. Figure 14 shows a close-up view of the split seconds mechanism.

The split seconds mechanism is described as

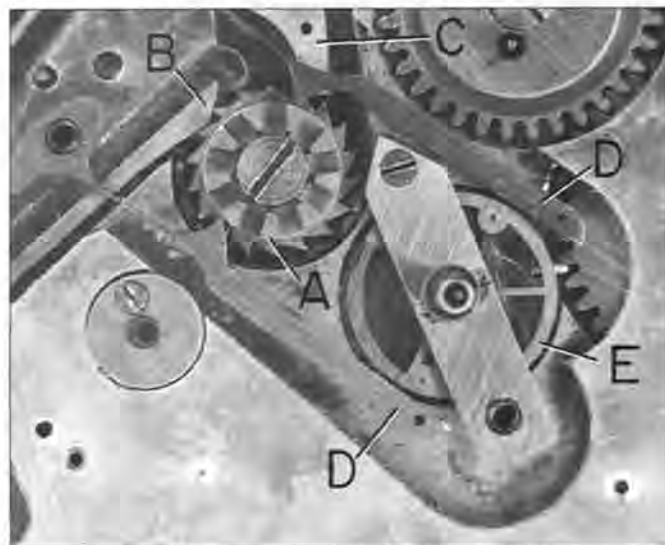


Figure 14

follows: This mechanism is operated by a separate button on the edge of the case about 30 degrees from the pendant of the case. A separate pillar wheel is used to control the two levers that work against the split seconds wheel. The pillar wheel is shown in View A, Figure 14. The pillar wheel jumper is shown in View B. The operating lever is shown in View C. The levers are allowed to go against the edge of the wheel to stop the wheel and its sweep hand. A second press on the button causes the levers to move away from the wheel so the wheel and its hand can start moving. The levers are shown in View D, Figure 14.

The split seconds wheel fits around the long pivot of the center seconds wheel that extends through the lower plate of the watch. A small heart is fastened to the long pivot under the split seconds wheel. A spring tensioned lever that is mounted on the under side of the split seconds wheel works against the heart to cause the two sweep hands to be brought together. The split seconds wheel is shown in View E, Figure 14.

The button in the watch crown operates the chronograph mechanism and the button on the edge of the case operates the split seconds hand.

When the crown is pressed, both sweep hands start at the same time and stay together. When the button on the edge of the case is pressed, the split seconds hand can be stopped while the other hand continues to turn. Pressing on the crown a second time will stop the moving hand. Pressing the side button will bring the two hands together. Then, by pressing the crown a third time, both hands will be brought back to zero. Multiple events can be timed with the split seconds timer.

"Timers" will be continued.



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Jack Kurdzionak, CW

From the Workshop

You Are Invited

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

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

Diamond Cases

Beware of those vintage wristwatch cases, usually women's models that are set with diamonds or other stones around the bezel. These stones are set into holes that were drilled or punched through the bezel. They are usually held in place by having the surrounding metal burnished. They look lovely, but each stone is set in a hole that admits all sorts of dirt into the watchcase and movement. It is not unusual for these watch cases to load up with dirt in just a few months after having had the case and movement cleaned. Whenever we repair one of these watches, we coat the underside of the stones with clear GS crystal cement applied from its HYPO-TUBE dispenser. This procedure makes the case much more dust resistant than it would be otherwise. It is also a reversible procedure that does no harm to the case or stones.

Beware of cleaning these cases in any kind of ultrasonic tank. The cleaner does a fine job, but on occasion a stone will fall out of its setting. It may have been loose and ready to drop out or it may have fallen out previously and been cemented in place by another repair person. To prevent the loss of these stones, clean the case in a small mesh basket to catch any stones that have fallen out during the cleaning process. When they must be replaced have them burnished in securely rather than use cement of any kind.

Jack Kurdzionak

When 1 + 1 + 1 = 4 or More

In the business world simple arithmetic doesn't always work out the way we were taught. I remember my high school geometry lessons that stated, "the whole is the sum of its parts." That may be a fact in arithmetic class, but not necessarily so when you are selling something. This tip from the late Chris Mansolilli falls into that of wise business practice rather than technical hints.

Many years ago Chris and I used to regularly attend NAWCC Marts together. With over 50 years experience as one of Boston's better watchmakers, Chris was ready to sell his accumulation of watches and tools as he neared retirement. We would rent a table at a Mart and Chris would bring part of his accumulation of STUFF to sell. Not only a good watchmaker, he was an honest and shrewd businessman as well. By day's end, Chris usually sold most of his STUFF at a satisfactory price and we had to pack very little for the trip home.

In addition to his large hand tool collection, he sold old pocket watch dials, cases, and movements. I asked him how he had acquired such an immense collection of pocket watch parts. His answer was simple. He didn't

gather pocket watch parts. He made the watch parts by taking pocket watches to the Mart in three pieces so that they could be sold separately. He realized a much greater sale price by selling them separately rather than as a complete watch. As an example, he would take a complete pocket watch that would sell for \$50 and make it into three separate items for sale. The case would sell for \$35, the dial for \$10, and the movement for \$30 for a total of \$75 rather than the \$50 they would command as a single unit.

There is an important corollary to Chris's words of wisdom. When you need a part for an obsolete watch, it is often better to seek out a complete watch or movement rather than attempting to purchase just one or two parts for that watch. A good example of this might be the watchmaker who needs a 4th wheel and pinion for a 16 size Illinois watch. That part is scarce and the price of a replacement will be commensurate with its scarcity. Wouldn't it be much better to go to a Mart and seek out a complete watch, needing repair, that has a good 4th wheel? For about \$60 the watchmaker not only has a 4th wheel, but he's got an entire movement of useable spare parts that can be used, as needed, on the current repair as well as other repairs in the future.

Jack Kurdzionak

The Lowly Dial Washer

No, I am not referring to a person who cleans the faces on street clocks, but the dial washer that is used on hour wheels of watches. A watchmaker servicing a wristwatch featuring a GMT type dial with an hour hand rotating once in 24 hours noticed the following problem. The watch has an ill fitting, very large dial washer in addition to excessive end shake on the hour wheel, causing the hour hand going out of coordination with the minute hand. He asked how he might solve the problem and what size dial washer should be installed.

