HOROLOGICAL TIMES

March 1998



American Watchmakers-Clockmakers Institute

Are You Looking for a HIGH QUALITY Watch Strap at an AFFORDABLE PRICE?



Zuccolo Rochet Watch Straps

Elegant French Watch Straps Known for Their Quality, Comfort, & Affordable Price!



Zuccolo Rochet Straps give you Quality, an Affordable Price & much more!:

- Hand-Made Straps of Luxury Craft Tradition
- High Quality & Rare Leathers
- Stainless Steel, Nickel-Free, Gold-Plated Buckles
- Antiallergenic & Waterproof Linings
- Jewelers Mark-Up – 2.5
- Generous Choice of Rich, Appealing Colors

LIMITED TIME SPECIAL
Buy Only 75 Straps & Get Display FREE.

FREE Zuccolo Rochet Counter Display

This elegant wrought iron display is a two-sided counter display that locks and also swivels on a sturdy base. Holds 150 straps, displays 24. **FREE w/purchase of 150 straps.**

#9815101

FREE Book with purchase of 48 Straps

Choose a pre-selected assortment of bestselling straps or choose your own selection. #98319





FREE 4-Piece Display with purchase of 4 Straps

Perfect counter top space saver – Lets your customers see the rich quality of Zuccolo straps without taking up a lot of space.

#998500

FREE 4-Piece Display with purchase of 4 Straps



Attractive display with eye-catching 4 color photo.

#9984000

We also carry a line of short straps. • Call Today!

Esslinger & Co.

1165 Medallion Dr. • St. Paul, MN 55120

75 Years Young — And Growing

TOLL FREE PHONE ORDERS:
1-800-328-0205
TOLL FREE FAX ORDERS (24 HRS):
1-800-548-9304

HOROLOGICAL TIMES™

An Official Publication of the American Watchmakers-Clockmakers Institute.

Executive and Editorial Offices

AWI Central, 701 Enterprise Drive, Harrison, OH 45030, Telephone: (513) 367-9800, Fax: (513) 367-1414, Web Site: http://www.awi-net.org. Office Hours: Monday through Friday 8:00 AM to 4:00 PM (Eastern Standard Time). Closed national holidays.

William J. Ewbank: Editor-in-Chief
Donna Baas: Managing Editor
Katherine J. Ortt: Associate Editor
Diane M. DeVillez: Art & Production Director

William J. Ewbank: Executive Director
James Lubic, CMW: Education & Technical Director
Nancy L. Wellmann: General Manager
John E. Piepmeier: Finance Director
Mary Sansalone: Education Coordinator
Sharon McManus: Membership Coordinator
Nancy Danner: Librarian/Technical Services
Mary Beth Huff: Shipping Coordinator
Debbie Schallick: Clerical Support

Technical Editors

Robert F. Bishop, James H. Broughton, Fred S. Burckhardt, David J. Carlson, David A. Christianson, J.M. Huckabee, John P. Kenyon, Archie B. Perkins, Robert D. Porter, Marshall R. Richmond

AWI Officers

Charles Cleves: President
David A. Christianson, CMW, CMEW: First Vice President
Greg Hostetter, CC: Second Vice President
Fred S. Burckhardt: Secretary
Robert F. Bishop, CMEW, FAWI: Treasurer

AWI Directors

James H. Broughton, CMEW, FAWI
M.R. "Buddy" Carpenter, CMC, CMEW
Alice B. Carpenter, CMW, CMEW
Joseph L. Cerullo, CMW, CMC
Ron DeCorte, CMW
Wes Door, CMW
Ewell D. Hartman, CMW, FAWI
Gerald G. Jaeger, CMW, CMEW, FAWI
Marshall F. Richmond, CMW
Sue Ann Wysong, CMEW

Dennis J. Warner: Affiliate Chapter Director
Kenneth J. Pell: Research & Education Council Director
M.R. Carpenter, CMC, CMEW: Immediate Past President

★ *Fellows of the Amerian Watchmakers Institute* ★

Robert F. Bishop, James H. Broughton, George Daniels, *Henry B. Fried, Josephine F. Hagans, *Orville R. Hagans, Ewell D. Hartman, Harold J. Herman, J. M. Huckabee, Gerald G. Jaeger, Robert A. Nelson, *Hamilton E. Pease, William O. Smith, Jr., Milton C. Stevens, *Marvin E. Whitney

**Deceased*

Reprinting and reproduction is prohibited without written permission from the American Watchmakers-Clockmakers Institute. Copyright © 1998 by the American Watchmakers-Clockmakers Institute.

HOROLOGICAL TIMES (ISSNO 145-9546) is published monthly and copyrighted by the American Watchmakers Institute, 701 Enterprise Drive, Harrison, Ohio 45030. Subscription price for the public is $45.00 per year ($4.50 per copy) in the United States and $50.00 per year ($5.50 per copy outside the U.S.), members subscription is $14.63 paid with annual dues of $45.00. Second-class postage paid at Harrison, Ohio. POSTMASTER: Send address changes to *HOROLOGICAL TIMES*, 701 Enterprise Drive, Harrison, Ohio 45030.

HOROLOGICAL TIMES CONTENTS

VOLUME 22, NUMBER 3 MARCH 1998

CLOCKS & WATCHES

16 Repairing Mechanical Watches & Clocks, By Henry B. Fried
Hollow Center and Cannon Pinions, Part 2

30 Technically Watches, By Archie B. Perkins
Antique Watch Restoration, Part CXXXXVII,
Worms and Worm Wheels (Continued)

24 How To Make A Winding Pinion And Clutch, By Robert D. Porter
Part 1

26 A Practical Course In Clock Repair, By John P. Kenyon
The Half Dead Beat Escapement

42 Repeater, Petite And Grande Sonnerie Clocks, By Leo A. Jaroslaw
George Graham Bracket Clock, Part 30

48 All The Time In The World?, By Jay Foreman

DEPARTMENTS

2 AWI Up Front
By Charles Cleves & William J. Ewbank

4 Questions & Answers
From the Henry B. Fried Library

6 Ask Huck
By J.M. Huckabee

12 Letters To The Editor

14 Rock Quarry
By Fred S. Burckhardt

20 Pickle Barrel
By Marshall F. Richmond

35 Bulletin Board

36 As A Clockmaker Turns
By J.M. Huckabee

38 Material Matters
By Peter W. Eckel

40 From The Workshop
By Jack Kurdzionak

50 Affiliate Chapter Column
By Jerry Kincaid

51 Association News

52 Classifieds

56 Material Search

56 Advertising Index

EDUCATION

47 Education Update
By James E. Lubic

SPECIAL INTEREST

8 The Duality
By Philippe Dufour

15 Proposed Amendments to the AWI Constitution

ON THE COVER: This month's feature is The Duality by Philippe Dufour of Switzerland. See page 8 for more information.

AWI
UP FRONT

President's Message

By now you have seen a couple of the new covers on our magazine. Fortunately, all of the comments I've been receiving have been very positive. I, myself, am very happy with this exciting new look and I am glad we are recognizing some of our highly-skilled members who are capable of hand producing these items.

The January Board of Directors meeting was very successful and once again we seem to finally have unity within the Board. We held several committee meetings in conjunction with the Board meeting since the majority of the committee members were already present for the Board meeting. It turned out to be a good arrangement and much was accomplished during these three days.

The new Strategic Planning Committee met for the very first time and is in the process of identifying where AWI is now and where we would like to be five years from now. The last time this was done great things came to follow. At the previous planning session several years ago, the Board outlined goals to start a school and to have all of AWI facilities combined under one roof. As all of you already know the last of these goals was achieved a couple of years ago with the building of our present headquarters.

Now it's time to set some new goals. When you see the projects that our members have accomplished individually, think of what we can accomplish together in the future. Nothing is out of reach for this talented association.

I have been working on my video on detecting imitation or fake Rolex parts or watches. Bob Bishop is in need of other videos to produce. Before filming begins, you have to write a complete script and submit it to the committee. If you feel you have a worthwhile project and you are willing to write the script, contact the Visual Aids Committee at AWI and submit your idea.



Charles Cleves

Executive Director's Message

Know Thyself

The ancient Greeks sought to learn the future by consulting the Oracle at the temple of Delphi on Mount Olympus. Since nothing in classical culture ever came easy, the Oracle's response to every inquiry came in the form of a riddle. It was the petitioner's job to figure out just what the Oracle had in mind when it predicted future events. The one solid piece of advice (which was apparently free) was an engraving on a stone tablet outside the entrance to the temple, placed so that all who entered could read: "Know Thyself." That this was the one constant message from the soothsayer has a pretty profound import for anyone who is engaged in the task of trying to figure out just what to do next.

The importance of this admonition was brought home to me this week by a couple of pieces of information that came across the desk. The first was a Questionnaire from the American Society of Association Executives titled, "Your Association's Future - Trends and Implications." The survey listed major trends in the areas of Information Technology, Science, Government and Regulations, Demographics, Social Trends and Global/Economic Developments and asked Association Executives to rate just how each development was going to impact his association. The second item of information was an occupational employment and wage data report that was passed along by Ken Price, an AWI Academy student. This information is drawn from the employment data collected by the U. S. Department of Labor and the various state employment agencies.

The ASAE survey forced me to think about just what trends would have the most influence on how AWI would develop in the next few years. I came to the conclusion that most of the emerging trends in the global economy will have little impact on AWI for the simple fact that watchmakers ALREADY are active participants in an international business. Government regulation, while important to us as individual citizens, will probably not have a lot of impact on the horologist's workplace. On the other

Continued on page 19

Bergeon Waterproof Watch Tester

Accurate and easy to use!



- Swiss-made for high quality and years of trouble-free operation.
- Uses air pressure to test the water resistance of watches up to 3 atm (safe up to 6 atm).
- Tests watches under normal wear conditions.
- When used correctly there is no danger of water entering the watch.
- A must for every shop to handle this critical procedure. Also ideal on your counter when working with your customers.

Specifications:

- Easy-to-read dial measuring 0-6 atm.
- Cast-metal base for stability.
- 64mm dia. cylinder opening.
- Holds two watches.
- Measures 245mm x 150mm x 290mm.
- Instructions included.

Order No. 5555

ORDER TODAY! IN STOCK AND READY TO SHIP!

Be sure to look for our monthly flyer, packed full of savings!

The Wm. S. McCaw Company
WHOLESALE JEWELRY
Since 1913

1722 Madison Avenue
Toledo, Ohio 43624
Phone: 419-243-3720
800-472-0200
800-537-0343
Fax: 419-243-0321
800-245-6481

VISA
MasterCard

Wholesale Watch Materials • Tools and Findings • Jewelry • Boxes

QUESTIONS & ANSWERS

From the Henry B. Fried Library

QUESTION

I have a customer's clock with suspicious mainsprings. It has both time and strike (hour and half hour). My gut feeling is that the time mainspring has been replaced with an excessively strong spring. The number 6756 is stamped on the bottom. Both barrel I.D.s are 36 mm with an arbor diameter of 5.5 mm.

I would appreciate information regarding the clock movement, including mainspring sizes of the time and strike barrels.

R.W. Dietzel, Albuquerque, New Mexico

ANSWER

Thank you for your inquiry regarding the mainsprings for your customer's Gilbert clock. I'm reasonably sure that this clock was manufactured after 1900 because American clocks did not use spring barrels prior to 1900.

In typical American time and strike movements (T&S), the mainsprings are the same dimension as, for example, the classic $^3/_4$" x .018" x 96". This is also true for most T&S movements after 1900 which use spring barrels. In your Gilbert movement, however, the strength of your time and strike mainsprings are quite different, .0145" and .0086" respectively. The power of a mainspring changes by a factor of 3 as the strength is changed. In the case of your two springs the power difference is 145/86 x 3 = 5.1. I believe the 5.1 difference in mainspring power is highly unlikely, if not impossible. A further variance is that the time mainspring is 6" too long and the strike mainspring is 12" too short to optimally fill the barrel at 50%.

Recommendation: I strongly suspect the optimum strength of the spring is much closer to .0145" than the .0086". You can prove this experimentally by partially assembling the movement and checking function, first the strike side and then the time side using the .0145" mainspring. If, as I suspect, the .0145" is satisfactory you will need a new spring. The menu of half-inch wide hole end mainsprings available from materials dealers is rather limited. One size available from several vendors is a hole end 0.500" x 0.013" x 60" mainspring. The spring is ideal length (see calculations below) and the strength should be useful for either the T or S train.

David J. Carlson, Member, AWI Technical Committee

Calculation of mainspring length for your spring barrel with a spring strength of 0.013".

B = Barrel inside radius in inches = 0.71" (Radius = 36/2 mm = 0.71")
A = Arbor Radius in inches = .11" (Radius = 5.5/2 mm = .11")
T = Thickness or strength = .013"

$$L = \frac{3.14}{2T}(B^2 - A^2) = \frac{3.14}{2 \times .013}(.71^2 - .11^2) = \frac{3.14 \times .492}{.026} = 59.44"$$

Waterproof Watch Case Opener



Provides a tight, non-slip grip that will not scratch or mar.

No. **59.0790** $16.95

VIGOR® Metal Watch Press



Ideal for closing snap-back watch cases, installing bezel rings and friction inserting mineral crystals.

No. **59.0795A** $39.50

For distributors in your area or for more information call

GROBET USA®

800-598-4467
800-847-4188

VIGOR®

Newly Updated !
415 different calibers in stock

For the latest in Quartz Watch Movement availability, be sure you have a copy of our handy "Watch Movement Booklet", dated February '98



New Replacement Movement for ETA 978 & 578

use your same hands



shown enlarged 3X
actual size is
13.00 x 15.15 mm
5 ½ x 6 ¾ Ligne

We now have in stock new replacements for the ETA 978.001/2 and ETA 578.002/4 movements which are no longer available. These special executions Ronda Harley Quartz HQ751E have the same dial feet positions, and the same hand sizes as the ETA 978 and ETA 578. The HQ751E-978 has 4 jewels & gilted plates like ETA 978.001/2. The HQ751E-578 has 1 jewel & nickel plates like the ETA 578.002/4. Hand sizes are .55 (minute), 1.00mm (hour). Dial foot locations are at 6:30 & 11:30 o'clock.

HQ751E-978 Mvt. for ETA 978 (4 jewel) **$ 13.95**

HQ751E-578 Mvt. for ETA 578 (1 jewel) **$ 11.95**

Accutron 214 Spaceview Conversion Ring

Now again available



MR401
shown
actual size

On the Accutron 214 Spaceview models this ring is used to compensate for the dial thickness. The Spaceview model does not have a dial so the movement is visible. This ring is needed when converting a non-Spaceview Accutron 214 to a see-thru type model.

BUL MR401 Movement Ring **$ 4.00 each**

Bulova Spaceview crystals

In converting to a see-thru model, the dial is removed, so you no longer have hour & minute references. To finish the conversion, the plain crystal is replaced with a Spaceview type, which has the hour and minute markings on the crystal itself.

stock #	diameter	Price /1	Price/3	Price/dz
BUL 1222 SL	29.9 mm	$ 11.15	10.00ea.	9.00ea.
BUL 1277 SL	29.0 mm	14.15	12.75ea.	10.50ea.

New Cell for Accutron 214 & 218



Top View
with cell
shown actual size



214 spacer

Side views, shown 2x actual size



218 spacer

Using a Zinc-air cell with Spacer

The original cells for the 214 & 218 (387/343) were a mercury type (1.35 volts) which are no longer available. In substituting a same size silver oxide type (387S,344) which is a higher voltage (1.5 volts), the movement may not keep time accurately. Quite often using our 1.4 volt zinc air cell can solve this problem. It may also mean that the watch needs service or cleaning. The zinc-air cell is smaller in diameter than the original, so we provide a spacer ring. We have received good reports when used for the 214 models. On the 218's, the battery life will be shorter.

Stock # 214ZA battery & spacer **$ 2.95**

Stock # 218ZA battery & spacer **$ 2.95**

Spacer not sold separately. Replacement cells $ 2.60/pack of 4 cells

Borel

Jules Borel & Co.
1110 Grand Boulevard
Kansas City, MO 64106-2348

Order Desk **800-776-6858**
Order FAX **800-776-6862**
Local **816-421-6110**

Borel

ASK HUCK

By J.M. Huckabee, CMC, FBHI, FAWI

THE TIRED AMERICAN CLOCK

PART 10

While this series is in progress, Mr. Huckabee will continue to answer questions on other subjects that may be sent to him by way of this column. Feel free to continue to direct your questions to: "Ask Huck," c/o Horological Times, *701 Enterprise Drive, Harrison, Ohio 45030.*

The series of questions on old American clock problems continues with a very basic but difficult escapement problem.

Q. How do you handle escape wheel problems such as a damaged tooth, broken tooth, wheel out of round, and wheel wobble? Do you top escape wheel teeth?

A. The items you mention are very serious problems which will require great skill to correct. I will discuss this as I cope with the situation. Someone has called this work the "growing of a self-eating watermelon." Another has said, "It's a case of everything you do will be wrong."

Damaged Escape Wheel Teeth

Often the damage to a wheel will be a few teeth that may be straightened with a heavy tweezer and touched-up with an escapement file. A tooth that is slightly short can sometimes be peened on the flat side to extend its length, and file finished.

A broken tooth may be replaced by an inserted tooth. When well done this can be a fine repair, but most jobs I see are shameful. At this time (1995), almost every size and tooth count wheel can be purchased with a matching anchor. This was not true twenty or thirty years ago.

Top The Wheel Teeth?

A wheel that is not round should be checked for a bent arbor. Don't forget, that wheel once ran true in round. When you top a wheel, your anchor no longer fits the wheel, so one solution creates another problem equal to, or greater than, the first one. I never top a wheel that requires more than about 0.002" removal from the teeth. In general, I do not ascribe to a significant amount of wheel topping.

Wheel Wobble

In this class of movement, a wheel wobble by one wheel thickness is not a serious problem. Even so, these wheels are thin and can usually be straightened with a little finger pressure. I have observed escapement anchors with a wear pattern much wider than wheel thickness. The wheel probably wobbled for fifty or more years. Anchor and/or escape wheel endshake may cause a similar wear pattern.

Replace the Escape Wheel

If you expect a replacement wheel to drop onto the old wheel hub and run true, you have a liberal education in progress. That's just about impossible. On the other hand, a replacement wheel can be installed to run dead true.

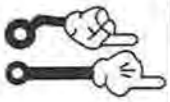
The wheel process must be such that each step negates all previous error. Use the old hub if material is suitable. Cut the hub flange and wheel seat to a skin-tight fit to the wheel bore, and lightly rivet the wheel in place. Do your lathe work between centers to cut the wheel seat.

Use the box turning technique and cut the wheel bore to size. I prefer to cut the wheel bore first, as it can be trial-fitted to the hub. Wheels so mounted will run true in round and flat. A shortcut to these methods will usually turn out "time expensive."

Forward

The old American clock questions will continue next issue.