Contrary to what is viewed as common knowledge, the primary functions of a dial washer are to add friction to the hour hand and keep the hour hand parallel to the minute hand. The hour wheel does not transmit power. The hour wheel literally floats under the dial. Its only function is to carry the hour hand. The friction added by the dial washer prevents the hour hand from having visible backlash (somewhat similar to a brake spring on an indirect sweep second hand). The axial pressure toward the pillar plate on the hour wheel from the washer also keeps the hands parallel.

Many think that the dial washer is to keep the hour wheel engaged in the minute pinion, but if you examine an Accutron 214 Spaceview model it works just fine without a dial washer. The shake of the hour wheel is controlled by the minute hand's position upon the cannon pinion.

For this watch, I recommended he discard the oversize washer and try deflecting the center of the dial down slightly to reduce the end shake of the hour wheel. This is done by supporting the edge of the dial on a round fixture, being careful not to damage the legs, covering it with a thin transparent plastic sheet to avoid marking the dial, and gently depressing the center hole with a pencil eraser. A slight deflection will limit the end shake. Next, fit a proper size dial washer, one that is not so large that it will interfere with the meshing of the hour wheel teeth. Install the dial and test the hour wheel for end shake. Check for proper end shake on the hour wheel. There should be some shake, but not so much that the hour wheel disengages from the minute pinion. Then install the hands and be sure they are properly positioned upon their posts. Finally, be certain the hands are parallel to each other as well as the dial, and clear each other as they turn.

Of course, any deflection done to a dial should be minimal. This is only for small adjustments to end shake.

Jack Kurdzionak



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You are invited to attend a dinner, sponsored by the AWI-ELM Charitable Trust, on Friday night August 2, 2002 at the Hilton Greater Cincinnati Airport.

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- In cooperation with AWI, maintains the movement bank and material search network to assist members in replacing hard to find parts for vintage timepieces.

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This "Friends of the Trust" dinner could be

your way of helping the Trust to continue its important work of contributing to the education of the next generation of watchmakers and clockmakers and maintain the historical record of our craft. The dinner tickets will cost \$50.00 per person, which will include dinner and a presentation by John Ventre of the Cincinnati Observatory.

Please send your reservations to the ELM Charitable Trust Dinner to AWI or use the meeting registration form found on page 51 of this issue. If you can't attend the dinner, won't you send a donation? Please make your checks payable to AWI-ELM Trust. The AWI-ELM Charitable Trust is recognized as a charitable or educational institution under Section 501(c)3 of the Internal Revenue Code by the Internal Revenue Service. Donations to these types of organizations may be deductible to you for income tax purposes, to the extent that they exceed the fair market value (FMV) of any goods or services received. Please consult with a tax professional.

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Fred S. Burckhardt
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NEW REQUESTS

L&R Model 728B

Clock Movement Cleaner

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

ITEMS STILL NEEDED

New Hermes Engravograph CA300 Calligrapher Attachment

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

Hanhard 560 Timer

Willard Kiser, Ironton, OH, is searching for a parts list and technical information for a Hanhard 560 Timer.

Macintosh Software for a Watchmaker's Workshop

Severo S. Saylon III, Verona, Italy, is seeking information on possible Macintosh computer software to assist him in running his watchmaker workshop (i.e. client files, watches, clocks, spare parts, etc.)

Dixie Milling Machine Instruction Manual

Odell Frank, Sacred Heart, MN, is seeking an instruction manual for a Dixie Milling Machine, Swiss made. The machine is the same as used in the Bulova Watch Company.

Truing & Poising Calipers

Del Faulds, Yachats, OR, is seeking a source for a complete set of truing and poising calipers used on old Navy clock balance wheels.

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

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ACCUTRON

Information & Stories I Recall

Larry Blanchard, CMW

Accutron

Ask anyone under the age of 25 if they know what an Accutron is and they will probably say no. But for a period approximately 1960-1980, Accutron was a household word in America. It acquired a reputation as the most accurate watch available, bought for personal use and given as gifts by the millions.

The following stories portray some of the prestige of the watch, and the frame of mind of jewelers, watchmakers and consumers during the Accutron era.

When the watch was put on the market, supplies were very limited. One jeweler's wife tells the following story. Early shipments of the watch were rationed. Her store got one watch in their initial shipment. Her husband liked the watch so much, he did not try to sell it. He probably could have sold it to any one of several customers at full retail. Instead he took it as his personal, favorite watch and wore it almost exclusively the rest of his days. At his funeral his family had the watch placed on his wrist and it was buried with him.

A watchmaker had taken Bulova's field training course on Accutron repair, and was very proud of his newly acquired technical ability. A customer came in with his Accutron, complaining that he had taken it to several shops and could not get it to keep accurate time. The watchmaker assured the customer that he could take care of

the problem. A few days after picking up the watch, the customer came back and promptly punched the watchmaker in the face, bloodying his nose and breaking his glasses. "The watch is running worse now than before," he said. The watchmaker sued. In court the judge asked several questions. It turned out that the customer was checking his watch randomly with any clock or radio. The watch was actually keeping time as advertised. The judge awarded the watchmaker \$500 and the cost of new glasses.

Another customer came into his local jewelry store every week for several months, admiring the model 214 Railroad Accutron. Finally he asked if he could put one in layaway for \$2.00 per week. The jeweler said yes. Every week, faithfully, he paid the \$2.00. During this period of time, he acquired every piece of printed literature that he could find, learning as much as he could about the watch. One of the technical facts he learned was that it is possible to regulate the dial time by storing the watch in particular positions when the watch is off the wrist. Thus, by checking the correct time from WWV short wave time and frequency standard, he monitored the time and could make it gain or lose fractions of a second each night when the watch was off his wrist. For several years, he would bring the watch in for a new power cell, exactly on the anniversary date of delivery of the watch to him. The watch was never off time more than 3 or 4 seconds.

A man purchased an Accutron, impressed with the claim of accuracy of one minute per month. Several times in the following weeks, he brought the watch to the store for regulation, complaining "it is not keeping time within 2 seconds per day." Each time the watchmaker checked the watch's time against his master clock and on his timing machine. Each time he explained that accuracy was guaranteed within one minute per month, not precisely 2 seconds per day. Then, after several weekly and sometimes twice weekly visits by the customer, he did not appear at the store for a month. When he did, he had a written log of the time observed on the dial, each 12 hour period of the day. Again he was complaining. The watchmaker looked at the log and checked the watch. Then he pointed out that the watch was off only 58 seconds in the 1 month period. "But look," the customer stated, referring to the log "on this day it was 4 seconds off, and on this other day only a 1/2 second. It is supposed to be 2 seconds per day." Neither the watchmaker or the jeweler had any success at making him understand that nothing was wrong with his watch.

"Sell a man an Accutron and watch him turn into a nut." This phrase was the theme of a series of TV advertising spots for Accutron. In the ads a man would look at a public clock, then at his Accutron. If the clock was off time according to his Accutron, he pulled out a pistol and shot the clock. I believe the series also appeared in

some magazines, and was only used one season (3 to 6 months).

An Accutron factory joke - Why does an Accutron hum? Because it does not know the words.

A consumer purchased a model 214 Accutron and was very proud of it. During the first 3 months he had it, he brought it to the jeweler for regulation, stating that it was gaining several seconds a day. He was a very good customer, and also personally known to the jeweler. He was not a complainer or an irritating type customer. After about 3 months the watch started losing and, eventually, got to the point where it was losing several minutes per day; however, the rate on the tuning fork when checked on the timing machine showed no loss. Since the watch was still within the 1-year

warranty period, the jeweler suggested that the watch be sent for factory adjustment. The customer agreed. When the watch came back, he continued to come to the store with basically the same story: gaining several seconds a day for several weeks, then losing several minutes a day, gradually getting worse. This time the watchmaker in the store examined the watch and found that there was almost no friction on the center wheel assembly. That was causing the hands to fall behind excessively. This series of events went on 4 or 5 times, with a couple more trips to the factory, and the watchmaker working on the watch in the store. By now the watch was out of warranty, and the jeweler was getting more puzzled and a little tired of seeing his friend for the same reason, and having to give away the repair, for the watch was less than 2 years old.

He knew that his customer friend was a carpenter, so one day he asked a few questions. "Do you wear the watch when working?" Yes was the reply. "Do you wear it on your left hand?" Yes was the reply. "Are you right-handed or left-handed?" Left-handed was the reply. Then came the dawn of discovery in the jeweler's mind. The explanation: The gaining of time during the first weeks was caused by over-amplitude of the tuning fork, caused by constant pounding motions of the left hand. Then after several weeks, with the force of gravity constantly pulling on the hands, the friction of the center wheel assembly was lost, causing the watch to lose several minutes per day. The jeweler asked the carpenter to wear the watch on his right hand. He agreed. Thereafter, the watch kept excellent time for many years.



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Laurie Penman

Westminster Chime Correction

I came across a type of correction device for the Westminster chime that I have never seen before and it is rather neat. It may be familiar to other people, (after all it is a mass-produced movement) but it is the first one I remember seeing. The backplate of the movement bore crossed arrows but I think it is too late a model for HAC and is probably a Junghans.

Correction devices are intended to put the chime back in sequence with the hands after a hiccup of some sort—owner moving the hands or the chime barrel being allowed to run down before the time train stops, (typically when we go on vacation). There are several ways of achieving this but most depend on two stopping systems that coincide at the end of the “quarter to” position, (“quarter of”). One of these will remain in place, holding the train back, until a long lift is made at the hour, then both are lifted clear and the train can move again. These systems require a fairly careful relationship between the two methods of holding the train back.

The photograph shows a count plate that has the plateau between quarter to and the hour, raised above the others—it has a slightly larger radius.

Just before chiming the small “L” shaped lever has its projection dropped into the slot of the count plate. It is pressed against the left-hand side of the slot and has been moved to the right until the vertical stop lever engaged a pin on a train wheel and stopped the clock after the last chiming session. The horizontal lever (shown in part only) carries a warning blade for the chime and at its left-hand end operates the lift sequence for striking—a perfectly normal rack striking system.

As the minute hand rotates a four-horned piece lifts the horizontal lever until its warning blade is in position and then a little further to lift the projection out of the slot. The “L” swings back to vertical and the stop lever to the right of it is rotated counterclockwise by the balance weight releasing the train to the warning.