If you have any questions, please write:
"Ask Huck" c/o *Horological Times*
701 Enterprise Drive
Harrison, Ohio 45030



MICKEY MOUSE HANDS
Black arm, Yellow hands .
$2.50ea, 6-11/ $1.90ea, 12/ $1.25



Luminous Diver Watch Hands
Available in chrome & gilt color.
$3.00ea, 6-11/ $2.00ea, 12/ $1.50

Hole Size Min – Hr.	Length (mm)	Order No''
65 – 110	9.0 – 7.0	HQ – M1
70 – 120	9.0 – 7.0	HQ – M2

Hole Size Min – Hr.	Length (mm)	Order No''
65 – 110	8.0 – 6.0	HQ – DJ1
65 – 110	11 – 8.0	HQ – DJ2
70 – 120	8.0 – 60	HQ – DS1
70 – 120	11 – 80	HQ – DS2

GENERIC Seiko Crowns Assortment
CR-305j2

Contains 2 of each of 12 most popular Seiko Crowns. Total of 24Pcs



REFILLS AVAILABLE
$1.25EA, 3-11/ $1.00EA, 12/ $.75EA

ORDER #	SEIKO #
CR-305J1	30M98NA1
CR-305J2	30MA6NA1
CR-305J3	30N77NA1
CR-305J5	35MR8NF1
CR-305J6	8M35B4NN
CR-305J7	8A35A0NN
CR-305J8	8M35M8BMG1
CR-305J9	8M35A0NG
CR-305J10	35MN2NS1
CR-305J11	8M40A0NNG1
CR-305J12	45MPONS1

SPC-1315 $15.95
Buckle spring bar assortment contain:
100Pcs. 10 each of 10mm, 12mm, 15mm,16mm, 18mm
In **1.3mm & 1.5mm** diameter
Ideal for Seiko fold over clasp.





Replacement Movement for ETA 578, 978.
Same Hand, Same Dial feet HQ751E. Please Call for price, volume discount available.

SMEA TRADE CORP.
13714 Gamma Road Suite 125
Dallas, TX 75244-4408

Order Desk 800-536-7632
Order Fax 800-536-7631
Local Tel. 972-404-9260

The Duality

A Double Escapement Wristwatch

By Philippe Dufour

Philippe Dufour says that people come to him because he creates watches that cannot be found elsewhere. "I'm obliged to innovate," he says pragmatically. The challenge to create the world's first double escapement wristwatch was seized gladly.

The Duality began when Dufour asked himself whether a small going barrel could drive two balance wheels, and whether he could contain this complex assembly in a normal-sized wristwatch.

The result is an authentic complication, one of the most difficult to realize.

Although the idea of multiple escapements had been used in the past, it had never been accomplished successfully in wristwatch size.

Abraham-Louis Breguet, the father of modern watchmaking, planned to build a double escapement clock, but it was never realized. In the 1930's, a large double escapement pocket watch was created as a study project at the technical college in Philippe Dufour's home town of Le Sentier.



Fourth wheels and differential assembled.

The Concept

The aim of the double escapement is to compensate for errors in the rate of the watch, produced by the effect of gravity on the regulating organs. In this sense, it challenges the existing champion, the tourbillon device, invented by Breguet in 1801.

Philippe Dufour's double escapement has proved to be effective. Compared with the tourbillon, it possesses the additional quality of retaining all its efficiency when reduced to the dimensions of a wristwatch.

The key to the concept is a complex differential system positioned, with the two escapement mechanisms, on the fourth wheel.

The two balance wheels operate completely independently of each other. The differential system averages out the differences between them, and thus reduces the potential error in rate by half.

Technical Beauty

Philippe Dufour describes the achievement in the simplest terms. "The two balance wheels are like two hearts which work as team, compensating for each other." He admits that it is "technically beautiful" by its symmetry and its formidable complexity. The differential system alone, without the regulating organs, has 21 parts, twice as many as the tourbillon. And yet the entire assembly is only 30 mm in diameter and 4 mm high. It fits neatly into a 34 mm watch.

Since Philippe Dufour works alone, he fixed himself a limit of 25 Duality watches. Each will be an original since he makes all the components himself. Indeed, the care he brings to bevelling a bridge or burnishing a spring is vital to the precision of his creation.

Perhaps none of this small collection will give him quite the same anguish as the first Duality did. Despite the sophistication of his computer plans, only when the movement was finally assembled was he sure that it would work. The traditional equipment for measuring rate in a watch is made for one "heart" not two.

Recognition

Philippe Dufour was not alone in recognizing his suc-



Philippe Dufour at the bench

cess. The Duality was the focus of attention at the 1996 Worldwide Watchmaking and Jewellry Fair in Basle. It has since been named one of the 10 finest mechanical watches of the year by *Watch International* magazine. It has also obtained the jury's Special Prize awarded by the Swiss magazine of watchmaking, *Montres Passion.*

How may the Duality be recognized? This master of complications says that, aesthetically speaking, he likes simplicity. For the Duality this means a smooth, finely polished case in yellow gold, rose gold, white gold or platinum. A silvered dial carries Dauphine-style hands pointing to raised hour markers and Arabic numerals. A distinctive feature of the dial is the unusual placing of the small seconds-hand at half-past seven, reflecting the layout of the movement. The strap is in top quality, hand-stitched crocodile leather.

Summing up the Duality its creator says, "I'm like the watchmakers of the past. I'm combining tradition with innovation. The only difference is I'm alive."

The Man

What kind of man would spend more than a year bent over a workbench to create one mechanical watch? Knowing that he would have to design, shape, finish and assemble each of its minute components himself?

"I'm always attracted by what seems impossible." So speaks Philippe Dufour, creator of the double escapement wristwatch, Duality, one of the most respected innovations to emerge from Switzerland's hallowed watchmaking valley, the Vallée de Joux, in recent times.

But his real motivation goes deeper. "I want to perpetuate our region's reputation for the finest traditional watchmaking. We have such a fabulous heritage. But we cannot content ourselves with repeating the successes of the past; we have to improve on our ancestors' performance."

Philippe Dufour was born in Le Sentier, in the Vallée de Joux, where he lives today. He says he had no particular interest in watches as a child but did love to take things apart to see how they were made. He went to school locally and, in a town of watchmakers, went into watchmaking himself at the local technical college. He liked it immediately. He obtained, with distinction, his Certificat d'horloger-rhabilleur (fully qualified watchmaker who specializes in repair work).

He was apprenticed locally but, very soon, his desire for broader experience saw him working with watchmakers in London, Frankfurt and the Virgin Islands. "I came home with respect for the talent I saw elsewhere and determination to further our own region's reputation," he says. At first, he worked with several of the world famous manufacturers in the Vallée de Joux. Then, in 1978, he set out on his own. "I haven't got a factory mentality, I need my independence".

He specialized in repairing old and valuable watches. This is one of the most exacting watchmaking disciplines and also one of the most stimulating. "Most of the watches were the work of the great watchmakers of the past, who were frequently from this region. Some were signed, some not, but I came to recognize each Master's touch."

In 1983 he completed the first of his own major creations, the world's first Grande Sonnerie and Petite Sonnerie Minute Repeater pocket watch, of which he produced five further examples. This was followed by the wristwatch version, which won the gold medal for technical innovation at the Worldwide Watchmaking and Jewellry Fair in Basle in 1992. Then, in 1996, also at the Basle Fair, he announced the first wristwatch with double escapement.

Behind the exploits is a calm man who says he learns every day. He learned, alone, to use the computer to design his watches, and believes firmly in the harmony between innovation and tradition.

Modest about his own work, he nevertheless has strong views. In discussing his relationship with potential clients, his favorite word is *transparent*. "I want a transparent relationship with those who acquire my watches. I want to be able to say that this is a movement that they won't find anywhere else. I am proud to put my name on a watch, but I will do so only when it is my work inside."

A man who spends at least 12 hours a day in his workshop, Philippe Dufour prefers naturally to enjoy his rare leisure time outdoors. One of his favorite pursuits requires the same sensitive ear and eye, the same infinite patience that he devotes to his craft. He watches birds in Le Sentier's vast and beautiful forest, Le Risoux. Not just any variety, but a rare species of grouse which has found its last refuge in this region.

Solitary by occupation, Philippe Dufour welcomes the chance to exchange ideas. Far from protecting his position, he wishes there were more adventurous, independent watchmakers. "The whole industry would benefit," he says.

Perhaps the message has been heard in his own family. Philippe Dufour has three daughters, and the eldest recently announced that she has decided to become a watchmaker.

The Workshop

Philippe Dufour's double escapement wristwatch, Duality, is recognized as a new technological triumph for the mechanical watch. Less widely perceived is the fact that he makes its beautiful movement alone, piece by piece, in his workshop. He is philosophical about this. "Perhaps the myth persists that all fine watches are made this way," he says.

In keeping with the watch's position astride the past and the future, it was made in a schoolroom.

Philippe Dufour took over the abandoned one-room school in Le Solliat in the Vallée de Joux, just above Le Sentier. The computer on which he developed the watch is located separately, but all the tools that bring the concept to life are united here. The schoolroom has been transformed into a highly personal and superbly equipped workshop.

While the computer reveals his drive to innovate, the workshop is imbued with his respect for tradition. Some of the tools date from the beginning of the century. Many have been recuperated from other watchmakers. Philippe Dufour is extremely proud of these acquisitions. "When a watchmaker disappears, he takes with him his special skills and technical secrets, and little by little we lose our culture. I'm simply trying to slow that process."

Sometimes the machine's former owner shares his secrets. Otherwise, it's a voyage of discovery. There are no instruction books. Showing an old gear cutter, lovingly restored, Philippe Dufour says, "Each time that I recuperate a machine, I rediscover a way of working". Of another lathe, waiting to be refurbished, "I'll be able to do fantastic things with this. Its life isn't over." Of an ancient engraving machine, used to apply fine decorative ribbing to his movements he says, "As soon as I can, I want to explore other patterns."

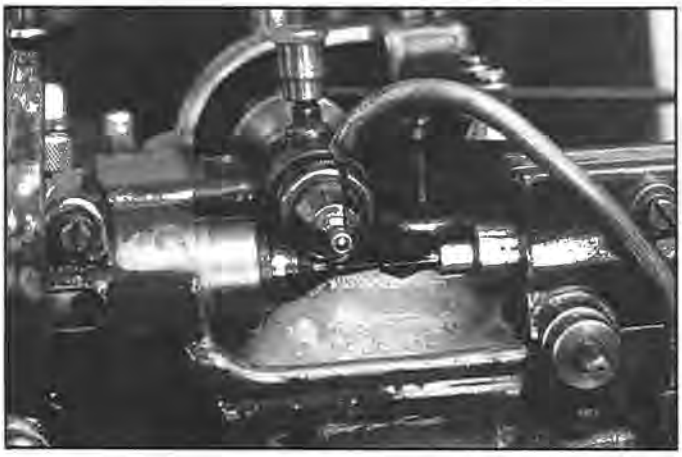
Philippe Dufour builds his movement blanks in German silver, as the old watchmakers did. "It's a fine material," he says affectionately. Like the old masters, he attaches great importance to the shape and layout of the bars and bridges. These are executed with an attention to detail that most of his contemporaries have abandoned. He calls his approach respecting the ethic of the traditional movement. In his own words, "The true high end of the range is a matter of what you can't see."

A Great Moment

The Duality demanded total concentration to build, and he tried to stay relaxed. When the moment comes for the final assembly and adjustment, the atmosphere changes. He dons his white coat and gloves and sits at his main workbench. The assembly takes days but "I don't see the time pass, it's always exciting. The final click when I close the case for the last time is a great moment."

Further Reading

"Duality, A Double Escapement Wristwatch from Philippe Dufour," By Ron DeCorte, CMW, *Horological Times*, June 1997, pages 40-43.



Geneva waves machine



Pinion cutting machine

AT LAST...

The Solution For the Problem Plastic Movements!

(And Metal, Too)



13 Fl. Oz Aerosol Can $16.95

1 Qt. Bulk Liquid $24.95

(No hazardous shipping charges when shipped ground!)

Just another quality watch repair solution from the Quartz Watch Specialists at...

ZANTECH® INC

7501 North Harker Dr., Peoria, IL 61615
Orders Only: (800) 441-7569
Phone: (309) 692-8326
Fax: (309) 692-8375

E-mail: myoung@zantechinc.com



Letters to the Editor

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

Dear Mr. Hostetter:

I welcome the new "Letters to the Editor" column in the recent *Horological Times*, and your letter in it. I must say it's time is due.

I agree with you almost 100 percent on your views. In answer to some of your questions:

(1) AWI members who work for a manufacturer, etc. should definitely be allowed to sit on the Board. Those who feel they should not, should not vote for them. We need all the help we can get. Who knows, they may bring in some new blood and make a vital contribution to AWI. (Right off, I think of what Dan Fenwick might contribute.)

(2) Emeritus members should have regular member voting rights. They "paid their dues" and might provide insight through their experience.

(3) Board members should sit off for a year after serving two terms. We need very much to have new people serve on the Board and committees. There same names appear year after year after year.

My biggest objection at this time is how the amendments were presented last Spring, an all or nothing option. It would seem that members should have had the choice to choose yes or no on individual questions, not yes or no on the package.

I wish you lots of luck, but I know it will be a very difficult task to make progress for the betterment of the organization and find solutions to its problems.

Last April, in response to the ballot for constitutional changes, I wrote a letter to Buddy Carpenter, (I have enclosed a copy for you) and sent copies to the entire Board, all the officers, the Executive Director, and in addition although not listed, to the officers of my Guild (Susquehanna) and the officers and some Board members of the Watchmakers Association of Pennsylvania.

As I recall, I sent out a total of about 30 letters. I only received one acknowledgment of my letter, and that was from Robert Porter.

Maybe I do go on a little and run off at the mouth when I really get upset with situations, and maybe the letter was not the best. It may be that I expect too much; however, I would have expected at least some acknowledgment from the person that I wrote to, the Executive Director, and those who were most directly involved, even if they do not agree with my views.

The complete lack of interest, caring, devotion and civility on the part of everyone was astounding.

No wonder members are the same way, apathetic. No wonder those craftsmen who are not members don't join.

One other question I would like to address is that it would be very appropriate to receive an accounting of the results of voting. I strongly believe the membership is entitled to see the results (numbers) of election and voting results published. How many members vote? Are elections carried by a very small majority of the membership? Do only a few members bother to vote? The minutes of the Board of Directors meetings would also let the membership know what is going on in their organization.

Your letter in the *Horological Times* was a good one. I hope that you might get the ball rolling.

James Moersh
Bloomsburg, PA

Mr. Moersh brings up a number of points that require a response: His April letter was distributed to the Board by this office along with any other written member opinions that had been received. While it would not have been appropriate for the Executive Director to comment publicly on political issues involving the eligibility of Board members, a simple acknowledgment would have been appropriate. I hope Mr. Moersh understands that things were pretty busy around this place at that time and accepts an apology for the oversight.

In past years, voting totals for the Board have not been published to avoid embarrassment to those not elected and to avoid any invidious ranking of the five winners. There is no reason why the total vote cannot be announced and we will do so in the future. By the way, about eighteen hundred members voted in last year's election. This represents about

forty percent of the total of eligible voters and is a remarkably high number for an organization like ours. The members should be commended for their involvement and willingness to participate.

William J. Ewbank
Editor-in-Chief

Dear Editor:

I am really glad to see that you're asking for input. Just a couple of comments. I have gone through a couple of certifications at AWI, but I've been disappointed that you don't publish the names of newly certified members in the *Horological Times*. It would seem to be a natural thing to publish them.

The AWI is great when it comes to technical information, but there are lots of us out here who are running a clock repair business without a clue when it comes to the day-to-day management of such a business.

The biggest problems I have are nontechnical. I'd love to see a column on these aspects of the clock business. For example, how to price work, how to handle comebacks, what to do about clocks abandoned in your shop, how to make guarantees, and so on. The list is endless.

I'm sure there would be lots of member feedback on such problems.

Keep up the good work.

John B. Shadle
Minatare, NE

We will be happy to print congratulations to those members who are awarded AWI titles of certification. This is a necessary step on the road to providing greater recognition to those craftsmen who have mastered the skills necessary to pass these difficult tests.

William J. Ewbank
Editor-in-Chief

Dear Mr. Hostetter:

I read with great interest your "Letter to the Editor" on Constitution & Bylaws. The Constitution & Bylaws of an organization needs to change with the times to keep abreast of changing laws and regulations. The basic Constitution & Bylaws of an organization are the fundamentals which keep an organization great through times and includes the AWI.

It seems the biggest issue is attracting the correct people to the director level, not changing it to include a specific few. I have only been a member for two years and during that time the only thing that seems important is should AWI allow members who work for suppliers, manufacturers or importers be on the Board of Directors. The answer is absolutely no. This group is limited and would influence what the AWI's purpose is and has always been. There is something inherently wrong when this is the biggest issue.

Your membership is large and contains vast numbers of talents. The changes are in the members and the work force. Members who work at jewelry stores, specialty stores, NAWCC, independents, self-employed and retired contract workers all can help form the AWI Board of Directors. Only paid members should be allowed to vote since AWI has a vast horizon in diversity of members. Two terms is sufficient for any director.

Once again, I am an outside member who's voice does not mean very much but am concerned about the single item which seems to keep coming up. Should an AWI member who works for a supplier, manufacturer, importer, etc. be on the Board of Directors? This is narrow in scope and the current changes in society have not changed to where the Constitution & Bylaws should change for this narrow of a group of people.

Sorry I sound so negative, but I worry about where the chairman of the committee is led. Maybe an outside consultant member with no bias should head up the committee and make recommendations to the Board and the members. I agree, wasting money on ballots is not in the best interest of AWI when they are specific in nature. Look at the "whole" with an outside eye. Then put it to a vote.

Edward Baraniuk
Calgary Alta, Canada

As a point of clarification and information: only paid, eligible active members receive ballots and are eligible to participate in AWI elections.

William J. Ewbank
Editor-in-Chief

Dear *HT* Readers:

In past years our magazine was responsible for reviewing new horological books as they appeared on the scene. Since the death of Henry Fried, the flow of books for review and introduction into our library has all but disappeared.

I would like to ask those people involved in the publishing, distribution and sales of horological books and materials to please keep us informed of new products that would be of interest to our readers. This will enable us to properly review the items in *Horological Times* and also add them to our library. Don't forget that any donations to the AWI-ELM Trust are tax deductible under Section 501 (3) (C) of the Internal Revenue Code.

Members, please remember that your input on this subject is also appreciated and requested. Many times a new book may come out that we are not aware of for a number of different reasons. Please keep us informed of anything you think is interesting.

Ron DeCorte
Chairman,
Technical Book Review Committee

Dear *Horological Times* Readers:

In the November 1997 issue of *Horological Times* in the article "Smithsonian To Add Quartz to Horological Exhibit" appears the sentence: "One of these is the first commercial digital watch with an LCD display manufactured by ILIXCO."

This is misleading. It should read "One of these is the first commercial digital watch with an improved field effect digital LCD display manufactured by ILIXCO.

In the article's version, the casual reader would infer that ILIXCO made the first LCD watch, but the first LCD watch was made by Optel. It is of special importance to AWI because, aside from historic accuracy, our own AWI member, Lou Zanoni, was involved. While working for Optel, Lou Zanoni and his co-inventor, Nunzio Luce, developed the dynamic scattering principle from which Optel made the first LCD watch.

Ben Matz
Adjunct Historian,
Special Project Smithsonian

ROCK QUARRY

By Fred S. Burckhardt

How do you like the new look of *Horological Times*? I think it's great. In fact, I was so enthused about it, I decided to give my shop a new look.

We must remember that changing a shop around after so many years could possibly cause a few problems. This was something I didn't consider before starting my "new look." For example, my bench was situated in such a way that when a customer came in, who was someone I didn't care to see, all I had to do was to bend down and slip out the side door. I knew this wasn't the way to act so I moved the bench to the center of the room so I had no way to escape. This proved to be a mistake as I no longer had a wall to hang all the little notes and phone numbers that tend to accumulate during a person's years in business. To remedy the situation I purchased a cork wallboard and transferred all the notes and numbers. In a way this proved to be embarrassing as some of the notes dated back to 1947. I hope they aren't still waiting for my return call. This should serve as a lesson to all of you and that is, always return calls within twelve months.