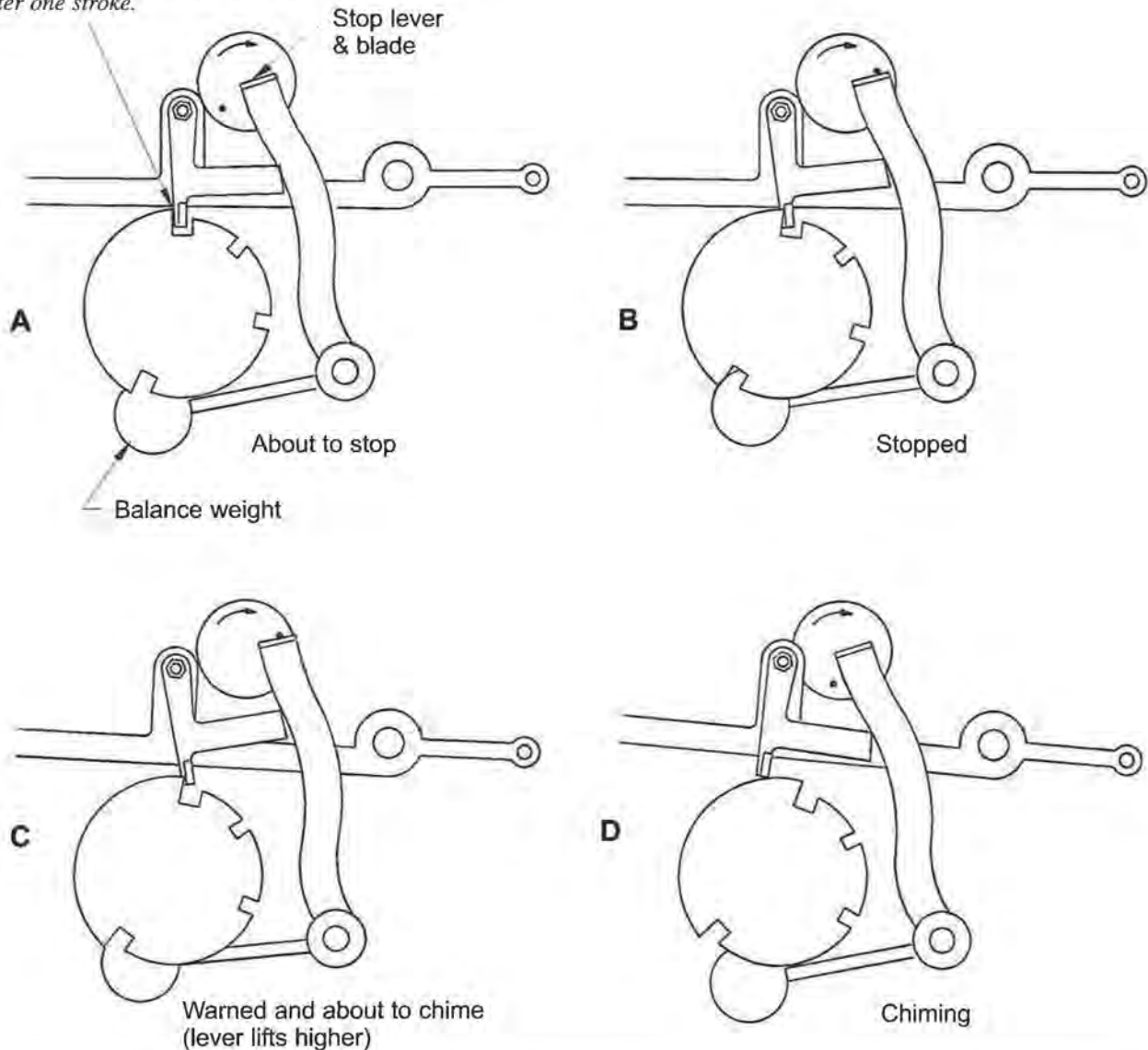
At the quarter, the long lever drops off the horned lifting piece, the warning blade drops out of position and the clock commences chiming. During the whole of the chime sequence the projection rests on the outside diameter of the count plate, held there by the pressure of the stop lever pressing against its right-hand end, (the balance weight maintains this pressure).



Must be smooth or when the hour chime commences the swinging arm will catch and move to operate stop lever after one stroke.

Hour plateau is higher and will not release swinging arm until lifted by large horn.

Must be smooth or when the hour chime commences the swinging arm will catch and move to operate stop lever after one stroke.



When the projection drops into a slot, the count plate carries on rotating until it swings the "L" lever to the right and forces the vertical stop lever into the stopping position ... and the train stops.

At the "quarter to" position of the count plate, the plateau is higher and so the projection cannot be lifted free of its slot until the extended lift at the hour position is made. As a result the chiming train remains locked. At the hour the extra lift frees the projection and the chiming proceeds in the normal manner.

It is pretty foolproof and requires little or no adjustment by the clockmaker but... if the outside diameter of the count plate is sticky or rough it will drag the projection to the right and stop the clock after one sequence (four hammer blows) of the chime. Make sure it is clean and polish with 800-grit emery paper. ☺

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John F. Kurdzionak

Affiliate Chapter Report

An Invitation

The Massachusetts Watchmakers-Clockmakers Association (MWCA) is New England's only AWI Affiliate Chapter. It holds five regular meetings per year, usually on Tuesday evenings. All of MWCA'S meetings begin with a social hour, then a delicious buffet dinner, followed by a brief business meeting, and then finishes with an interesting presentation given by a guest speaker. Other Chapters may have meetings similar to this, or quite different, but the importance of membership in, and attendance at, local Chapter meetings, regardless of their format, is the emphasis here. We have a format in Massachusetts that works for us, but it is certainly not the only way of doing things.

Guest speakers in Massachusetts are often local talent from the Boston area. For example, in March the guest speaker was Tom Barry, President of Yeuell Nameplate and Label Corporation, which is the metal finishing company that manufactures Chelsea Clock Ship's bell dials for Chelsea Clock Company. Tom is as local as they come, his home being right around the corner from my parents' home, and his company being one town away from where our Chapter meetings are held. His presentation was an excellent slide show showing the manufacture of Chelsea dials from start to finish. Your own chapter will likely find that there is local talent available for presenting a program to your group. Tom manufactures Chelsea dials, he happened to be in our family's place of business one afternoon for a battery change, and while there, he was asked by my father to speak to our group about Chelsea dials. He accepted. Believe it or not, finding a speaker for your group can often be as simple as that, and the presenter does not necessarily have to be a watchmaker!

On occasion, as a special treat, Massachusetts does arrange to have a guest travel from afar to speak to its group. There is excellent talent elsewhere, and in the past we have been fortunate to have several speakers from

afar be willing to visit Massachusetts, including Jim Lubic, Henry Fried, Mark Butterworth, Ben Matz, and Gene Kelton, to name a few. Bringing in a speaker from another part of the country makes for an interesting, and sometimes well-needed, change of pace from the norm. Your local chapter, if it invites guests from afar, will often find that the answer is "yes," and this will make for an excellent change from the meetings your chapter is used to.

With the intent of showing AWI members the benefit of joining or forming a Chapter and attending Chapter meetings, it is with great pleasure that I announce that Massachusetts' guest speaker in May, 2002, will be Ron DeCorte, immediate Past President of AWI, and that anyone wishing to attend is welcome to do so. It is my hope that AWI members, especially those who are not members of a chapter, will accept this invitation to visit us in Massachusetts and experience an AWI Chapter meeting. Mr. DeCorte will be presenting a slide show and talk on the Packard Collection of watches, formerly owned by AWI. This is your opportunity to attend a meeting of an AWI Chapter, to meet Mr. DeCorte, as well as meet many other AWI members from New England. AWI 2nd Vice President Jack Kurdzionak, and Affiliate Chapter Director John Kurdzionak will be in attendance as well, and it is our hope that we will see many new faces at the meeting and be able to meet as many AWI members as possible. Attendance at the May meeting in Massachusetts will be our opportunity to do that. If traveling to Massachusetts is not practical, I also invite and encourage all AWI members to attend the Chapter meetings nearest to them, and also to attend the AWI Annual Meeting this August.