The next problem that arose was with the electrical cords that ran across the floor. These were necessary as no plugs were available in the center of the room. I know watchmakers and clockmakers are supposed to know a little about everything but I have to admit, electrical type stuff isn't one of my best areas of knowledge. For example, did you know that when you trip over an electrical cord and break one of the wires, things won't run right and lights go out? Even worse is the fact that all the electrons, protons, watts, volts, and amperes are running all over the place as they escape from the damaged wires. These are known to cause a state of atrophy among many horologists, so be careful. If you should accidentally break some wires, always repair them so the same wires go back with the ones to which they were originally tied. One time I hooked up a wire that came from the lathe to one from the bench light. Now every time I need some light I have to step on the foot pedal.

As we all know, whenever you remove something from the wall that has been there a long time, an image of the piece can be seen. I decided to paint the walls. The paint store was having a sale on some striped paint so I bought a gallon of chartreuse and flaming burgundy. Just between us, I thought it looked good. Now that the walls were taken care of, my next project was the replacing of the carpet. Luckily, I was able to find the perfect color to blend in with the walls, a nice deep purple.

Of course, the shop was closed during this period of remodeling. I was anxious to once again open the door and have the customers rushing in. I even had a sign made up announcing the remodeling sale and the increase of the guarantee on my work from thirty days to sixty days. Unfortunately, this didn't seem to make much of an impact. Not wanting to waste any time, I sat down at the bench and started to do some work. I looked up just in time to see a woman customer coming in the door. She looked around, hid her eyes and screamed, "Oh my God!" She left rather in a hurry. I think she must have forgotten an appointment or something. All day long people came in and turned around and went back out, never saying a word.

Needless to say, I was a little disappointed. It came time to close. As I got up from the bench and started to the switch box, I tripped over some wires and fell through the cork board, knocking over a material cabinet spewing stems and staffs all over the place. In my effort to miss falling against the ultrasonic tank, I went backward, falling on some bare wires. My glass frames melted into a single lump of gold-filled and plastic. I slowly got up and walked toward the front door. I turned around and looked at my shop and felt a touch of pride realizing that all this was done with my own hands. But, the best was yet to come! As I turned out the lights, a pleasant surprise awaited me. The paint glowed in the dark! Now who says this watchmaker has no taste?

Proposed Amendments to the AWI Constitution

Below is a list of amendments proposed by the Constitution and Bylaws Committee and reported to the Board of Directors at its Midyear meeting. The proposed amendments have been reviewed by the Institute's General Counsel. The complete text of the original language will appear first, followed on the next line by the complete revised text. Language to be deleted is underlined. *New language appears in italics.*

Wherever the title Executive Secretary appears in the Constitution, the title will be changed to *Executive Director.*

Wherever the title American Watchmakers Institute appears in the Constitution, the title will be changed to *American Watchmakers-Clockmakers Institute.*

Wherever the title Perpetuation Fund appears in the Constitution, the title will be changed to *James M. Dodson Perpetuation Fund.*

Article III - Articles of Incorporation
Section 2.

The governing offices shall be located at such location as the Board of Directors designates.

The governing offices shall be located at *701 Enterprise Drive, Harrison, Ohio.*

Article VII - Board of Directors
Section 3.

Any member, after serving two (2) consecutive terms on the Board of Directors, shall be ineligible for re-election for one (1) year. A fraction of a term shall be considered as one term.

Any member, after serving two (2) consecutive terms on the Board of Directors, shall be ineligible for re-election for one (1) year. A fraction of a term *served over one (1) year shall be considered as one (1) full term.*

Section 5.

Ex-officio Directors shall have no voting rights.

Ex-officio Directors shall *not have voting rights unless said Director is serving as an elected Director.*

Section 7.

No person may become a member of the Board of Directors unless that person is an active member of the Institute and has been in good standing for at least one (1) year previous to election. That person cannot be associated with any commercial enterprise doing business with members of the Institute.

No person may become a member of the Board of Directors unless that person is *an active voting member of the Institute and has been in good standing for at least one (1) year immediately previous to election.*

Article VIII - Duties of the Board of Directors
Section 6.

The Board of Directors shall declare an elective office vacant, for any reason, by an affirmative written vote of 80% of all Directors, excluding the holder of that office. A resulting vacancy shall be filled according to the bylaws.

The Board of Directors shall declare an elective office vacant, for any reason, by an affirmative written vote of *70%* of all Directors, excluding the holder of that office. A resulting vacancy shall be filled according to the bylaws.

Section 9.

The Board of Directors, through the President, may at its discretion, appoint a member, or members, of any classification of the Institute, or other person or persons to represent it at meetings of societies or at public functions. The responsibilities of such representatives shall terminate with the completion of the duties for which they are appointed.

Section 9. (Deleted)

Article X - Officers
Section 1.

The Board of Directors, at the Annual Board of Directors meeting, shall elect from the Board, a president, vice president, secretary, treasurer, and may also elect one or additional vice presidents. Their terms of office shall be for one (1) year. Candidates for these offices shall be presented by the Nominating Committee for Officers and may also be nominated from the floor by a Director.

The Board of Directors, *as a part of new business* at the annual Board of Directors meeting, shall elect from the *voting members of the Board*, a president, *one or more* vice-presidents, a secretary, *and a* treasurer. Their terms of office shall be for one (1) year. Candidates for these offices shall be presented by the Nominating Committee for Officers and may also be nominated from the floor by a Director.

Section 2.

The President may not be elected for more than three (3) consecutive terms.

The President may not *serve* more than *two (2)* consecutive terms *in such office. For the purpose of this section a "term" shall not include any time served as president as a result of the death, resignation, removal or other termination of his/her predecessor in office.*

Article XII - Constitutional Committees
Section 1(b)

The Executive Secretary and/or a representative, shall be an ex officio member of the Executive Committee.

The Executive *Director* shall be an ex officio member of the Executive Committee, *but shall have no voting rights.*

Section 2(c)

An annual audit of the financial records of the Institute shall be conducted by an independent firm of state licensed or certified public accountants which has been approved by the Executive Committee. This report shall be sent to the members of the Finance Committee and all members of the Board of Directors. *A summary of the said report shall be communicated to all members of the American Watchmakers-Clockmakers Institute, and a full copy shall be available to any such member requesting the same.*

Section 3(b)

This committee shall submit names and qualifications of no less than ten (10) and no more than fifteen (15) nominees for the Board of Directors to the Executive Secretary. This list of candidates must be submitted no later than four months prior to the annual meeting of the Board of Directors.

This committee shall submit names and qualifications of no less than ten (10) and no more than fifteen (15) nominees for the Board of Directors to the Executive *Director.* This list of candidates *shall* be submitted no later than *midnight on the last day of February.*

Section 3(d)

One half of one percent or more active members of the

(Continued on page 28)

REPAIRING MECHANICAL WATCHES & CLOCKS

A COMPLETE SERIES OF BENCH PRACTICES

HOLLOW CENTER AND CANNON PINIONS, PART 2

By Henry B. Fried, CMW, CMC, FAWI, FBHI, ★FNAWCC
© 1998 (All rights reserved by the author)

Center Squares

If a center pin is to be made for an old watch or for a modern table-type movement which is set with a key from the back, the head of such a pin must be square. When the size of the square is left to the watchmaker's judgment, it is advisable not to have the thickness of the square exceed twice the thickness of the taper's base. Too thick a square places a strain on the taper and increases its susceptibility to breakage. The length of the square should be no longer than necessary as the longer squares on these tapers break more frequently than do the shorter ones.

To make the square, the taper is first formed by the methods described earlier. A section of the metal rod in the chuck behind the taper is advanced to become the square. Some watchmakers prefer to cut off this extra length with the taper and then holding the tapered section in a chuck while the square is filed. However, this places a strain on the thin taper in the chuck. To avoid this, the square should be filed after the taper has been finished while it is still in the chuck as shown in Figure 14. In this manner, the square may he filed without strain on the taper. The square can be filed with the headstock locking pin set in the quarter holes of the spindle's index plate set into the head of the pulley. (For detailed methods of filing a square, see pages 82 to 87 in the author's *Watch Repairer's Manual*.)

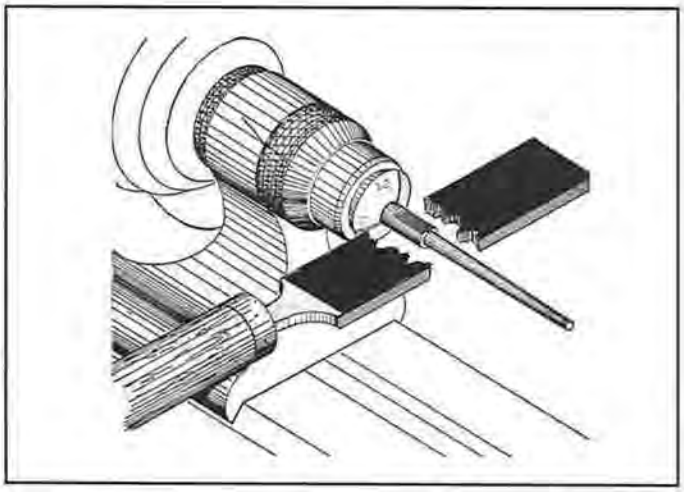


Figure 14. File square on taper, holding in lathe chuck to avoid bending or breaking.

The square is finished with a slight taper to allow the setting button or key to slip on without undue force. It should then be hardened and tempered in the same manner as in a regular center pin. To prevent the bottom of the square from scratching the watch plate, a small, thin washer is placed between the square and the hollow pivot-end (Figure 15). This washer must not be too thick or it will not permit the base of the taper to enter the pinion, causing it to become loose. Instead of a washer, it is also possible to start the square further back on the head of the taper and thus provide a flat round surface to the end of the hollow pivot as shown in Figure 16.

Clock Cannon Pinions and Their Tension

The method of obtaining the tension between cannon pinion and center pinion in most clock movements is shown in Figure 17. This is best understood if it is explained from the view of logical assembling of this unit.

A thin cylindrical rod of wire acts as the center arbor. The cannon pinion is a brass pinion which is driven onto the center arbor frozen tight. Any movement of this pinion then carries the center arbor with it, and any movement of the center arbor will also carry the cannon pinion along with it as well. The cannon pinion in this case is but a small wheel without any tube such as is used in watch movements.

The center arbor goes through the lower (dial side) plate. Then a thick brass retaining collet or washer is driven onto the arbor frozen tight to a point which will allow a certain amount of endshake between it, the plate and the cannon pinion wheel. Over this washer is slipped a spiral tension-thrust spring, a loose thin steel washer being placed over the arbor and resting on the spiral spring.

The center pinion and center wheel are then placed over the arbor and this rests on the thin steel washer which serves to separate the spring from the leaves of the center pinion. Then another thick brass retaining washer is driven over the center arbor until it not only touches the back of the center wheel but presses it down a little, squeezing in the spiral spring. This washer regulates the endshake and provides the amount of clutch tension needed. The washer is driven down to its correct relative position frozen tight.

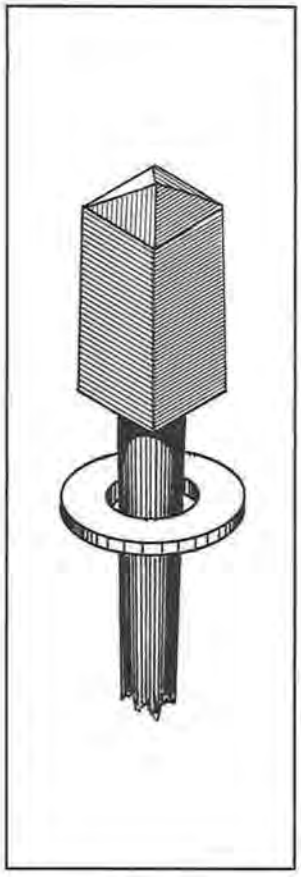


Figure 15. To prevent scoring plate separate square from pivot with thin washer.

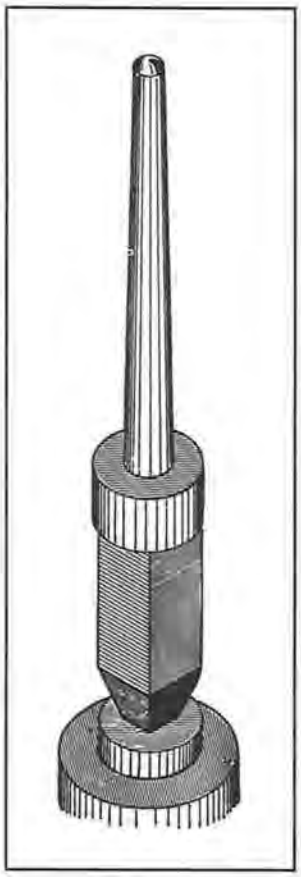


Figure 16. Washer is unnecessary if square is filed back of taper sufficiently to leave a flat round surface.

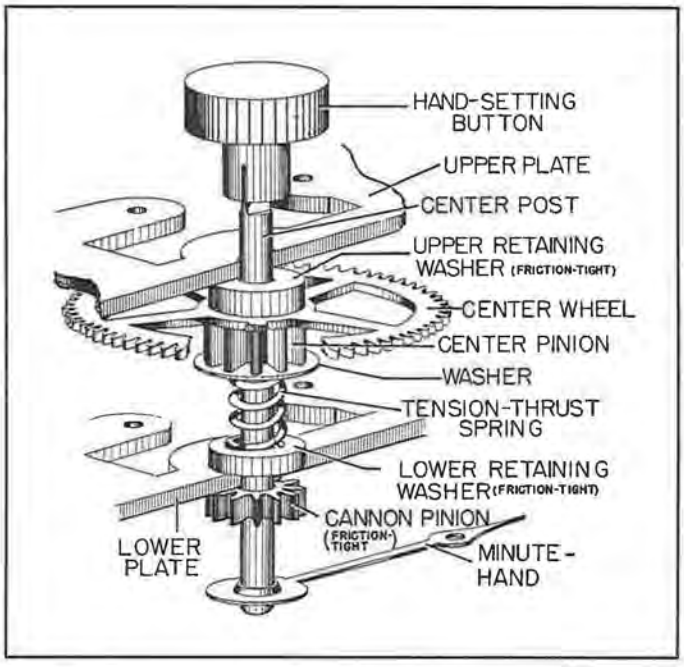


Figure 17. Center wheel, arbor, and cannon pinion assembly on clock and desk-watch movements showing cannon pinion friction.

Livesay's Inc.

Wholesale Jeweler & Watchmaker Supplies
Tampa, Florida 33602-1200

Final Test Watch Winder

A machine for positional testing of watches and for winding automatic watches. Can be used in a horizontal or vertical position. For 6 watches with bracelets. Gents watches without bracelets can be fixed by the spring bar. Indicates on average to within 5 seconds the performance of a watch on a wrist. Replaces the static control of positions with a life like test, as if it were on a wrist. Rotates once per minute. Made in Switzerland.



Stock No. BER-5802

LIST PRICE $450.00

OUR PRICE $310.50

Your Headquarters For Batteries, Watch Material, Tools, Findings, Bands, Jewelry Boxes, Casting Supplies, Watch Movements, and Much, Much More. Catalogs Available.

Phone Orders

(800) 476-2715

Toll Free 24 Hour FAX Orders

(800) 476-8016

398

Tampa (813)229-2715 Local Fax (813)221-8016

The upper plate is then assembled after which the hand setting button is slipped over flats in the end of the center arbor.

The friction tension then is able to work in the following manner. The spiral spring pushes against the center pinion on one side and the lower retaining washer on the other side. The center wheel is backed up by the upper retaining washer. When the center pinion turns, the entire unit turns with it because of the spring pushing up against the center wheel pinion. The center wheel and pinion, pressed up against the retaining washer carries that along. Since the retaining washers are frozen tight on the arbor, anything attached to the arbor in this manner will turn with it. This includes the cannon pinion wheel.

However, when the hand-setting button is turned by the fingers, the tension of these pressing springs is overcome by the force of the fingers turning the button and the arbor skids inside the center pinion and washer rubbing over this spring. The minute hand, mounted on the tip of the center arbor will turn with it regardless which force is applied to the center arbor. The fast cannon pinion wheel turns the dial train which activates the hour wheel and the alarm mechanism.

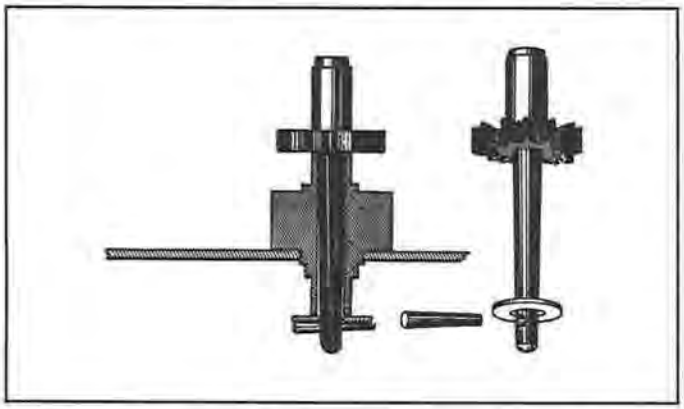


Figure 18. Some watches have cannon pinion and tapered center pin in one.

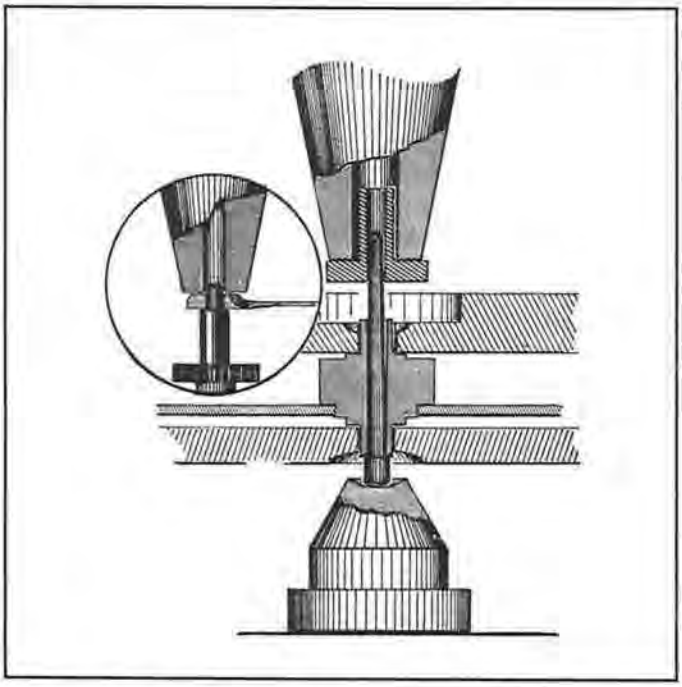


Figure 19. Replacing cannon pinion on center pin. Inset shows minute hand properly placed on protruding center taper.

Should this tension be lost or weakened, pressing the spring together by driving the washers closer together will tighten up on the tension. However, this increases the endshake and the best solution is to remove the upper retaining washer, obtain a higher spring and re-assemble the unit as shown in Figure 17.

Some older watches obtain the tension by using a spring washer between the head of the taper pin and the pivot end. The tension is renewed by reshaping the washer and driving the cannon pinion and taper pin head together, which depresses the spring washer.

A system employed by some of the finer watches which use the hollow center pinion method is shown in Figure 18. Here the cannon pinion and taper pin are made from one piece. This is inserted through the dial side of the movement and the friction takes place closer to the dial side hollow pivot of the center pinion. To keep this in place, a thin short taper pin is inserted through a hole near the end of the taper and is separated from the pivot by a thin small washer. Renewing the friction on such an arrangement is done in the same manner as shown in Figure 4 (*Horological Times*, February 1998) except that the slight bulge is placed as close to the cannon pinion as possible.

To assemble a cannon pinion on a hollow center pinion taper pin assembly, the minute wheel is first removed to avoid crushing its teeth when the cannon pinion is pushed down. Then the staking set is set up with a tapered-side solid concave stump, centered against a flat-faced, hollow punch whose hole fits closely over the cannon pinion tube as shown in Figure 19. The movement is then placed over the stump so that the (bottom) head or square of the center pin rests in the concave of the stump. The punch is then placed over the cannon pinion and a few light taps on the punch should be sufficient to bring the cannon pinion down tight and snug against the (dial side) hollow pivot and the taper-head against the opposite pivot-end. If the hammer blows during this operation are too strong, there is danger of mushrooming both pivot ends.

Replacing the minute hand is done in the same manner as replacing a cannon pinion but with a hollow punch whose hole size is just a little larger than the thickness of the protruding center (taper) pin. This operation is shown in the inset of Figure 19.

Executive Director's Message
(Continued from page 2)

hand, demographic trends and the growth of information technology promise to be of vital importance to AWI and its members, now and in the future. For example, we all must admit that watchmaking and clockmaking features an aging work force and an increasing number of part-time workers. Whether this is a permanent state of affairs, or a temporary phenomenon, has great import for the future of AWI as an organization.

Information technology holds the promise of wonderful new methods of communication that will enable our far flung membership to break down the barriers of distance and professional isolation and to participate in distance learning and information sharing in ways we could scarcely imagine a few years ago. How does AWI go about mastering these new sources of information technology, and if we do, how many members will participate and benefit?

As for the federal reports on the state of the watchmaking profession, I'm afraid I bogged down on one or two inconsistencies that were mathematically impossible; but the report itself had some information about wages and job growth that were pretty interesting. For example, the report states that there are about three thousand people employed as watchmakers or in related fields, and that the field will enjoy one hundred fifty new openings each year. I suspect there are considerably more than three thousand people involved in the trade in one form or another. The potential of one hundred fifty job openings each year sounds about right. The report also includes some data about earnings that are very significant. Watchmakers cover a wide range of income, from minimum wage to over fifty thousand dollars a year. However, over half of the watchmakers in the report were on the very high end of the scale, with over thirty thousand per year in income. The other half covered a wide range from less than ten thousand up to thirty thousand. We might infer that the report includes a number of semiretired and part-time workers, and that the full-time craftsman can enjoy a pretty lucrative living.

What do we do with all these statistics and all these questions? How does this sort of data affect AWI as an organization and the AWI member as an individual? Are the reports and data accurate? I submit that these are pretty important questions and, once answered, can help provide some guidance and direction to the future course of AWI. First and most important, we must do more to know ourselves. Your association has never really compiled much information about the membership. A first attempt to learn more about you was included in the annual membership survey in the January 1998 issue of *Horological Times*. If you haven't already, I encourage all of you to go back to the last page of the January issue and take a few minutes to complete the survey. As with all collections of data, the bigger the sample, the more accurate the information becomes. I would hope that we can verify or disprove the information in the government survey. With good information, we can start to chart a course for the association that will be of more benefit to its members.

The AWI Board of Directors has formed a Strategic Planning Committee to study these issues and to report back to the Board its recommendations for the future course of the Institute. The members of this committee are actively employed in the field as watchmakers and clockmakers, and they also possess a pretty impressive collection of resumes that include advance academic degrees and successful careers in government, education and business. Their first job is to ask questions. The second job is to provide potential answers. Their overriding mission is to imagine!

Can and should AWI become more of a trade association than it is now? Is there a role for the Institute as an advocate on behalf of the profession? Do we have the capability to expand our educational offerings to include training materials that will help the watchmaker and clockmaker be a more successful businessperson? Is it possible to expand the field of horology to create new and better economic opportunities for all our members? As the astronomers are asking about the universe of stars, is the universe of horology expanding or shrinking? Does the future hold the potential for a growing organization, or should we seek to retrench and to preserve the organization as it is now? As always, the riddle of the Oracle leads to more questions than answers.

The months and years ahead promise to be a very interesting time for all of us as our Institute learns to cope with the future. You, the member, have many new chances to have an influence on the future. *Horological Times'* "Letters to the Editor" column, the Strategic Planning Committee and your member surveys are all tools you can use to make your contribution to the future of AWI. We need your help and we're looking forward to hearing from you.



William J. Ewbank

PICKLE BARREL

BASIC MATERIALS FOR JEWELRY CRAFTING AND REPAIR

By Marshall F. Richmond, CMW

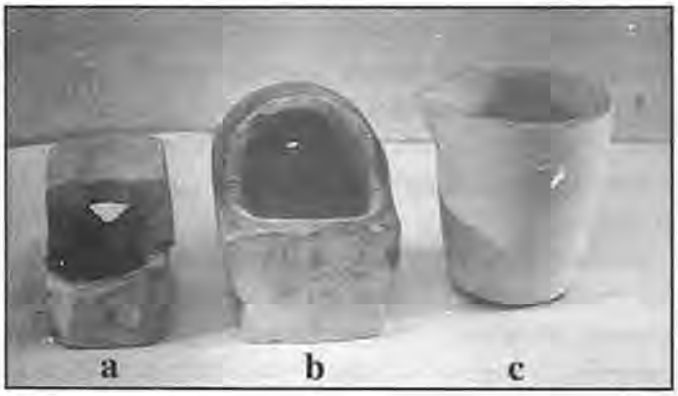


Figure 1.

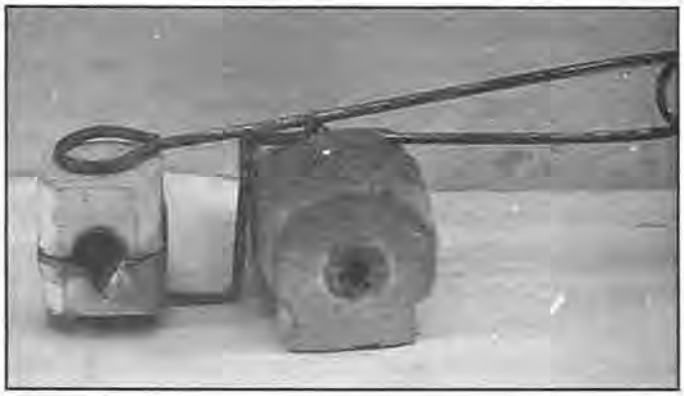


Figure 2.



Figure 3.

The actual basic material for jewelry work is the metal used; however, we do not use the metal and its components in their natural state. We use karat gold, sterling or coin silver, brass, nickel, copper, and many other metals used in alloys. Most of these materials we can purchase from our jewelry supplier as well as jewelry findings. In my experience, karat gold is one of the most important stock items because a large percentage of the work we do requires 10K or 14K gold and gold solders. To start a shop doing jewelry work it is wise to start small, especially if there is any doubt of the success of the venture. Today it seems that there is more karat gold jewelry being sold and in use than there ever was. This creates a need for an inventory of karat gold and solders as well as karat gold findings such as spring rings, catches, jump rings, chain ends, locket bails and pendent loops as well as many other repair or attachment pieces. In starting with a small inventory many jobs will have to be laid back to await parts that have to be ordered, but with foresight coupled with common sense, an inventory can be built by ordering extra pieces. Today most material suppliers ship the day the order is received, and with a watts phone call the order can be received within a day or two.

Karat gold is one of the most important materials we need to do our work. I have devised a way to have a good stock of it with very little outlay of cash. I save all scrap-like cuttings from making rings smaller, gold sawdust and old worn-out shanks that have been replaced with new ones. When remounting customers' stones they are credited with 70% of the value of the fine gold in the old mountings. The catch-all apron of my jeweler's bench catches all sawdust and file dust as well as many small pieces that are sawed out of jewelry such as in sizing smaller. Every so often this is cleaned out and the dust and scrap is then cleaned. This is done by first using a strong magnet which will pick up any steel or iron dust or filings that come from sawing and filing articles of steel or ferrous metals. This is put in a crucible (Figure 1-b) which is kept on my bench for this purpose. Any gold scrap that should go to the refiner is also put in this crucible. Every so often this is melted down using the "Hoke" torch with a large tip held with tongs made for this purpose (Figure 2).

These tongs and the crucible are part of a sand casting set that is available with a casting flask, parting powder, crucible, asbestos-free pad, borax, five-pound casting sand, crucible tongs, and some practice metal. This sells for less than $50. With this outfit, scrap gold can be cast in round, square or other shapes. Then, with a rolling mill (Figure 3), these castings can be shaped to thickness. Note the groove in the right ends of the rollers with which strips can be rolled out into shapes such as, round or half-round, then further reduced in draw plates (Figure 4) with the drawtongs shown.

Karat gold, after casting and cooling, is completely annealed, so rolling or drawing can be done immediately

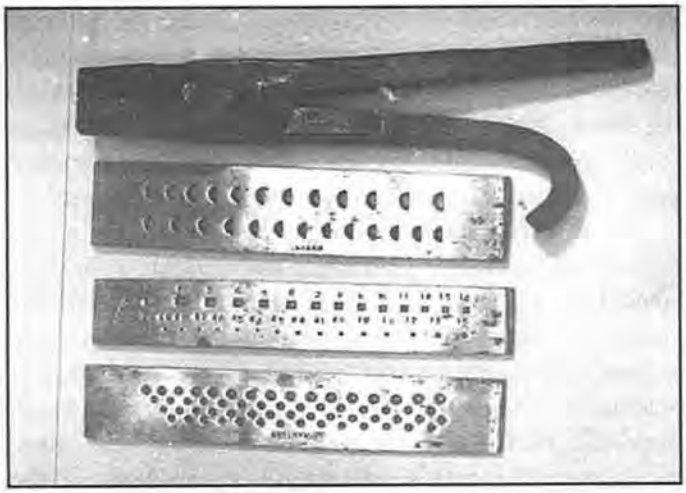


Figure 4.



Figure 5.

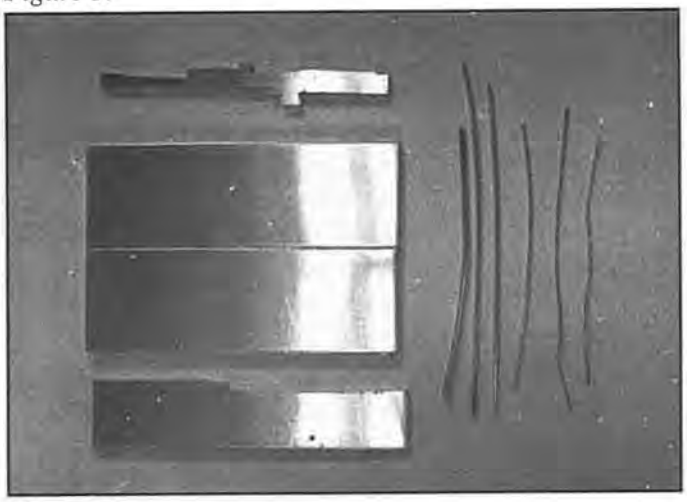


Figure 6.

S.T. INT'L SUPPLY CO.

TOLL-FREE 800-364-CELL-(2355)

FAX: 800-572-2356 L.A. TEL: 213-622-2500
L.A. FAX: 213-622-3018
320 West 7th St. Los Angeles, California 90014
Wholesale Jeweler & Watchmaker Supplies

FREE WATCH MOVEMENTS CATALOG

With purchase of any 5 movements.

104-page catalog features over 600 different movement models, and lists dimensions, dial feet position, hand size, battery, stem tap size, coil, circuit and digram of features.

No. BK-297 $2.95



MOVEMENT SPECIAL SALE

ETA	
801.004	$6.75
802.004	$4.95
802.104	$4.95
955.114	$11.95
955.414	$11.95
956.114	$11.95
FE	
5120	$8.95
5130	$8.95

ORIENT	
9GB	$4.95
6DXQ1	$8.95
HARLEY	
751	$8.50
753	$8.50
762	$5.50
763	$5.50
ISA	
369	$5.50
1198.32	$7.95

PULSAR	
PC11	$6.50
PC21	$4.95
VX10	$7.50
VX11	$7.50
VX50 E	$5.95
VX51 E	$5.95
MIYOTA	
2025	$4.95
2035	$4.50
6L22	$6.95
6L32	$6.95

FREE SHIPPING

PROFESSIONAL WATCHMAKERS BENCH

Beautifully finished in natural wood on all 3 sides, suitable for store-front use.

No. BN-225D $395.00

Free shipping on our watchmaker's bench to customers within the continiental U.S. No. C.O.D.





CLASPS FOR SEIKO

Assortment contains one each yellow and white in 5.5, 6.0, 7.0, 8.0, 9.0, 10.0, 15.0 and 16.0 mm. For total of 16 pieces. Comes in convenient plastic storage box.

CC-CLA16 $29.95
Refills $1.95(each)



METAL BAND END PIECES

Ladies: 13mm
Gents: 20mm
Assortment contains one pair each yellow, stainless steel and two tone in ladies and gents size. Total 12 pairs of end piece. Comes in convenient plastic storage box.

CC-EPA24 $23.95
Refills $2.50(pair)



BUCKLE EXTENDER

Ladies: 10mm
Gents: 16mm
Assortment contains 2 each yellow and white buckle extender in gents and ladies for total of 8 pieces. Comes in convenient plastic storage box.

CC-BEA220 $18.00
Refills $2.50(each)

MasterCard VISA

Sale ends Mar. 31, 1998

after cooling by quenching or slow cooling. When rolling or drawing metal it will harden, so when it shows signs of hardening it should be annealed by heating to a cherry red and cooling in room temperature water or slow air cooling. This annealing applies only to nonferrous metals because if a ferrous metal such as steel is quenched when it is cherry red it will become flint hard. This metal must be slow cooled to anneal it to a dead soft condition. The scrap karat gold should be clean scrap if it is to be used in making or repairing gold jewelry. The 10K and 14K gold should be kept separate and labeled if you are to use the same karat gold on the items you are making or in repairing gold jewelry.

The filings, sawdust, etc., mentioned earlier can be melted in the crucible after adding some borax. It will become molten and form a nugget of oval shape which can be stored until enough accumulates to warrant shipping to a refiner. The reason for melting the sawdust and filings is that too much can be lost in handling if kept in the powdered state. Figure 5 shows a can of borax on a piece of firebrick and a round bench heat pad that is non-asbestos. The fire brick and non-asbestos pad can be used to place metals on for annealing. The round pad is good for some jewelry jobs because pins can be stuck in it for holding work while hard soldering. The fire brick is better for most jobs; it is cleaner because no dust from the pad contaminates the work.

For ring sizing, 10K and 14K gold can be bought in 3-inch strips from most jewelry supply houses. A complete stock of all sizes with one 3-inch strip of each at the current gold market would be around $1200. Figure 6, on the left side, shows four strips of flat gold and 6 pieces of round wire. The flats are 1 mm thick, 1-1/2 mm thick, and 2 mm thick; the wires are 1.2 mm (16 ga), 1 mm (18 ga), .8 mm (20 ga), .6 mm (22 ga), .5 mm (24 ga), and .4 mm (26 ga). The top flat started at the size of the two center ones which are 1 inch x 3 inches. It has had pieces sawed off for ring sizes, shanks, and pieces for stone settings, pendents, earrings, and other needs for gold. The pieces are first sawed from the metal, then thinned in the rolling mill for thickness, and then shaped for whatever the need. With the three thicknesses I have in stock, I can cover most any repair. The wires listed will cover almost anything needed. However, any of these sizes can be reduced with the drawplates and drawtongs (Figure 4) to any size needed. The 20-gauge is the correct diameter for making pierced earring posts. I use the 24-gauge frequently in repairing 14K tennis bracelets where the hinge has to be rebuilt and drilled for hinge pins which are installed and then the ends are gold soldered.

Gold wire is something we need to stock in the sizes noted because reducing it with the drawplate is time consuming. I only use it when I'm out of a size or if a size in between is needed. I do not like to lay a job back and wait for material. Having the know-how and the tools to improvise, rarely is a job held over waiting for ordered material. The best part of my system is the few cash dollars that I have invested in gold inventory. When a job is priced, the charge for the gold is whatever the going retail price is for the gold used, plus my labor time. This makes it more profitable than if a heavy inventory of gold is carried.

Gold solder is another place where I can take advantage of accumulating gold scrap and sending it to a refiner. They have an assay charge then credit me with the fine gold value. I can then order anything in return at the refiner's prices, so my solder costs me much less than if ordered from other sources. The refiner also offers a much larger selection of gold solders than a jewelry supplier does. As most of the work in my shop is repair, most of the solder stocked is easy flow yellow and white in 14K. When fabricating, like installing heads or shanks, it is wise to use hard flow solders. If later repairs are made close to the solder joint with easy flow solder, it reduces the chances of the hard solder melting and loosening because the easy flow solder melts and flows at a lower temperature than does the hard flow solder. Paste solders have become popular in recent years because they come in a hypodermic needle and also contain the flux. It is available in 10K yellow and white, 14K yellow and white, and 18K yellow. Each needle contains 1 DWT of solder and the cost is comparable to sheet solder. (See Figure 7; a and b are 14K yellow and white sheet solder, c is a hypo-tube of 14k paste solder and d is a sheet of 1/4 ounce silver easy flow solder. The market price of gold greatly affects the cost of gold, gold findings, gold solders, and gold jewelry. Most suppliers of findings, gold solders, and gold jewelry have been using the $400 gold market to price the items. They have an adjustment figure for every $10 change ± in the market price of gold. This applies only to karat gold, not gold-filled or plated items. Refiners have their own way of pricing for fabricated gold such as ring-sizing stock, gold wires, heads, shanks, and settings which are figured by the actual weight of the gold, the market price, and the cost of producing them. Out of curiosity I checked gold prices starting in 1990 from invoices from the refiner and my findings are for gold and silver per troy ounce.

Date	Gold	Silver
8-06-90	$381.00	$5.00
8-27-91	$353.80	$4.00
6-19-92	$342.00	$4.00
8-24-93	$373.65	$4.75
1-17-94	$392.30	$5.25
12-16-94	$381.00	$4.75
1-19-95	$381.90	$5.00
9-28-95	$358.50	$5.50
3-26-96	$389.50	$5.50
8-28-96	$388.50	$5.25
9-09-97	$321.70	$4.75
10-18-97	$310.75	$4.75
10-23-97	$324.30	$5.00

Since the last recording it seems that the gold market fell below $300. Although I pay very little attention to the gold market, it seems that the price of gold changes daily anywhere from a few cents to several dollars. I have sent gold in and one day it will be assayed and a credit established and the next day when my gold is returned it will show a different price per ounce for that day.

Other basic materials such as brass, nickel silver, and sterling silver can be obtained from the jewelry material suppliers. Stainless steel has to be obtained from other sources. Some of the stainless steel needed can be cut from stainless steel watch backs. Nickel silver can be obtained from salvage watch cases that are marked "Silverode," "Silveroid," or some other name leading one to infer silver. The term "German Silver" also refers to nickel silver as it has no real silver content.