On Tuesday, May 21st, 2002, the Massachusetts Watchmakers Clockmakers Association, Inc. will be holding its Spring meeting in Reading, MA at 6:00 PM. As the President of the Chapter, and as the Affiliate Chap-

If other Chapters would like notice of their meetings mentioned, please supply me with the information and I would be happy to note it in future editions of the Affiliate Chapter Column.



Laurie Penman

Education Update

Jim Lubic and I are off to Wisconsin on April 20th to give a couple of talks, which brings me to the subject of bench courses. I am sure that there are a number of members who want bench courses in their area, in fact I know there are because I've had individual inquiries for them. However, so far they have remained as just that ... individual requests. We do need to have requests from small groups of members in order to provide the courses. It is a matter of economics.

The instructors are available for a very wide range of clock repair and clockmaking subjects and we are standing ready to organize courses of any number of days that a chapter wants for its members. All that is needed is the request, a suitable venue, and the financial arrangements between AWI and the local chapter. I know the problems that exist in attempting to relate the calendars of chapter members so that a sufficient number can attend on the same days, but the need is there and if it is to be satisfied, some poor soul has got to put dates together at a local level and then forward them to us.

Bench courses that are available range from general "Solve a problem" courses with dozens of member's movements or parts brought along for solutions and demonstration of repair techniques, to more specific topics such as demonstration of bushing, depthing, escapement repairs, or gear repairs. Think of a subject and ask, and then organize a group of attendees, please.

I have just had a query that is not at all uncommon. A student has an Ingraham movement for repair and saw that it had no oil cups and a great deal of shake between the plates.

"How do I correct this?" was the question. This is my answer.

Oil cups were invented in the mid-18th century to provide a sump of oil at the bearing. Animal oils were used then and dried out, (oxidized) quite rapidly, by providing a small amount of oil outside the actual bearing surfaces, cups extended the life of the oil by about three times, so that clocks only needed lubricating every three to five years. The oil in an oil cup does not simply rest there but circulates through the bearing and back again. Animal oils rapidly acquire a skin which covers the oil outside the bearing, which of course includes the meniscus between the shoulder and the inside of the plates as well as the oil in the cup. As a result the quantity of oil actively lubricating the bearing was increased, hence the increase in its useful life.

Mineral oils extended this further but still oxidized and dried out and so oil cups were still necessary. However, modern, synthetic oils will only dry out if they are in dusty conditions, (at least within the normal ten to twenty year servicing cycle for antique clocks) and oil cups are not needed any longer. In fact, since they provide a larger surface of oil outside the bearing, they provide a larger catchment area for dust and grit, which then circulates. I prefer to keep the amount of synthetic oil in a bearing down to a minimum, providing a fully charged bearing surface but only a small meniscus at the shoulder and the entrance to the hole. The cup is kept dry and to achieve this I over lubricate the pivot hole, leave for an hour so that the oil is drawn into all the working surfaces and then soak up what remains in the cup with non-acidic paper.

Why would a clock built before syn-

thetic oils were available not have oil cups? If a clock is well designed and the bearings are lightly loaded, it will often run dry or nearly dry and I'd guess that this is the case here. The use of a synthetic oil will, nevertheless, improve lubrication. Certainly there is no need to worry about oil cups which, since they decrease the effective length of support to the bearing, increase bearing pressures.

The other part of the question dealt with the shake in the arbors. Excessive shake is a matter of opinion. Consider what results from a pivot protruding beyond the plates and the shoulders and thus allowing a lot of shake.

On the negative side: pivots are longer than necessary and if there is too much loading, they will bend; wheels and pinions move so much that they interfere with other parts; a large part of the pivot protrudes from the bearing, may gather dirt and dust and bring it inside the bearing.

On the positive side: the clock has probably been like this since it was made and the pivots have not bent; if parts were touching there would be a history of problems, and there did not seem to be so in this case; in practice a shaky arbor, (with "too much" room between the plates), nearly always remains in one position; pressed against the inside of one plate or the other. The exception is the fly which rotates very rapidly and can be seen to rattle from one side to the other.

If there is no evidence that any repairer has increased the shake by bending the plates or machining the shoulders, and it is a bit unlikely, the clock should be left alone. The clock is happy, why alter anything? Too often "corrections" that are carried out on clocks are not corrections at all but new modifications!

There is absolutely no reason to alter a clock to comply with a book statement, the proof that the maker got it right or wrong in the first place is indicated by its performance. How long has it been working? Does it keep reasonable time? Is it reliable in its striking? If you have answers to these questions that satisfy you and that, apart from the removal of old oil and dirt, the clock is in good working order, ignore opinions on what is "right" for a clock movement. In particular, of course, do not redesign a clock without really good reasons.



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EDUCATION

Bench Courses

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

DATE	CLASS	INSTRUCTOR	LOCATION	FEE
MAY 2002				
11-12	Introduction to American Pocket Watches	Alice Carpenter	Los Angeles, CA	\$250.00
JUNE 2002				
15-16	A Study of the Deadbeat Escapement	Jerry Faier	New York, NY	\$250.00
AUGUST 2002				
17-18	A Study of the Deadbeat Escapement	Jerry Faier	Philadelphia, PA	\$250.00
SEPTEMBER 2002				
28-29	Beginning Lathe	Robert Porter	Seattle, WA	\$250.00
NOVEMBER 2002				
9-10	Beginning Lathe	Robert Porter	San Francisco, CA	\$250.00

Continuing Education

AWI Training Center Harrison, Ohio

AWI's continuing education program offers 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 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 45030-1696; Toll Free 1-866-367-2924, Phone (513) 367-9800, Fax (513) 367-1414, E-mail: educate@awi-net.org.** Please include a check or charge card number (Visa, Mastercard, Discover or American Express), card expiration date, signature and daytime phone number. All registration fee checks and charges are processed immediately upon receipt.