In reference to melting gold, if you apply the torch directly to the gold to be melted it is best to use the reducing flame of the torch which is the outer end of the flame. Also, the use of borax is good as either or both of these reduce the chance of the gold oxidizing. Gold like all metals has a melting temperature, a flow temperature, and a temperature that causes the metal to boil. When this happens in karat gold the alloy will boil before the gold which can increase the karat of the gold. Especially when using solders, overheating will cause the solder to boil leaving the solder joint porous, as the alloys in the gold solder have a lower melting and boiling temperature than the gold in the solder.

Being a watchmaker has been a great help to me in becoming a competent jewelry craftsman. Many of the tools and equipment used in watch repair are useful in doing jewelry work, especially the lathe and staking tool. It has also helped me accumulate the inventory in materials and findings used in making and repairing jewelry without having the cash investment.

In the next article I will discuss repairs requiring heat, soldering, welding, fluxing, annealing, and other related subjects.

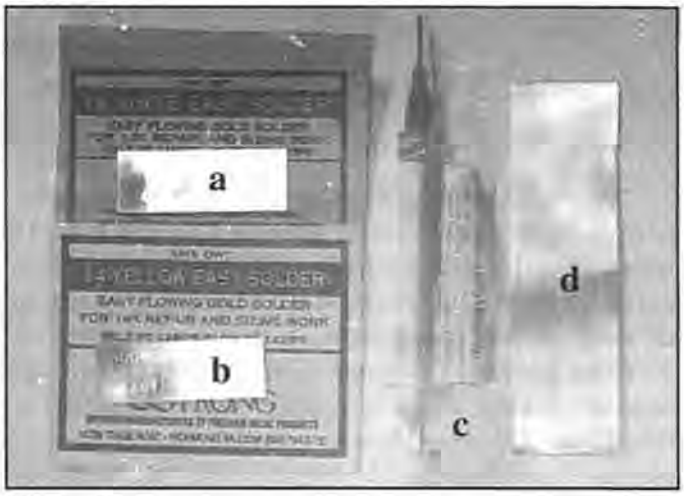


Figure 7.

WITSCHI

CYCLONIC*

Drives All Quartz Watches by Magnetic Energy, Which Can Be Controlled in Speed and Intensity

- Re-animation of the movements
- Time Setting
- Tests hand setting
- Tests concentric running of the gear train
- Improved lubrication

In Addition

- Tests the battery
- Can set locked trains into motion again
- Enables repair of most permanently sealed watches



Witschi Electronics USA, Inc.
303 Broad Street • Palmyra, NJ 08065
Tel.: 609-829-1179 • Fax: 609-829-2266
Tel.: 1-800-882-7977 (U.S., Can. & Mexico only)
www.witschiusa.com • e-mail: voight@witschiusa.com

AMERICAN EXPRESS • DISCOVER • MASTERCARD • VISA

How To Make a Winding Pinion and Clutch

Part 1

By Robert D. Porter, CMW
© 1998 (all rights reserved by the author)

The making of miniature parts to restore or repair antique watches and clocks can be challenging, sometimes frustrating, and occasionally economically rewarding to those of us who enjoy this kind of work. A fine old repeater watch with a worn out winding pinion and clutch gave us the opportunity to make a new winding pinion, shown almost finished but still covered with oil and cutting burrs in Figure 1, and the clutch that drives it. We will also get to practice our tool-making skills by making the gear cutters and some lathe attachments you probably haven't seen before as well. Let's roll up our sleeves and pour another cup of coffee — this job will take a while.

The measuring tools pictured in Figure 2 were used to determine some of the information we need from the old parts. The tool that looks like a silver pencil is a 20X measuring microscope. The instrument next to it on the right is a magnifying comparator with measuring scales, angles, and circles. The digital caliper measures in inch or metric values. An outside micrometer will also be used.

A tooth of the winding pinion was measured at its widest point and found to be .35 millimeters. Then .35 mm divided by 1.413 (a tooth thickness factor for cycloidal gears that drive or are driven, such as a cannon pinion or winding and setting gears) gives us a module value of .25. This module times the number of teeth in the winding pinion (21) gives us a pitch diameter of 5.25 millimeters. The pitch diameter of a gear is an imaginary reference circle from which the addendum (curved part of the gear tooth) and the radial dedendum section of the gear tooth are calculated, and is the line of action between a set of gears.

The sample parts were measured and a scale drawing (Figure 3) was made of two adjacent teeth primarily to determine the width of the cutter at the minor or root diameter of the tooth, the cutter profile length, and the radial flank angle to set the cutter forming tool to. The clutch face was also measured. We now have all the information we need to make the winding pinion and its cutter.

In Part 2 we will illustrate an easy to make lathe attachment for grinding any radius and clearance angle we need on the cutter-forming tool.



Figure 1.

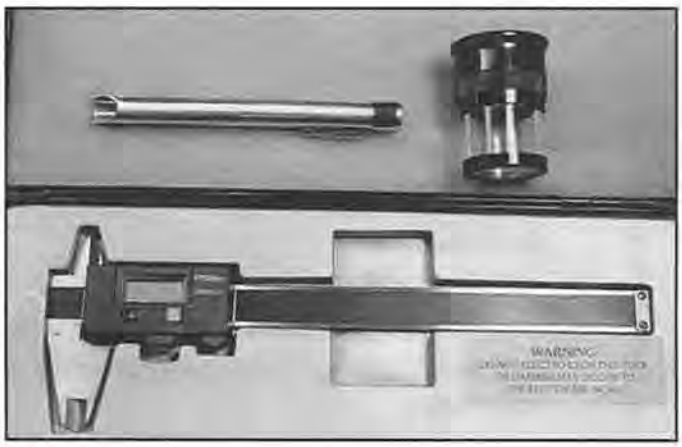


Figure 2.

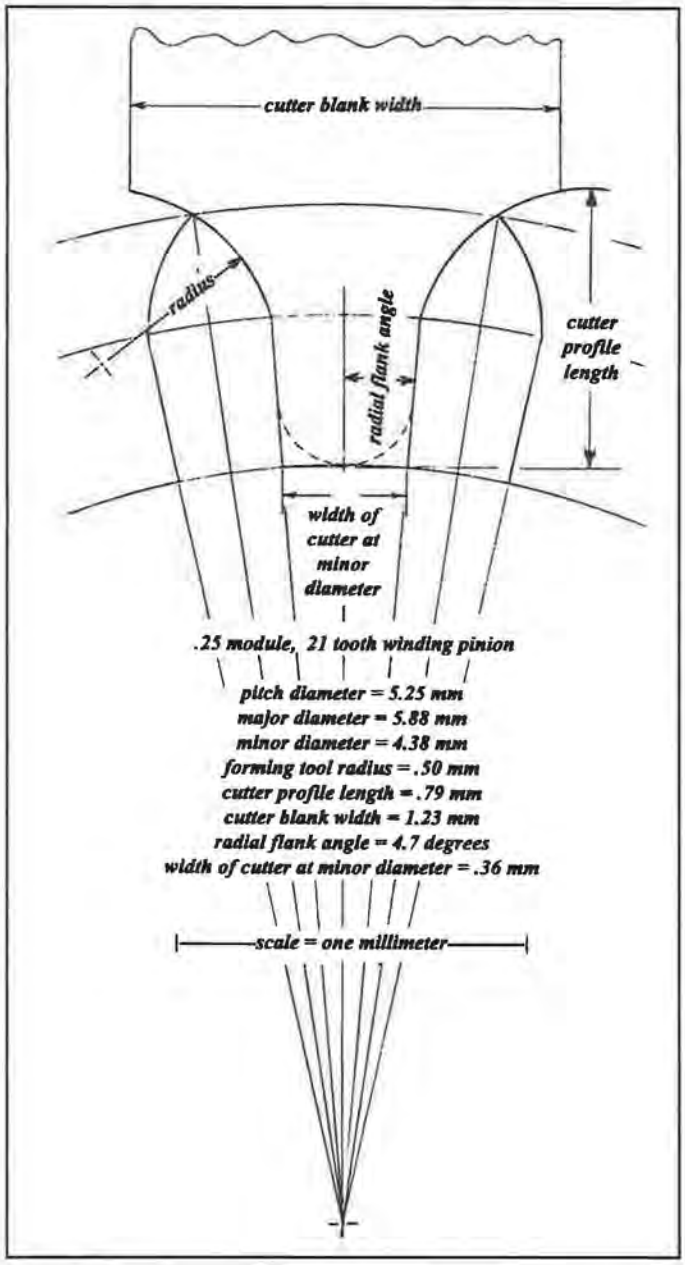


Figure 3.

HERMLE - KIENINGER - URGOS
MOVEMENTS FROM

Butterworth Clocks, Inc.

- largest distributor of Hermle movements
- distributor of Kieninger movements and parts
- exclusive distributor of Urgos movements
- over 100 models in stock--largest selection in the U.S.

PHONE/VOICE ORDERS 1-800-258-5418
TOLL FREE FAX 1-888-399-8463
1715 Pearlview Ct. • Muscatine, IA 52761

Factory-fresh • Most models bronze brushed
Same day shipping, 2-year warranty
Call for free price list

NOW AVAILABLE!

Basic Dry Water Resistant Tester / Leak-Controller

Self-contained portable water-resistent tester. Uses no water. Safe for all mechanical and quartz watches. Easy to operate. Simple one minute test.



TS5200.....
$1095.00

Ultrsasonic Mark V Watch Cleaner!

Ultrasonically cleans complete or partially disassembled watch movements.



CL2195..... **$2295.00**

QUICK SHIPPING · FAST FAX · FREE 24HR PHONE ORDER

TWIN CITY SUPPLY
Minneapolis, MN 55426-2823
612) 545-2725 USA: 800-328-6009
FAX: (612) 545-4715 FAX: 800-328-6001

A Practical Course In Clock Repair

Unit 4

The Half Dead Beat Escapement

By John P. Kenyon, CMC

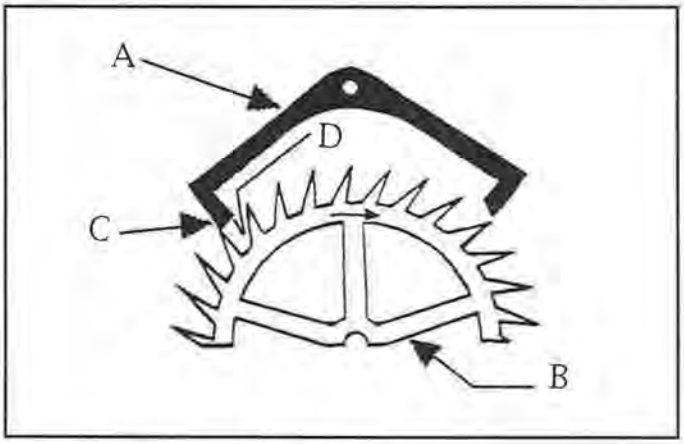


Figure 1. Half Dead Beat Escapement

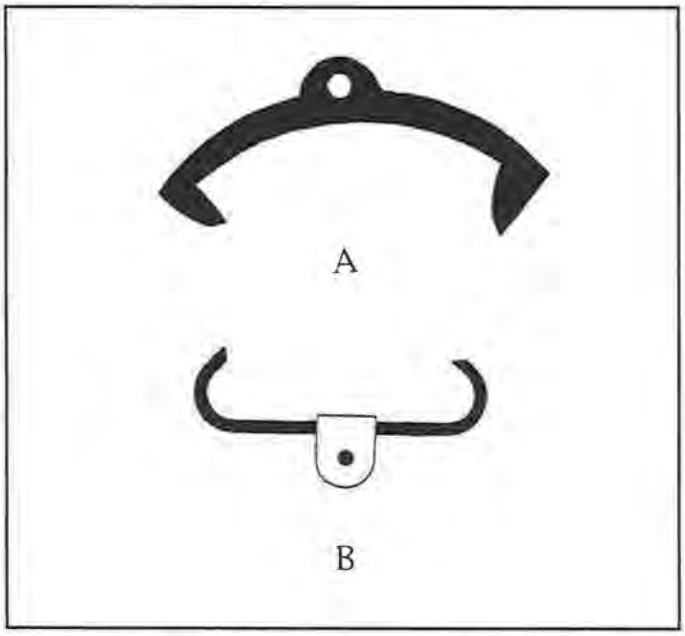


Figure 2. Half Dead Beat Escapement Verge Designs

The half dead beat escapement is a modification of the dead beat escapement. It incorporates both dead beat and the recoil features. Early models of this escapement were noted for isochronal error. That is, they gained time when fully wound and lost it as the power declined. Half dead beat escapements can be found in black mantel, tambour, German import, and other short pendulum, spring-driven clocks of the twentieth century.

Design

The half dead beat escapement is a similar design to the dead beat escapement, except the pallet locking faces do not form the arc of an imaginary circle from the pivot point of the pallets. They are shaped on an arc of a larger radius and there is a slight recoil action. The locking faces in this escapement are designed to diminish the losing rate expected from the long vibrations in short pendulum, spring-driven clocks equipped with dead beat escapements.

Figure 1 illustrates a half dead beat escapement. The verge is represented by A, while C is a locking face and D is an impulse face. There is also a locking face and impulse face on the pallet on the opposite end of the verge. The escape wheel is illustrated at B.

The verge illustrated in Figure 1 is a solid anchor. Figure 2A is another design of the solid anchor. Figure 2B shows a strip pallet verge. As on other escapements, the verges are shaped so that they move freely in between the teeth without touching the backs of the teeth.

Operation

In Figure 3, a tooth is locked on the entry pallet while another tooth has just dropped from the exit pallet. As illustrated, tooth E is in contact with the locking surface of entrance pallet F. As the pendulum oscillates to the left it unlocks the escapement and continues to travel. Tooth E contacts the impulse surface of pallet F picking up thrust and pushing the pallet away, while pallet G moves toward tooth H. When tooth E slides over the end of the impulse surface of pallet F, tooth H comes into contact with pallet G at the locking surface. Pallet G will continue to move in between the teeth. Since the curve face of the locking surface of the pallet is not a concentric arc of a circle centered at the pivot point of the verge, there is a slight recoil.

The angle of the locking surface should be 1/2 to 1 degree. Generally, high-grade movements have a smaller angle of lock. The impulse surface should be 1-1/2 to 2 degrees. These angles are illustrated in Figure 4. The drop-lock, or overlap of the tooth on the locking face of the pallet is usually at least 1/2 degree.

Adjustment and Repair

Prior to any adjustment, pivot hole wear must by repaired so that the center distance of the escape wheel and verge arbors can be corrected. If escape wheel teeth are worn, they should be reshaped and the tips burnished. In

extreme cases, the escape wheel may need to be replaced. Pallet faces worn from the sliding action of abrasive charged escape wheel teeth can usually be repaired, but in extreme cases will need to be replaced.

The adjustments for this escapement are exactly the same as for the dead beat escapement. Equalizing the drops is done by adjusting the center distance of the escape wheel and verge arbors. Decreasing the center distance will decrease the outside drops and increase the inside drops. Increasing the center distance will increase outside drops and decrease inside drops. Adjusting the center distance will change the drop-locks, but if the pallets are in good condition equalizing the drops should result in the correct amount of both drop and lock.

If it is necessary to adjust lock, it can be decreased by opening the pallets and increased by closing them. Unequal locks can be equalized by altering the impulse angle of the pallet(s). To equalize the locks, increase the impulse angle on the pallet having the larger lock or decrease it on the pallet having the smaller lock. After the locks have been equalized, the pallets may have to be opened or closed to adjust for the correct amount of lock. The locks on this escapement should be as small as possible.

Pallets can be opened or closed by the same technique covered in the lesson on recoil escapements. Pallets can also be closed by compressing the verge (lengthwise) in a vise. Always check for hardness of the verge with a file before making any adjustment for lock.

Adjustment of the drops and locks modify each other, so it will be necessary to manipulate back and forth between them to arrive at optimum settings.

With the passing of time, the unceasing dropping and sliding of escape wheel teeth on the steel pallets will eventually wear grooves in the pallet faces. Superficial wear of shallow grooves in the impulse and/or locking faces of the pallets can usually be disregarded if it is smooth and shinny. Rough grooves should be refinished with a course (#4) emery stick, followed with a medium (#2) emery stick, and then a fine grit (#4/0) emery stick to polish the surface. Polish in the direction conforming to the sliding action of the escape wheel teeth to avoid a cross action of the teeth sliding over fine ridges left by the emery sticks and be careful not to alter the lift angles.

In the case of badly worn pallets, some repairers attempt to shift the escape wheel and/or the verge on their arbors so that the teeth line up with an unworn section of the pallets. This technique is a "fix" and not a restoration. Jess Coleman's procedure for building up worn or grooved pallets by soldering bits of a thin razor blade to the surface is an acceptable method, or new pallets can be fabricated.

I will continue next time with the Brocot escapement.

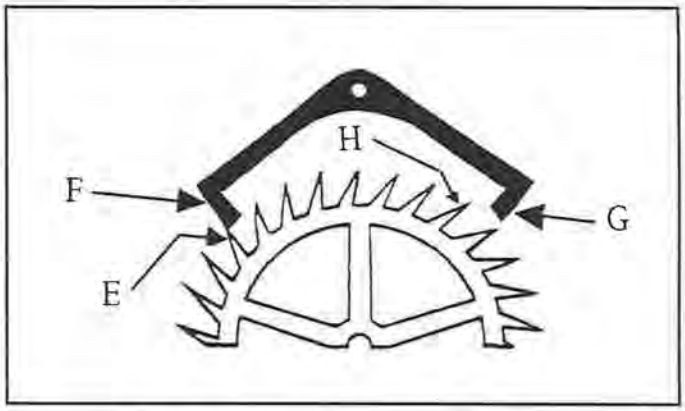


Figure 3. Half Dead Beat Escapement Action

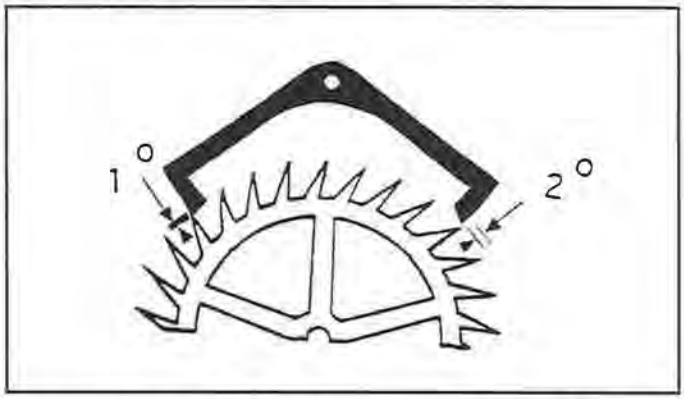


Figure 4. Half Dead Beat Escapement Lock and Impulse

United Tool & Material Co.

535 16th Street • Suite 840 • Denver, CO 80202



Watch Parts
Watch Bands
Eveready & Renata Batteries
Crystals
Movements
Ultrasonics
Cleaning Solutions
Benches
Tools
Equipment
Supplies
Solder
Casting Supplies











VISA

Orders Shipped Same Day
Expert Material Clerks

MasterCard

PHONE & FAX
Toll Free 1-800-332-4158

(Continued from page 15)
Institute who are eligible to vote may nominate one candidate by petition. That person's name shall be included on the ballot provided that person meets the qualifications required to serve as a Director of the Institute. The petition of nomination, signed by the members, must be received by the Executive Secretary not later than four months prior to the annual Board of Directors meeting.