DATE	CLASS	INSTRUCTOR	LOCATION	FEE
APRIL 2002				
29-May 3	Riefler Clock Repair 1	Laurie Penman	Harrison, OH	\$400.00
MAY 2002				
6-10	Riefler Clock Repair 1	Laurie Penman	Harrison, OH	\$400.00
JUNE 2002				
3-7	Riefler Clock Repair 2	Laurie Penman	Harrison, OH	\$400.00
10-14	Riefler Clock Repair 2	Laurie Penman	Harrison, OH	\$400.00

AWI Bench Courses

Advanced Clock Repair

Beginning Lathe

Clock Case Repair

Clock Escapements

Cuckoo Clock Repair

ETA Products

Filing & Flat Polishing

400-Day Clock Repair

Hairspring Vibrating

Introduction to American Pocket Watches

Introduction to Clock Repair

Introduction to Quartz Watch Repair

Lathe Program

Mechanical Watch Repair

Micro Lathe Operations

Mechanical Chronograph

Organize Your Work Habits for Success

Platform Escapements

Repair of the Atmos Clock

Repair of the Bulova Accutron

Seiko Kinetic Quartz Watch Repair

Sequential Chime

Servicing ETA Quartz Chronographs

Striking Clocks

A Study of the Deadbeat Escapement

Swiss Auto Quartz

For details on scheduling a Bench Course in your area, please contact Nancy Wellmann, AWI Education Coordinator at 1-866-367-2924 ext. 303 e-mail: educate@awi-net.org

WIN A Witschi NEW TECH HANDY!



Witschi Electronics USA Inc. and the American Watchmakers-Clockmakers Institute are offering AWI members the opportunity to win a Witschi New Tech Handy and, at the same time, help boost the membership of AWI. Give this membership application to a friend and encourage him/her join AWI.

Tony Voight of Witschi Electronics USA, Palmyra, NJ, will be drawing the winner's name from the entries during the 2002 AWI Annual Meeting in August. Recruit as many new members as you can and increase your chances of winning the New Tech Handy! Be sure to print your name and membership number in the space provided. Membership applications must reach AWI no later than July 19, 2002 to be eligible for the drawing.

American Watchmakers-Clockmakers Institute Membership Application

Please send all AWI correspondence, including *Horological Times* to:

☐ Business Address ☐ Home Address

☐ Mr. ☐ Mrs. ☐ Ms.

Name

first

middle

last

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City _____ State _____

Postal Code _____ Country _____

Phone (____) _____

Fax (____) _____

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Previous AWI member? ☐ Yes ☐ No

If yes, AWI membership # _____

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☐ Certified Watchmaker ☐ Certified Master Watchmaker
☐ Certified Electronic Watch Technician ☐ Certified Master Electronic Watchmaker

I derive my principal source of income from: ☐ Clock Repair ☐ Watch Repair

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☐ Regular member \$ 70.00

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☐ Check ☐ American Express ☐ Discover ☐ Mastercard ☐ Visa

Credit Card No. _____

Expiration Date _____

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Please return this form and payment to:

Deadline for Entries: July 19, 2002

American Watchmakers-Clockmakers Institute

701 Enterprise Drive Harrison, OH 45030-1696

Phone Toll-Free 1-866-367-2924 ext. 302 Fax (513) 367-1414

E-mail: memserv@awi-net.org

Industry News

Black Forest Imports, Inc. New Warehouse Distribution Center

Black Forest Imports, Inc., a leading wholesaler of contemporary horological products based in Yorba Linda, California, has opened a new warehouse distribution center in Greensboro, North Carolina. This new warehouse will give Black Forest customers the advantage of quick and inexpensive shipping times no matter where they are located in the USA.

Black Forest Imports, Inc. began operations in 1981 with a philosophy of giving a high level of service, broad technical support and product solutions for today and the future. Since the beginning, Black Forest has been known for their large supply of cuckoo clocks, parts and service knowledge. But as they have grown they have added Hermle, Kieninger and Urgos movements and parts as well as many quality tools.

All orders will still be called in to the California office. The expert order clerks will be available from 9:00 AM until 7:00 PM Eastern Standard Time to enter your orders into the sophisticated order entry system which will then decide the optimum shipping location for each order and automatically print packing lists in that location.

Scottie Baldwin, Rick Dunnuck and Bill Gabriel, who combined have over 60 years experience in warehouse distribution, will be heading up the East coast distribution center. For further information please call 1-800-824-0900.

The Human Edge Features Pulsar Inventor John Bergey

The National Geographic Channel (NGC) will feature John Bergey, inventor of the Pulsar wristwatch, during an upcoming episode of *The Human Edge*. This chapter will air on May 26, 2002 at 8:00 p.m. ET/PT. Each half-hour episode of *The Human Edge*, produced by Foxstar Productions, a premium nonfiction unit within Los Angeles-based Fox Television Studios, features three topics focusing on people pushing the boundaries of scientific and technological development, and how their creations will affect our lives. *The Human Edge*, Saturdays at 8 p.m. ET/

PT, follows the most innovative scientists and inventors among us, the movers and shakers who are creating new ways to help the human race reach its fullest potential.

This segment of the May 26th show has a direct connection to AWI Fellow, Benjamin Matz. In an effort to find John Bergey, NGC first contacted the Hamilton Watch Company. The Hamilton Watch Company did not know Mr. Bergey's whereabouts, but sent them a copy of the book, *The History and Development of the Quartz Watch* by Benjamin Matz. This book includes the history of the invention of the Pulsar wristwatch. NGC then contacted Mr. Matz; he dug into his files and provided them with Mr. Bergey's address and phone number. Mr. Matz and his book will receive credit during programming.

The National Geographic Channel (NGC), launched in the United States in January 2001, premiered more than 400 hours of original programming during its first year and will premiere more than 400 hours in 2002. The Channel, an extension of the National Geographic Society's legacy and brand, broadcasts a daily news journal, *National Geographic Today*, as well as a comprehensive lineup of original prime time programming that includes natural history, science, exploration, adventure, and world cultures.

To find out if you have the NGC channel or if it is coming to your area please visit NGC's website: <http://www.nationalgeographic.com> or call toll free 1 866 NAT GEO TV.

Antiquorum Auction Sets World Records

A 1939 Patek Philippe platinum "World Time" wristwatch set the new all time world record price for any wristwatch when it sold for more than 6.6 million Swiss francs (approximately U.S. \$4 million). Antiquorum's April 13-14 auction realized a total just over 38 million Swiss francs (about U.S. \$23 million), more than double the pre-sale estimate of 16 million Swiss francs. Altogether 13 world records were set during this auction and were all purchased by the same Asian collector. The sale total is Antiquorum's best watch auction ever and the second best interna-

tional watch auction total to date. This auction collection was 333% sold by value and 83% sold by lot.

The horological tools, workbenches, books and documents also brought astounding prices, well above their estimates, and totaled over 2 million Swiss francs (U.S. \$1,331,847). Practically all were purchased by the same Middle Eastern collector. Among these was a draft for a book on horology written by Abraham Louis Breguet which sold for just over 245 thousand Swiss francs (U.S. \$149,695) setting a world record for any horological letter or document.

Concours d'Elegance Pavilion Featured at JA New York's Summer Show

JA New York once again welcomes Concours d'Elegance, the world's finest and largest timepiece collection, to its summer show at the Jacob Javits Convention Center. Sponsored by the American Watch Guild in concert with *American Time*, and the *Watch & Clock Review*, Concours d'Elegance will return for an encore on July 28-31, 2002.

Located in the Crystal Palace of the Javits Center, Concours d'Elegance will present collections from more than 60 prestigious timepiece manufacturers and designers, such as Hermes, Versace, Bertolucci, Michel Parmigiani-Fleurier, Boucheron, Corum, Maurice Lacroix, Piaget, David Yurman, Xemex, and more. Concours d'Elegance is a complement to the ever-crowded American Time Clock & Watch Section, making the JA New York show a must-see for any jeweler that features watches and clocks.

Drew Lawsky, show director of JA New York said, "Watches play an important role in fashion and accessories, and has always gone hand in hand with jewelry sales growth. Especially with the fashion industry focusing on menswear more than ever, as well as designers launching more unique and collectible designs at our show, this summer's JA New York is the perfect shopping haven for retailers looking to provide quality and brand name watches for their elite customers."

Attendees can also expect to see

more at this year's Concours d'Elegance. According to Bert Kalisher, director of the American Watch Guild, "After a successful debut at last year's summer JA New York, this year's Concours d'Elegance will be enhanced with more cocktail parties, seminars, demonstrations, and celebrity clock collectors, such as Eli Wallach."

The annual window display contest will be held during the show. Twenty-five judges representing the finest watch jewelry stores in America will evaluate the more than 60 watch companies in categories such as brand, diamonds, sport, fashion complications and mechanics, and design.

As a new addition, there will be fifteen "by-appointment-only" private offices. Representatives from the American Watchmakers-Clockmakers Institute will also present special sessions on profitable watch repair, as well as watch displays and sales.

The American Watch Guild is an association of 260 retailers and manufacturers whose goal is to create a higher standard of integrity, quality, and service. The group promotes high ethical standards and educates the public on the benefits of purchasing from the American Watch Guild retail members with factory authorized watch lines.

For the latest information on exhibits, seminars and events at the JA New York Summer Show 2002, visit the show web site: <http://www.ja-newyork.com> or call 1-800-650-1591.

JA's Careers Outreach Program to be Unveiled at JA New York Show

Jewelers of America (JA) is set to unveil its Careers in the Jewelry Industry outreach program at the upcoming JA New York show, July 28-31, 2002, at the Jacob Javits Convention Center in New York City.

The Careers in the Jewelry Industry program is an ambitious outreach initiative that seeks to promote the jewelry industry as a viable career choice among high school and junior college students, as well as adults changing careers or re-entering the workforce.

"By attracting desirable job seekers to the trade, we hope to bolster the long-term well-being of the jewelry industry," says JA President and CEO Matthew A. Runci.

The project will increase the jewelry industry's visibility at schools and mainstream career fairs and offer prospective jewelers a guidebook describing ten different career paths (sales associate,

manager, bench jeweler, mass manufacturer, wholesaler/importer, appraiser, watchmaker, designer, laboratory grader, and educator). The guide will be distributed to 9,000 high schools, 900 junior colleges, and 1,500 adult career counseling centers.

"We are looking forward to showing the industry what we've been working on, and to recruiting the next generation of jewelers," says JA Director of Education David Peters.

The program has received support, most notably from the Gemological Institute of America (GIA), who signed on as the program's principal sponsor. However, additional financial support from industry organizations and individual jewelers is still needed to help fund the project through its final stages. In return for a contribution of \$100 or more by June 15, 2002, JA will include donors in a special section of the Careers in the Jewelry Industry guidebook. The final section of the publication will feature names, photographs, and quotes of contributors in a vintage high-school-yearbook-style format.

In addition to the guide materials, career counseling events in 7,000 high schools, 500 junior colleges, and 900 adult career centers have been targeted for attendance. JA is seeking jewelers who wish to support the initiative by staffing tables at career fairs in their communities.

Jewelers wishing to be a part of the Careers in the Jewelry Industry program by donating their time and/or money are invited to contact JA Director of Education David Peters at 213-607-7654 or e-mail davidpeters@sbcglobal.net.

Rio Grande's Catalog In Motion Showcased Education & Training

Rio Grande completed its 15th Catalog In Motion showcase of tools and equipment during the Tucson Gem & Mineral show in February. An expanded educational venue, including on-site jewelry making classes and live presentations by professional jewelers and schools, brought show-goers the tools, skills and references they need to become more proficient, productive and profitable.

Extremely strong interest in live presentations supported Rio Grande's decision to make their Catalog In Motion more than just a products showcase. A presentation by Jewelers of America was followed by two days of the new Rio Grande Education in Motion program, where four respected and nationally accredited jewelry institutions—*The Revere*

Academy of Jewelry Arts, The Texas Institute of Jewelry Technology, The New Approach School for Jewelers and Conner Jeweler's Institute—provided free bench demonstrations in stone-setting, casting and wax-carving, and offered numerous bench tips. Their hands-on bench work was projected from a large screen so audience members could see what the instructor was doing as they listened to a real-time description of the work.