One half of one percent or more active members of the Institute who are eligible to vote may nominate one candidate by petition. That person's name shall be included on the ballot provided that person meets the qualifications required to serve as a Director of the Institute. The petition of nomination, signed by the members, must be received by the Executive *Director* not later than *midnight on the last day of February.*

Section 6(b)

A decision of this committee may be requested by petition of five (5) members of the Board of Directors or twenty-five (25) members of the Institute.

A decision of this committee may be requested by petition of *six (6)* members of the Board of Directors or *2.5%* of the members of the Institute.

Section 6(c)

A majority vote of the members of the committee voting on interpretation of the Constitution and Bylaws constitutes a final decision.

A majority vote of *all members of the Judicial Committee constitutes a final decision on an interpretation of the Constitution and Bylaws, provided, however, that any such decision shall be subject to the review and approval of the Institute's General Counsel. In the event that any decision is rejected or modified by the General Counsel, the reasons for such rejections or modification shall be promptly submitted in writing to the Committee.*

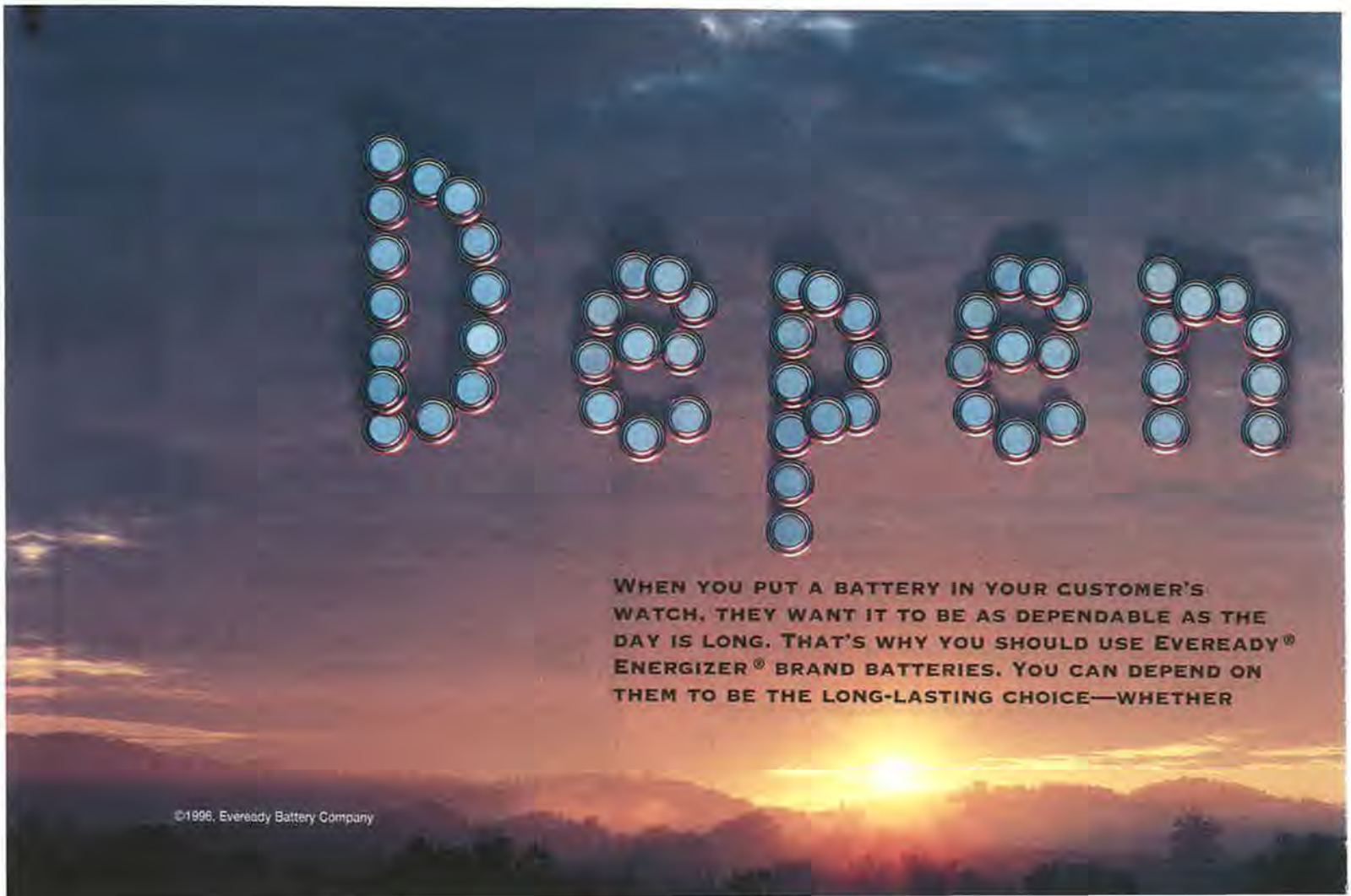
Article XIII - Affiliate Chapters
Section 2.

The Affiliate Chapter delegates at their annual meeting may select one chapter delegate to serve a one year term as a Director of the Institute. This person, upon approval of his/her credentials by the Board of Directors, shall have full vote and voice, the same as the director of the Institute who has been elected by the membership at large, provided that such person is an active voting member of the Institute and has been in good standing at least one year prior to election to this post.

The Affiliate Chapter delegates at their annual meeting, may select one *Affiliate* chapter delegate to serve a one year term as a Director of the Institute. This person, upon approval of his/her credentials by the Board of Directors, shall *become a Director and have the same rights as elected Board members, including the right to vote,* provided that such person is an active voting member of the Institute and has been in good standing at least one year *immediately* prior to *his/her selection for* this post. This person shall be known as the Affiliate Chapter Director.

Article XV - Research and Education Council
Section 2.

The Research and Education Council representatives may select one of their number to serve as an ex-officio member of the Board of Directors. This person, upon approval of his/her credentials by the Board of Directors, shall have the same rights as a Board member except voting rights. This person shall be known as the Research and Education Council Director.



The Research and Education Council representatives may select one of their number to serve as a member of the Board of Directors. This person, upon approval of his/her credentials by the Board of Directors, shall *become a Director and shall* have the same rights as *an elected* Board member, *including the right to vote, provided that such person is an active voting member of the Institute and has been in good standing at least one year immediately prior to his/her selection for this post.* This person shall be known as the Research and Education Council Director.

Article XVIII - Constitutional Amendment
Section 2.

Any member desiring to propose an amendment to the constitution, may do so by obtaining the signatures of one percent, but not less than 50, of the members eligible to vote, to a petition in which the proposed amendment is properly set forth. This petition shall be conveyed to the Constitution and Bylaws committee in accordance with Article XVIII, Section 4.

Any member desiring to propose an amendment to the constitution, may do so by obtaining the signatures of *2.5* percent, but not less than 50, of the members eligible to vote, to a petition in which the proposed amendment is properly set forth. This petition shall be conveyed to the Constitution and Bylaws committee in accordance with Article XVIII, Section 4.

Section 5.

If a majority of the Constitution and Bylaws committee signify approval, a ballot shall be mailed from the headquarters office of the Institute to each Institute member entitled to vote within thirty (30) days after the date upon which that approval has been received by the Executive Secretary.

If the Constitution and Bylaws committee, *by majority vote, agrees that said proposal is in proper form,* a ballot shall be *included with the annual ballot for election of Directors. If, in the sole opinion of the Committee, the proposal is not in proper form, the proposal shall be returned to the member for correction. The proposal may be resubmitted in the proper form within sixty (60) days, provided however that only those proposals received and approved before March 15th shall appear on the ballot mailed that year.*

Section 10. (New Section)

A special ballot may be mailed provided that the same has been approved by a vote of two thirds or more of the entire Board of Directors.

Section 11. (New Section)

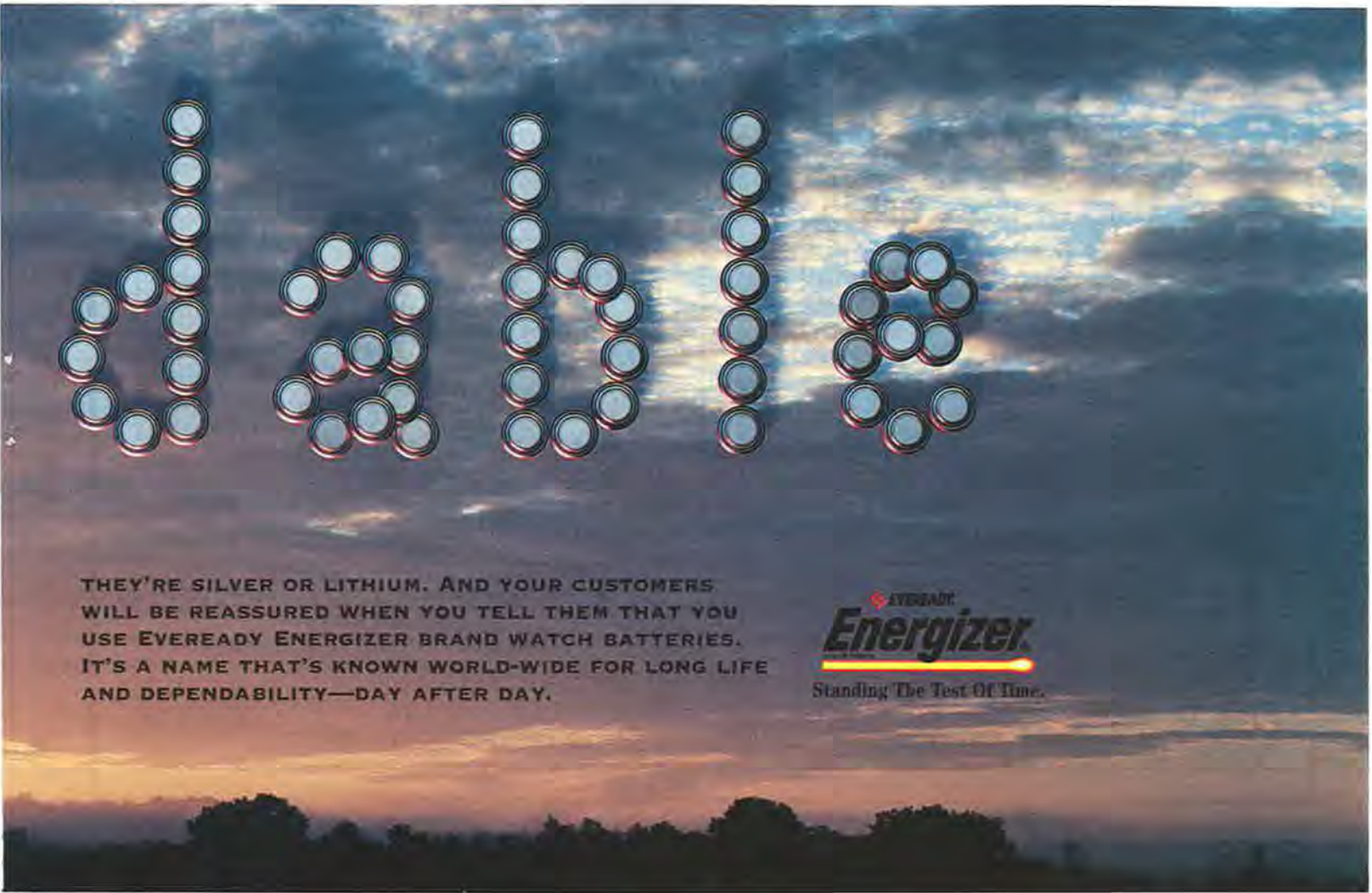
Any proposed changes to the Constitution originating with the Constitution and Bylaws Committee shall first be approved by a majority of the Board of Directors before being included on any ballot.

Article XXII - Mailing List
(To be deleted from the Constitution and transferred to the Bylaws.)
Section 1.

The membership mailing list shall not be made available to any person, organizations, business enterprise other than Affiliate Chapters of the Institute, then solely for Institute business.

Section 2.

Qualified affiliate chapters may obtain the membership list for their area to be used exclusively for contacting horologists in their area. When the Institute membership list has been used by an affiliate chapter, the list they develop for their area must be restricted in use in the same manner as is the Institute's list.



TECHNICALLY WATCHES

ANTIQUE WATCH RESTORATION, PART CXXXXVII

WORMS AND WORM WHEELS (CONTINUED)

By Archie B. Perkins, CMW, FNAWCC, FBHI
© 1998 (All rights reserved by the author)

The worms discussed previously were all single thread or single lead worms. Worms can be made in one, two, three, or four lead types. Figure 1 shows all of these types. The type of worm can be identified by viewing it from its end as shown in Figure 1. The number of leads can be traced from their starting point at the end of the worm.

View A shows a single lead worm. This worm must be used with a worm wheel made specifically for a single lead worm.

View B shows a double lead worm. When a worm has two or more leads, the starts of the leads are equally spaced. Each lead must be indexed, as when cutting a regular-toothed wheel. Each lead is cut separately. This requires special equipment which will be discussed later. The worm wheel used with a double lead worm must be made for a double lead worm. The teeth of the wheel are made at a greater angle than the teeth of a worm wheel for a single lead worm.

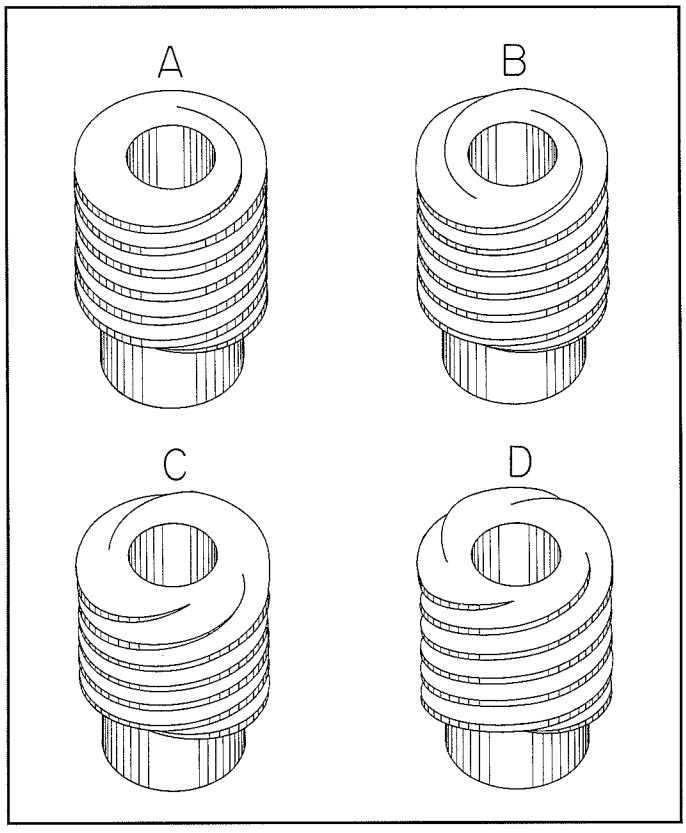


Figure 1.

View C, Figure 1 shows a triple lead worm. The starts of the three leads are equally spaced. The worm wheel must be made especially for a three lead worm. The teeth of the wheel are sloped to match the slope on the worm threads.

View D, Figure 1 shows a four lead worm. The starts of the leads are equally spaced. The worm wheel used with this worm must be made to be used with a four lead worm.

The Lead and Pitch of a Worm

Figure 2 shows how the lead and pitch of a worm are calculated. View A shows the lead of a spiral and how it is calculated. The right-angle triangle shown in View A is used to illustrate the spiral lead. Side "a" equals the angle of the lead. Side "b" of the triangle equals the length of the lead, and side "c" equals the circumference of the cylinder.

Calculating the Lead of a Worm

To lay out the triangle, we can measure the diameter of a worm blank to determine its diameter, and multiply this number times π 3.1416 to determine the circumference "c" of the blank. The length of the lead "b" is determined. Then, the angle "a" of the lead is determined by drawing a straight line from the end of line "b" to the tip of line "c" of the triangle. The triangle should be a scaled drawing. If the drawing is actual size, when the triangle is wrapped around the worm blank, it should show up on the blank like on the unshaded part of the blank in View A, Figure 2.

Rules Used to Calculate the Parts of a Spiral Lead

Rule 1. Divide the circumference of the cylinder or spiral by the number of inches of spiral to one turn of the cylinder. The quotient will be the tangent of the angle of the spiral. The tangent of a number can be found in a table of

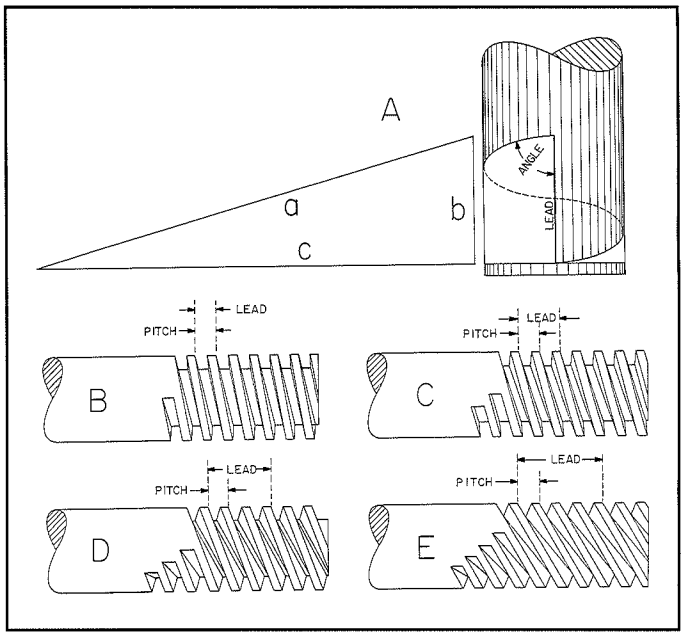


Figure 2.

natural trigonometric functions. Note: The circumference equals the diameter times π 3.1416.

Example: When circumference = 1.57" and length of lead = 2.50 and we need to find the tangent of angle:

Tangent of Angle = Circumference ÷ Length of Lead

Tangent of Angle = $\frac{1.57"}{.250}$ = 6.28 Tangent of Angle

Rule 2. Divide the circumference by the tangent of angle and the quotient will be the lead of the spiral.

Example:

Lead of Spiral = $\frac{\text{Circumference}}{\text{Tangent of Angle}}$

$\frac{1.57}{6.25}$ = .250" = Length of Lead

Rule 3. Multiply the tangent of angle by the lead, and the product will be the circumference.

Example:

Circumference = Tangent of Angle x Length of Lead

6.28 x .250 = 1.57 = Circumference

When applying these calculations to spiral gears, the angle is used at the pitch circumference and not at the outer circle.

Comparing the Pitch and the Lead of Worms

Figure 2, View B shows a single lead worm. The pitch and lead both cover the same linear distance. That is, the linear distance along the cylinder that is taken up by the lead

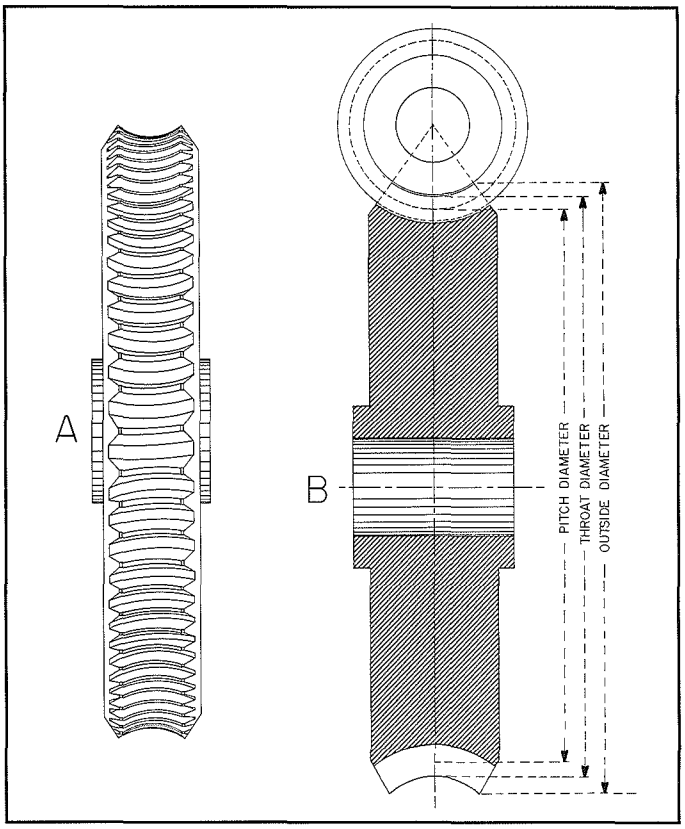


Figure 3.

706 S. Hill St., #580
Los Angeles, CA 90014

SMITH SUPPLY HOUSE
LOS ANGELES

Tel: (213) 622-1687
Fax: (213) 488-0922

Watch Materials, Supplies & Tools

Watch Battery Distributor

MARCH SPECIALS

DOUBLE SPRING CALIBRE
635 -645
Part 5607

AXLE SPRING CALIBRE
620 630
635 645

$20.00 each

HAMILTON
980 - 980A - 980B
982 - 982B
Staffs 5027 14/0
Stems 5026 14/0

$5.00 each

SET BRIDGES
Universal 42
Movado 245
Omega 330
Buren 65

$15.00 each

GENERIC Hands To Fit
Rolex
Set of 3 Hands

$15.00 each

YOUR SUPPLIER OF SPARE PARTS FOR ALL BRANDS OF
MECHANICAL AND QUARTZ WATCHES, CLOCKS AND ALARMS

CALL TOLL FREE (800) 23-SMITH

is equal to the distance of the pitch from one thread to the next thread.

View C, Figure 2 shows a worm with a double lead. In this case, the lead is twice the pitch.

View D, Figure 2 shows a worm that has a triple lead which makes the lead three times the pitch.

View E, Figure 2 shows a worm which has four leads. In this case, the lead is equal to four times the pitch.

Making Worm Wheels

Figure 3, View A shows a throated worm wheel which is of the best design. The teeth are shaped to fit the worm closely which increases the strength of the gearing compared to a wheel that has regular-shaped teeth that are cut diagonally across the circumference of the wheel or a wheel that has rounded sinks around its outside edge for the outside edge of the worm thread to work in.

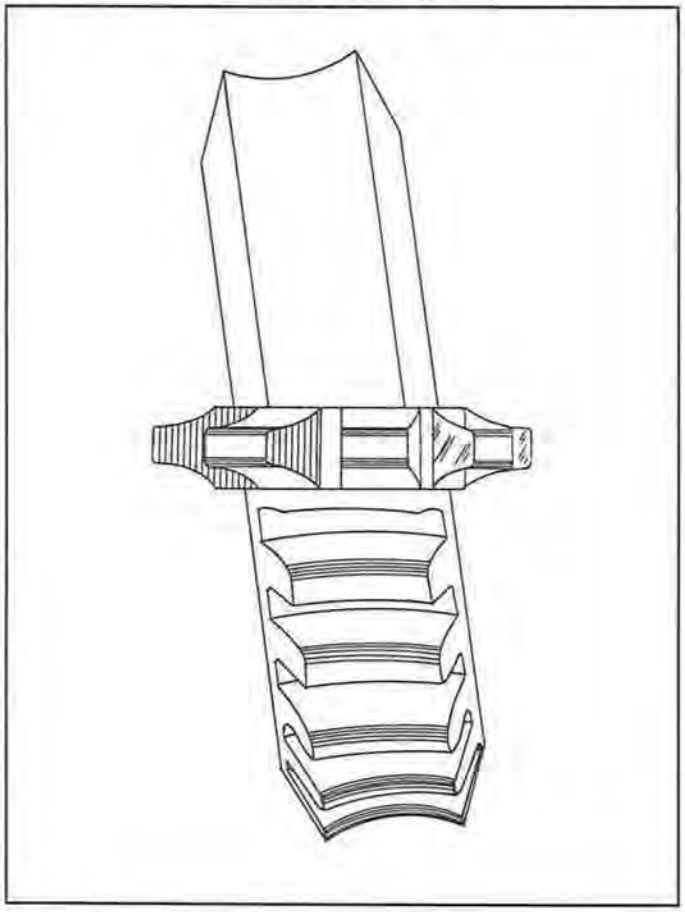


Figure 4.

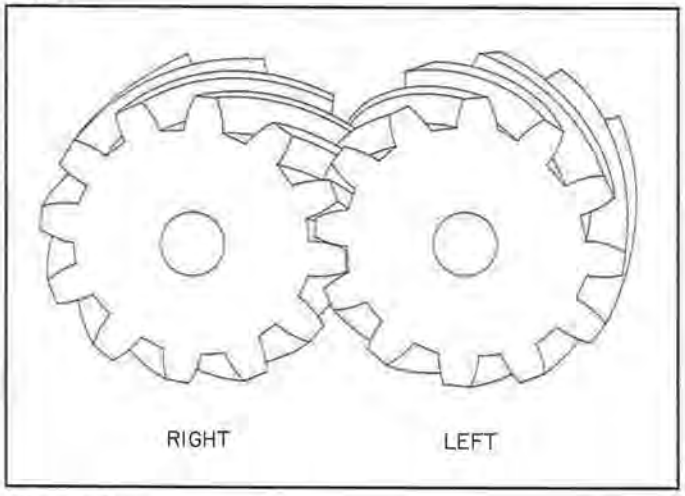


Figure 5.

Figure 4 shows the first steps in making a worm wheel. The worm wheel blank is usually gashed with a single wheel cutter before the teeth are finished by hobbing the wheel. The spaces are gashed with a cutter which leaves the teeth too thick. Then, a hob that is slightly larger in diameter than the worm that is to work with the wheel is used to hob the teeth to bring the teeth and wheel to size. Note that the gashing cutter is presented to the blank at the proper angle to match the lead of the worm that is to work with the wheel. The longer the lead of the worm, the more angle needed on the teeth of the worm wheel. When gashing the blank with a regular wheel cutter, the cutter is lowered and raised each time a gash is made and it is not moved across the wheel blank as is done when cutting regular teeth. Sometimes the blank is gashed with a coarse hob and the teeth are finished with a fine-toothed finishing hob. Special equipment is needed to hob a gear compared to cutting the teeth with a regular wheel cutter. When hobbing a gear, the blank is turned slowly at a given speed by the use of gearing while the hob is turning at a given speed and is being fed through the blank at a given speed. Note: Brown and Sharpe state in their book, *Practical Treatise on Gearing*, that "In the absence of a special worm gear cutting machine, the teeth of the wheel are first cut as nearly to the finished form as practicable: the hob and worm-wheel are mounted upon shafts and hob placed in mesh, it is then rotated and dropped deeper into the wheel until the teeth are finished. The hob generally drives the worm-wheel during this operation.... In making wheels in quantities it is better to have a machine in which the work spindle is driven by gearing so that the hob can cut the teeth from the solid without gashing."

Pitching Worm Wheels and Worms

View B, Figure 3 shows how a worm and worm wheel work together. The illustration shows the pitch diameter, throat diameter, and outside diameter of the worm wheel.

For worm wheels with 30 or more teeth, the following rule is used to calculate the pitch diameter of the worm wheel.

Rule: Multiply the number of teeth in the worm wheel by the distance between the centers of adjacent worm threads and divide the product by π 3.1416.

Note: In case the worm has multiple leads, the distance between the centers of adjacent threads is the lead of the worm divided by the number of threads.

To Calculate the Throat Diameter of a Worm Wheel

Rule: Divide twice the pitch diameter by the number of teeth in the wheel and add the quotient to the pitch diameter.

To Calculate Depth of Tooth

Rule: Multiply the distance between the centers of

adjacent threads of the worm by .6866.

Worm Calculations

To Find the Outside Diameter of a Worm

Rule: Multiply the distance between adjacent threads of the worm by .6366 and add the product to the pitch diameter of the worm.

To Find the Pitch Diameter of a Worm

Subtract half the pitch diameter of the worm wheel from the distance between centers and double the remainder.

Helical Gearing

Figure 5 shows a pair of helical gears. The teeth of this type of gear are cut on a helical path rather than the straight path of regular gears. For two of these gears to work together side by side, one of the gears must be cut with right-hand leads and the other with left-hand leads. If a pair of these gears is to work together at right angles to each other, they both must be of the same lead. That is, both gears must have right-hand leads or left-hand leads.

To cut this type of gear, special equipment is needed for indexing each lead and for rotating the blank as the leads are cut.

Equipment for Making Helical Gears

Figure 6 shows a basic method for indexing and rotating

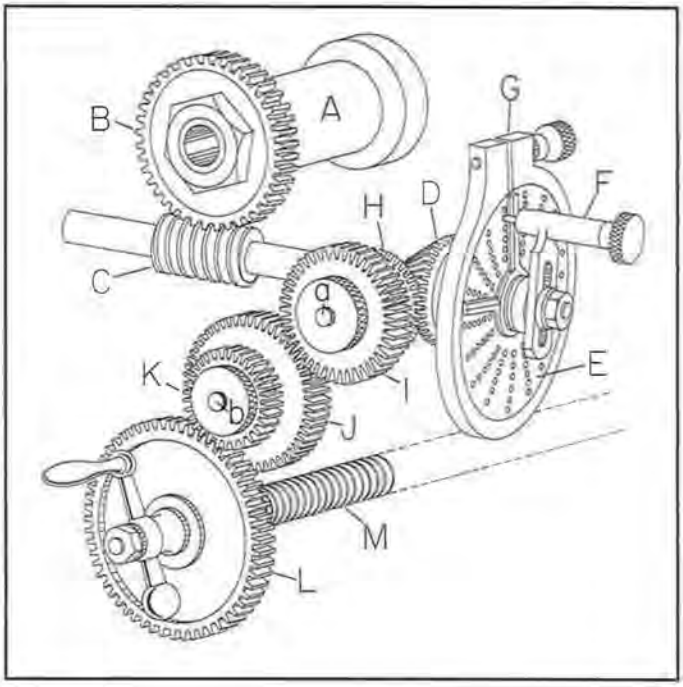
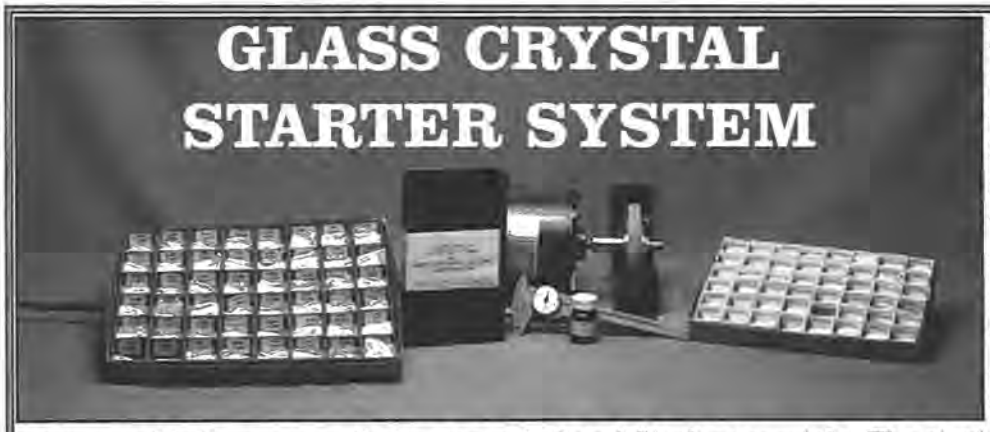


Figure 6.



Do it yourself! Save time and money by fitting your own crystals. This special service can increase your store traffic and customer satisfaction with while-u-wait crystal fitting. No more waiting and worrying about sending your customers valuable bezels through the mail - you get all the equipment you need plus a video tape that shows and tells you exactly how to grind and fit glass crystals. The starter system includes a grinder, one gross of flat unfinished tempered blanks, one gross of regular blanks, the instructional video, and a set of written instructions.

A $988.50 VALUE - SPECIAL $877.50. YOU SAVE $111.00!

S. LaRose, Inc.
Worldwide Distributors to Horologists

3223 Yanceyville St., P.O.Box 21208
Greensboro, N.C.27420,USA
Phone:(336) 621-1936
Fax:1-800-537-4513
E-mail: SLAROSE@worldnet.att.net
HOME PAGE: http://www.slarose.com

Here is what you get:

095003A - Vernier Gauge $19.50
095003B - Retail 4" Grinder $345.00
095003C - F-Blk 50 Asst (1 gross flat unfin. tempered blanks).....$216.50
095003D - Cement $3.00
095003E - RG-1 asst. (1 gross regular blanks) $375.00
095003F - Video - Fitting glass watch crystals $29.50

095003 - Complete System $877.50

the gear blank when cutting the leads of worms and gears. This arrangement is used on the indexing head of the milling machine used in machine shops. The same type of arrangement can be applied to the watchmakers lathe also.

This arrangement is a combination thread cutting and indexing arrangement. The requirements for this attachment are: (1) It must have gears to connect the lead screw of the slide rest to the lathe spindle for turning the lathe headstock while the spiral is being milled. (2) Then, there must be a means for locking the gearing and disconnecting the headstock so it can be indexed for milling the next lead.

The following is an explanation of the arrangement. View A shows the lathe headstock spindle. View B shows the worm wheel mounted on the lathe spindle. View C shows the worm on its shaft. View D shows a beveled gear that has the index plate E mounted onto its hub. The gear and index plate are free to turn as a unit around the worm shaft. The index crank F is fastened to the end of the worm shaft. The index plate can be locked in any position by the index plate clamp G which is fastened to the frame work of the arrangement. The index plate and its beveled gear are locked by this clamp when the work is being indexed. When a lead is being milled, the clamp is released which allows all of the gearing to turn, including the index plate. The index plate must be locked by the index pin for the worm to turn the lathe headstock.

Beveled gear D is connected to beveled gear H at all times. These two bevel gears should have the same number of teeth as the worm wheel on the lathe spindle. Beveled gear H is keyed to the gear "I" mounted on stud "a". Gear "I" connects to J and K on stud "b". Gear K connects to gear L on the lead screw M of the slide rest.

When the crank on the lead screw is turned, the gear train turns the lathe headstock if clamp G is released and the index pin is in a hole in the index plate.

Calculating the Change Gears

The indexing and thread cutting arrangement should be designed so the lead screw and the headstock spindle have the same ratio. The lead screw of the slide rest usually has 40 threads per inch; therefore, the worm and worm gear that drive the headstock should also have a 40 to 1 ratio. This would allow a single thread worm and a 40-tooth worm wheel on the lathe spindle. When the lead screw is turned 1 revolution, the worm shaft should also turn 1 revolution. When the headstock spindle makes 1 revolution, the lead screw should advance 40 revolutions or 1 inch. This would be the lead of the machine.

When we place a 40-tooth gear on the slide rest screw and have a 40-tooth bevel gear on the worm shaft and worm stud, a spiral with a 1-inch lead will be cut if the other gears in the gear train are not compounded (stacked up). Note: Any gears which are not compounded that are placed between the lead screw and the worm stud do not change the ratio between the lead screw and the lathe spindle. If we exchange the 40-tooth gear on the lead screw with one that has fewer teeth, the lead that is cut will be longer because the lead screw will need to be turned more turns to cause the lathe spindle to make 1 revolution. On the other hand, if the gear on the lead screw has more than 40 teeth, the lead that is cut will be shorter because the lead screw will need to be turned fewer turns for the lathe spindle to turn 1 revolution.

To select change gears when cutting a particular helix, we would use the following formula:

$$\frac{\text{Lead of Helix}}{\text{Lead of the Equipment}}$$

Let us say we need to cut a helix that has a lead of 2 inches and the lead of the equipment is 1 inch. Then, it is only necessary to select gears that have this ratio: $\frac{2}{1}$.

By multiplying these two numbers by the same number, we arrive at gears that are in the set of available gears.

For example: $\frac{30}{30} \times \frac{2}{1} = \frac{60}{30}$

How these gears are placed in the gear train depends on the relation of the lead of the helix and the lead of the machine. When the lead of the spiral is less than the lead of the equipment, the smaller of the two gears must be driven. When the lead of the helix is greater than the lead of the equipment, the larger of the two gears should be the driven gear.

BIBLIOGRAPHY

Brown, Joseph R. and Sharpe, Lucian. *Practical Treatise on Gears.* Providence, RI: Brown and Sharpe Mfg. Co., 1900, pp. 63-78, 109-131.

Colvin, Fred H. and Stanley, Frank A. *American Machinists' Handbook.* New York: McGraw-Hill Book Co., 1945, pp. 427-456.

Davis, W. O. *Gears for Small Mechanisms.* London: N.A.G. Press, 1953, pp. 83-85, 110, 120.

Henry Ford Trade School. *Shop Theory.* New York: McGraw-Hill Book Co., 1946, pp. 93,101, 103, 167-180.

International Correspondence Schools Reference Library Book 50. *Milling Machine Work, Gear Calculations, Gear Cutting.* Scranton, PA: International Textbook Co., 1901, Section 16, pp. 19-31, Section 17, pp. 41-49.

South Bend Lathe Works. *How to Run a Lathe.* South Bend, Indiana, 1956, pp. 83-86.

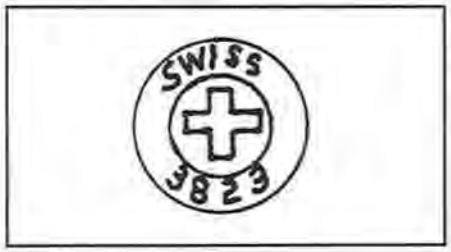
BULLETIN BOARD

A. NEW REQUESTS

Portescap Ultrasonic Cleaner Rc-4
R.L. D'Avignon, Syracuse, NY, is seeking a schematic for a Portescap US Ultrasonic Cleaner, Model Rc-4. If anyone has this schematic, AWI will make a copy for Mr. D'Avignon, retain one for our technical files and return the original.

Vigor Electric Soldering Machine SM-800
Alfred Born, Decatur, IL, is in need of an instruction manual for a Vigor Electric Soldering Machine, Model SM-800. It is a heavy-duty model, 110 volts, A.C. 60C cycle. The machine serial number is 4071.

Identification of a 19-Ligne Timer
R. L. D'Avignon, Syracuse, NY, is looking for help in identifying a trademark from a 19-ligne timer. He is in need of technical information after an identification is made.



B. RESPONSES

Anti Magnetique Watch
Stephen Gergely, Moncton, N.B., Canada, sent in the following reply to W.A. Stancliff's request for information on an "Anti Magnetique" watch.