As always, 5000 feet of show space was dedicated to demonstrating more than 1000 tools and pieces of equipment, all continuously powered up and in operation for show-goers to see and try. As the casting, plating, cleaning, stone-setting, stone-cutting, finishing, fabricating and other equipment was up and running, industry experts and product professionals were on hand to answer questions and provide information about the tools that could help each jeweler be more efficient and effective.

For more general information about the annual Catalog In Motion show, and for dates for the 2003 show, visit www.cataloginmotion.com. Direct e-mail to ct@tbgr.riogrande.com

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STRIVING **4** THE BEST

AWI is "Striving 4 The Best" and invites your participation in its 42nd Annual Meeting & Convention. Meet with us August 1-4 at the Hilton Greater Cincinnati Airport, 7373 Turfway Road, Florence, KY 41042-1356. For reservations call 1-800-HILTONS or call the hotel direct at 859-371-4400. Deadline for hotel reservations is July 12, 2002.

AWI's 42ND ANNUAL MEETING AGENDA

Thursday, August 1, 2002

- | | |
|------------------------|--|
| 9:00 a.m. - Noon | Research & Education Council (REC)
AWI Classrooms - Harrison, OH |
| Noon - 1:30 p.m. | Lunch on your own |
| 1:30 p.m. - 5:00 p.m. | Continuation of REC Program |
| 2:30 p.m. - 5:00 p.m. | Chronometer Club
Business & Technical Forum
(Members & Applicants only)
Hilton Conference Room II |
| 3:00 p.m. - 6:00 p.m. | Registration
Hilton Greater Cincinnati Airport |
| 7:00 p.m. - 9:00 p.m. | New Member Reception
Hosted by Membership Committee |
| 7:30 p.m. - 10:00 p.m. | Affiliates' Orientation and
Round Table Reception |

Friday, August 2, 2002

- | | |
|-----------------------|--|
| 8:00 a.m. - 9:00 a.m. | Registration
Hilton Greater Cincinnati Airport |
| 8:00 a.m. - Noon | Affiliate Chapter Meeting &
Keynote Speaker |
| 10:00 a.m. - Noon | J.M. Dodson Perpetuation
Fund Meeting (Trustees only) |
| 10:00 a.m. - Noon | Industry Advisory Board
(IAB) Meeting |
| Noon - 1:30 p.m. | Lunch on your own |
| 1:30 p.m. - 5:30 p.m. | AWI Board of Directors Meeting |
| 6:15 p.m. | Bus leaves for Trust Dinner |
| 9:30 p.m. | Bus leaves for Hilton |

Saturday, August 3, 2002

(Note: No Board Meeting on Saturday)

- | | |
|------------------------|--|
| 8:00 a.m. - 9:00 a.m. | Registration |
| 8:00 a.m. - 9:30 a.m. | Clock Program Presenters
Laurie Penman
Jerry Faier, CMC (tentative)
Mark Butterworth |
| 9:45 a.m. - 11:15 a.m. | Watch Program Presenters
Bob Porter, CMW
Jack Kurdzionak, CW
Stewart Lesemann, CW, CEWT
(tentative) |
| 10:00 a.m. - 4:00 p.m. | Trade Fair |
| 11:30 a.m. - 1:30 p.m. | Luncheon Buffet |
| 1:30 p.m. - 3:00 p.m. | Clock Program Presenters
Laurie Penman
Jerry Faier, CMC (tentative)
Mark Butterworth |
| 3:15 p.m. - 4:45 p.m. | Watch Program Presenters
Bob Porter, CMW
Jack Kurdzionak, CW
Stewart Lesemann, CW, CEWT
(tentative) |
| 6:00 p.m. - 7:00 p.m. | President's Reception |
| 7:00 p.m. - 10:00 p.m. | Dinner Buffet & Awards
Program |

Sunday, August 4, 2002

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

AWI's 42ND ANNUAL MEETING

Registration Deadline: July 2, 2002

(Please type or print all information requested)

Name: _____ AWI Member No.: _____

Company/Affiliate Chapter: _____

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

Phone: _____ Fax: _____

E-mail: _____

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

Child #1: _____ Age: _____

Child #2: _____ Age: _____

Child #3: _____ Age: _____

Registration Fees

Received by July 2

After July 2

Weekend Package*

AWI Member _____ @ \$205.00 _____ @ \$235.00

Spouse/Guest _____ @ \$100.00 _____ @ \$125.00

Children (under 12) _____ @ \$ 45.00 _____ @ \$ 55.00

Saturday Package**

AWI Member _____ @ \$165.00 _____ @ \$195.00

Spouse/Guest _____ @ \$ 65.00 _____ @ \$ 75.00

Education Package***

AWI Member _____ @ \$125.00 _____ @ \$155.00

Friends of the ELM Charitable Trust Dinner (Friday night)

_____ @ \$ 50.00

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

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

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

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Account # _____ Expiration Date _____

Signature _____

Please make checks payable to AWI. All fees must be paid in advance; credit cards will be processed upon receipt. Payment in U.S. Funds, drawn on a U.S. Financial Institution. No refunds for cancellations after June 30, 2002.

AWI's 42nd Annual Meeting
701 Enterprise Drive Harrison, OH 45030
Toll Free 1-866-367-2924 Fax: 513-367-1414 E-mail: orders@awi-net.org



New Members

Alabama

Gillis, John—Northport, AL

Arizona

DeFelice, Ken—Scottsdale, AZ
Herbineaux, Pierre—Tucson, AZ*
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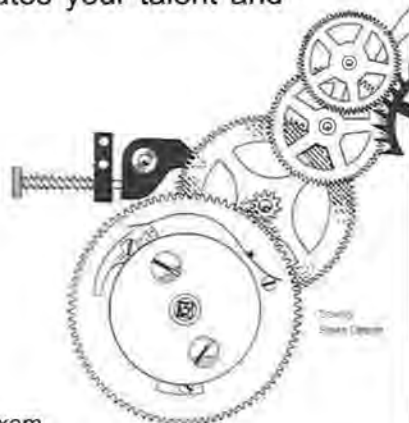


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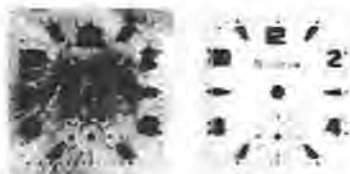
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