These watches were made in Switzerland in the 1930s. They are not expensive watches. In Europe we call them Roskopf "pin lever". The cannon pinion is driven by the mainspring barrel cover.

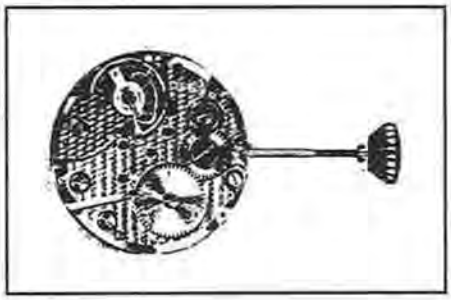
C. ITEMS STILL NEEDED

Computer Software
Mike Hatten, Greenville, NC, is looking for computer software that would be used for calculations concerning gear cutting, pendulum length, etc. If you have such a program or know where it can be obtained, let us know and we will share it with your fellow *HT* readers.

Parts for Watches Manufactured in China
Wilbur Horrell, Arlington, TX, is seeking a source for spare parts for watches made in China.

"Centennial" Watch
Mike Seiger, Auburn, AL, is looking for help in identifying this watch. It is a 43 mm Swiss-made watch. *Centennial* is printed on the dial. The movement is stamped No. 3364,+. The escapement is a pin lever. Stamped in the back cover is 194424. The case is sterling silver. Any help in identifying this watch would be appreciated.

Bleno Watch SA
James Blackwell, Dracut, MA, is seeking a parts list, a model number, or a part number for the ratchet click for this Bleno Watch SA. It is 17 jewel, 11-3/4 ligne. Any information would be appreciated.



LeCoultre Clock
Chris Carey, Watertown, MA, is trying to find the model number of a LeCoultre clock. This specific clock has a gear train which is all in one line and it is not shockproof.

Eli Terry Clock
George Jones, State College, PA, is looking for a complete photo of the Eli Terry clock shown in this photo. The top of the clock is missing and Mr. Jones is not sure of the correct finish. It has brass works and the pull-open shutter above the hands to show the escapement.



Safeway Watch Cleaner
W.C. Schmitteckert, Dayton, OH, is seeking a manual for a Safeway Model Type B Watch Cleaner made by Zenith Manufacturing.

Ultrasonic Instrumentation International
R.W. Dietzel, Albuquerque, NM, is looking for a schematic and operator's manual for an ultrasonic cleaner from the Ultrasonic Instrumentation International Company, Westbury, Long Island, New York. The model number is GI2080-LD.

As a Clockmaker Turns

Collet Problems with the Watchmaker's Lathe

Part 4

By J. M. Huckabee, CMC, FBHI, FAWI

Overview

This is the final part of the "Collet Problems..." series of articles. We will bring together the techniques learned, and fit this group of alien collets into a watchmaker's lathe. In addition, there will be some guidelines on refurbishing collets, and collet use.

Another discussion will involve an evaluation of practical accuracy of lathe work. Only the very rich or the very foolish can justify and afford a perfect lathe with perfect collets. Yet, the skilled workman turns out perfect work with a machine of nominal quality.

Collet Size Problems

Minor differences in collet size may be of no consequence in your lathe. The same can be said for the lathe spindle. However, if the lathe spindle bore is a little small, and collet body slightly oversize, this build-up of tolerances may spell big trouble.

The block of new collets in Figure 1 is a classic example of a tolerance build-up problem. These, plus another block of smaller sizes, are a little larger than most WW-style collets. Figure 2 shows the body diameter to be just over 0.315". Eight millimeters is about 0.3149". These collets have been in at least ten different lathes with no problems. Yet a very fine lathe of famous name at the AWI Educational Center would not receive a single one of these. The same collets were fine in other lathes there. Conclusion: good lathe, good collets, unfortunate tolerance build-up. An isolated case that could be corrected. If I owned the whole problem, a cut of about 0.002" in spindle internal diameter would be made.

The collet of Figure 3 has a typical diameter to those in my shop. A few of my collets measure down to 0.309", and at least a few measure 0.316". This range is not a problem in my machines.

The longer collet in Figure 3 is a Moseley conoidal piece. This will not go full depth into some Moseley and WW spindles. By a slight internal cut at the head angle and body junction the collet becomes workable. Do not cut the spindle mouth region.

Overall length adaptation was discussed in Part 3 of this series. That adaptation is not a big problem. The piece in Figure 4 is extra long because of its deep pocket. The deep pocket has no influence on the collet-spindle fit.

Thread fit is very important. Damaged threads in the drawbar is a disaster—no drawbar, no lathe. Be sure drawbar and collet threads are clean, and the fit-up permits engagement of at least 75% of the collet threads. The two pieces should screw together finger-easy.

Thread size is usually stated as 270-40 for the 8-mm lathe. That number means 0.270" diameter with 40 threads per linear inch. The measurement in Figure 5 is nominal for the collets I own.

Where Is the Key in the Spindle?

To cope with the spindle key, we need to know where it is located and its width and length. Location is determined by inserting a collet with its keyway misaligned. The collet will touch down and stop with its thread body shoulder against the key. Figure 6 shows where the collet will be with respect to the spindle mouth. This is a nominal example. That information (Figure 6) transferred to Figure 7 will show key location in collet keyway.

Use the same technique with a WW collet in the Moseley spindle. The result is shown in Figure 8. Key engagement in Figure 8 is marginal because of differences in collet length.

If you have a WW-style lathe, a similar group of tests can be made. Paint the collet with a dark ink pen and slip the collet in place and search the point of touchdown. My experience indicates that the key width and length will be the most common problem in use of alien collets. These keys are hard and very short. Remove the lathe spindle and with a suitable flat-faced punch drive the key into the spindle bore. Then check out your fit-up problems.

Key Size Adjustment

A method to reduce key length is to remove the piece, and re-insert it to slightly less depth, and grind away the outside end. The key is usually too hard to cut with a file. To make a new key, turn a piece with a tang end, harden, insert from outside, and cut off the parent piece. A thin grinding wheel in a motor tool is suitable.

Still another decision is to remove the key. Given a true spindle and true collet, the practical truth and accuracy of the lathe is unchanged with, or without, the key. Surface area of the collet head is greater than that of the collet bore. It will not slip in the spindle. With drawbar and collet threads clean, a fingertip on the collet face is all that is needed to close the collet. I use lathes that have no keys and others with keys. This is not a problem in most jobs.

Our final, but rarely found problem is collet head-to-body shape. Compare the two WW collets in Figure 9. The top example may not reach full depth in some lathes. A small cut in the spindle in that area solves the problem. This is another example of the problem discussed with Figure 3.

Practical Accuracy of the Lathe

What makes a good lathe? Good bearings, true spindle, perfect collets, perfect headstock-tailstock alignment, on and on. And if you have all of this, what will it be after a year, two, or three?

The practical accuracy of the machine is no better than your workmanship methods and skills. Those idealistic features are great, but in the real world we need good quality spindle bearings and a good steady source of motive power. Most of the other items can be solved with workmanship.

Our collets are used as a chucking convenience, not a guarantee of accuracy. Job setup should never depend on a perfect collet for a perfect job. Here is why: a

work piece that is not perfectly round, perfectly straight, carefully chucked into a perfect collet will not run true. That covers almost everything we do. A piece that overhangs the collet by more than about 4-6 diameters cannot be expected to run true, even under perfect conditions. That also covers almost every job. Choose your raw material size, length, and support such that the finished job is of reduced dimensions. That cancels the problem. Pieces that must be perfect should be worked between centers, or on a faceplate. That cancels the problem. In fact, the most important feature of a lathe is good slack-free spindle bearings.

Refurbishing Collets

New collets can be wasted money unless you intend to take care of them, and use them wisely. A new collet in a tarnished lathe spindle will be disappointing. The same is true if your spindle bearings are neglected. Chucking an off-size piece in a collet will spoil the collet. Likewise, chucking a hard piece with a rough surface can be the end of a good collet.

Surface tarnish, rust, chips, etc., all spoil collet accuracy. Tarnish inside the collet bore is the most difficult to clean up. A small buffer wheel made from Scotch-Brite Scour Pads, from the grocery store, works wonders on external tarnish. Internal tarnish may be cleaned up with a piece of pegwood and solvent, but most times this means a lost collet.

The collet group in Figure 1 is now about 32 years old, and like new. This block

Continued on page 56.

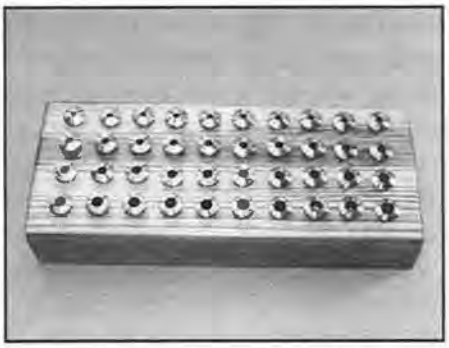


Figure 1. This group of new WW-style collets would not fit into one very fine American-made WW lathe.

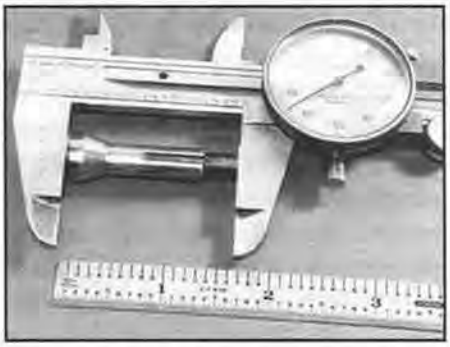


Figure 4. Overlength due to head shape is not a problem. This example is 1.666" long.



Figure 7. The key of a Moseley lathe is about here when the collet is seated.

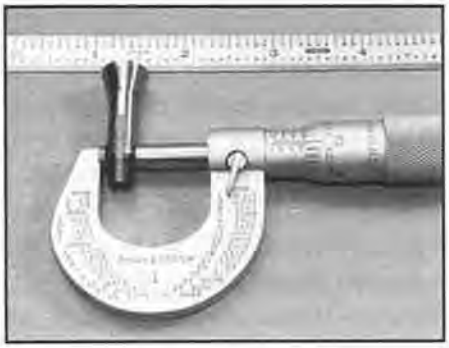


Figure 2. Body diameter is just over 0.315". The misfit was less than 0.002".

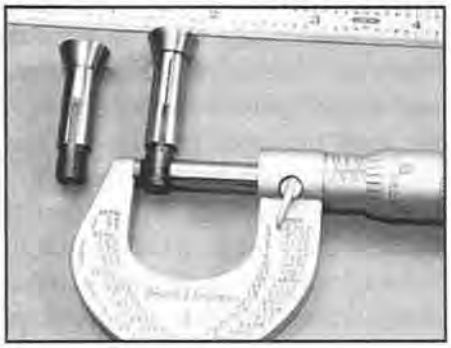


Figure 5. Thread size is very important. This 0.2694" diameter is nominal for the 0.270-40 size that fits almost all 8-mm lathes.

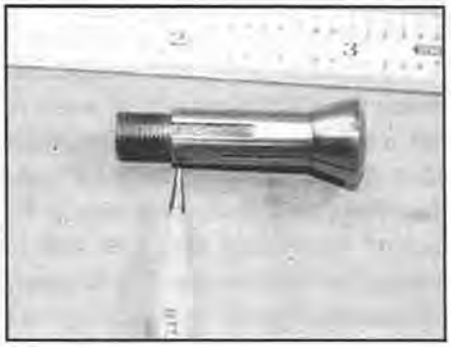


Figure 8. A Moseley lathe key is about here when this WW collet is used, really a marginal engagement.

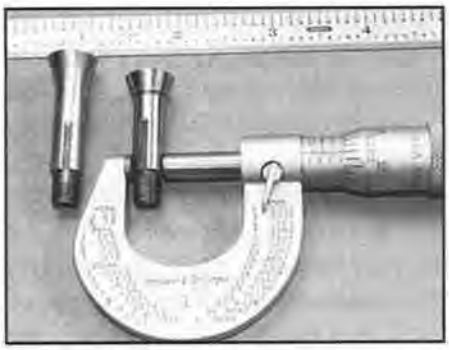


Figure 3. These pieces have a body diameter of 0.312". Head shape, length, and keyway differ.



Figure 6. A Moseley collet is about this deep in the spindle when body end meets the key.



Figure 9. Two very similar WW collets. Top example may have a problem in some lathes but easy to correct.

MATERIAL MATTERS

By Peter W. Eckel

Comebacks

Everyone has had them and everyone hates them. You're sitting at your bench, minding your own business when you're confronted with something you've seen before, a job that just went out and has now returned. Once in a while you find that you made a mistake or just missed something but more often than not it's just unexplainable. It may be a circuit that tested fine when you overhauled the watch or a clock with a chime that was fine the last time you saw it. But now you have a watch with a dead circuit or a clock with a chime that is not striking when it's supposed to. Maybe it's a cracked jewel that looked fine when the watch went out or, worst of all, it may be your customer's mistake that caused the thing to grace your bench again. Now your decision, is the repair something that you should charge for or do you eat it in the name of customer goodwill. A gentleman I used to work with had an interesting idea that he supposedly used when he had his own store. He would ask the customer whether the watch had been dropped on the cement or the carpet. This was to solve the problem of asking whether the watch had been dropped at all, to which the customer would inevitably answer no. Did this strategy work? I don't know, that part of the story never came up, but I loved the concept anyway.

So, what does all that have to do with material? I'm glad you asked me that. We material people have comebacks too; however, we refer to them as returns. We spend our day faithfully filling every single order perfectly and find that somehow you've received the wrong part. Ah, now you see the similarity, as I mentioned in my previous column, we material folks are not infallible (as much as it pains me to admit such a thing), but by the same token a surprisingly small number of returns are due to flat-out error. Some returns occur because we material people make a guess, not a very scientific explanation I agree but it does happen. We like to believe that we are making an educated guess but it doesn't always turn out that way. An example, you order a balance staff and we forgot to ask one of those important questions like shock or regular. There are "eleventy million" choices and we can't get in touch with you, so we send the most popular staff in shock since a shock staff will work in a regular but not vice-versa. Most of the time this works out well but when it doesn't we have created a return and delayed your job. There are of course times when we material people either pick out the wrong part or do not notice that the incorrect part is in the envelope we are picking material from. What can you the watchmaker do about these returns? Absolutely nothing, when we make mistakes it's totally out of your hands and we do feel bad that we have caused a problem for you and delayed your work.

What are the main reasons for returns that are not the material person's fault you might ask? They fall into three categories: a lack of communication, a lack of preparation, and what I call the shotgun approach to watchmaking.

The lack of communication is something we can all work on together. Sometimes even when we material people think we know exactly what part you are describing over the phone, we just do not have a meeting of the minds, and the result is an incorrect part winging its way to you. Please understand that when we continue to ask questions about the part you are sure you described perfectly, it's just our way of making sure that the picture in our mind is the same as in yours.

The problem of lack of preparation I'm afraid is all yours. Pretend for a moment, even if you can't set a VCR and have no intention of using a fax, that your order is a fax order. This will allow you the time to organize your thoughts and write down exactly what you need so that the order can be filled quickly from only one phone call. Please remember that the less time we spend on the phone taking the orders, the more time we have to get them out that same day. One more quick reminder, the earlier in the day you fax or call in your order the more likely it is to get shipped immediately.

Now for my explanation of the "shotgun approach" to watchmaking. This is something we've all done and it seems like a good idea at the time. A watch comes in that is very rusty and the prime suspects for replacement are a stem, clutch, winding pinion, and a detent, so the order goes out to your favorite material house for these parts. So what's the problem you ask? You haven't actually taken the thing apart yet and you may need all these parts or you may not. If your guess is correct the shotgun approach

has worked out OK and the idea of ordering everything you might need for the job has no ill effects. However, if the job needs more parts than you thought, you must order again creating a delay. This is something your customer dislikes a great deal. Also, if you ordered more parts than you ended up using, you have a return that your material person dislikes. It reminds me of a sign I once saw in an auto parts store, a place I am known to frequent, which read "parts are to buy not to try." I think these are good words to live by. Let's face it; at your end you have the postage for sending things back and the headache of keeping track of credits. From our point of view, we have the time involved in picking out the part, unpacking it and putting it back in stock, and the clerical time in the credit process. This is why some houses use a re-stocking charge.

After giving these problems great thought I have decided that if we ask you better questions when you place your order and if you the watchmaker or clockmaker answers them (even if we forget to ask), we are more than halfway towards solving our common problem.

Here are some things we should be asking you when you call for casing parts:

1) First and foremost, what color is it? You'd be amazed at how genuinely helpful this is.
2) Name brand watches have case numbers that are essential, while off-brand watches have case numbers that are worthless. For example, Rolex, Bulova, Seiko, Pulsar, Lorus, and Omega all have helpful case numbers. Gruen, Helbros, fake Rolex, and the like have case numbers that in most instances are of little value.

Here are some things that are darn handy to know when you order movement parts:

1) It sounds too obvious but please have the calibre and the calibre number already written down.
2) Is the balance shock resistant or regular for staffs, and is it flat or overcoil for a balance complete?
3) Is the movement two hand, sweep second, sub-second, date only, day/date, chronograph, alarm, or none of the above?
4) Any time you can let us know the tap of a stem, it is greatly appreciated.

Helping to keep returns to a minimum helps everyone. You get the job out on time because you have the correct part the first time and everyone saves on shipping. Besides, with fewer returns we material people will be able to lower prices because of less time taken with the returns. Yah, right! Back to reality! Well, maybe they just won't increase in price quite as fast.

That's all for now, and remember, material matters!

vibrograf® *"the most trusted brand name for watchmakers since 1931"*

SM-8810
The dry waterproof checker that professional watchmakers prefer



WATCH-MATIC Popular Mechanical Watch Timer



QUARTZ PLATFORM
Available Quartz Timing Platform

WATCH-MASTER
Versatile Quartz Watch Analyzer



For more information, or the name of your local distributor contact:

VIBROGRAF U.S.A. CORP.
504 Cherry Lane, Floral Park, NY 11001
Tel: (516) 437-8700 Fax: (516) 437-8708

Trade-Ins Taken

FROM THE WORKSHOP

By Jack Kurdzionak

Look Before You Loupe

Bob Bishop of Pennsylvania has made the following suggestion to aid those of us who wear eyeglasses with a spectacle loupe attached. The clamping mechanism can create problems of its own and the hinged arms of the loupe get in the way of fingers whenever one is doing very close work. All clamping loupes attach to the outer aspect of eyeglasses which is the root of the problem. If we could only attach the loupe to the center of the eyeglasses, it would make life much easier for us.

Bob's solution is to first make a block of plastic or brass to fit the opening of the bridge of the frame (assuming your glasses are made that way or you will have to improvise). This block should be friction-fit so that it can be inserted easily, but tight enough to stay in place. Remove the clamping parts of the loupe and devise a means to fasten the hinged portion to the block. Construction may differ so that you will have to custom design the attachment to match your loupe. I also soldered a bar to the top of the loupe frame to touch the top of the spectacle frame when the loupe lens was in the proper position. This guarantees perfect optical alignment each time the loupe is used.

Down Periscope

The ultrasonic tank used for cleaning almost anything is not a good place to lose something small. These tanks frequently hold a gallon or two of cleaning solutions that become cloudy after just a few uses. If a small part finds its way to the bottom of the tank, it can be difficult to find. You might put on a rubber glove and probe the depths of the tank for that missing screw, washer, or who knows what. You might even have to drain the tank through a sieve and hope that the missing part is found.

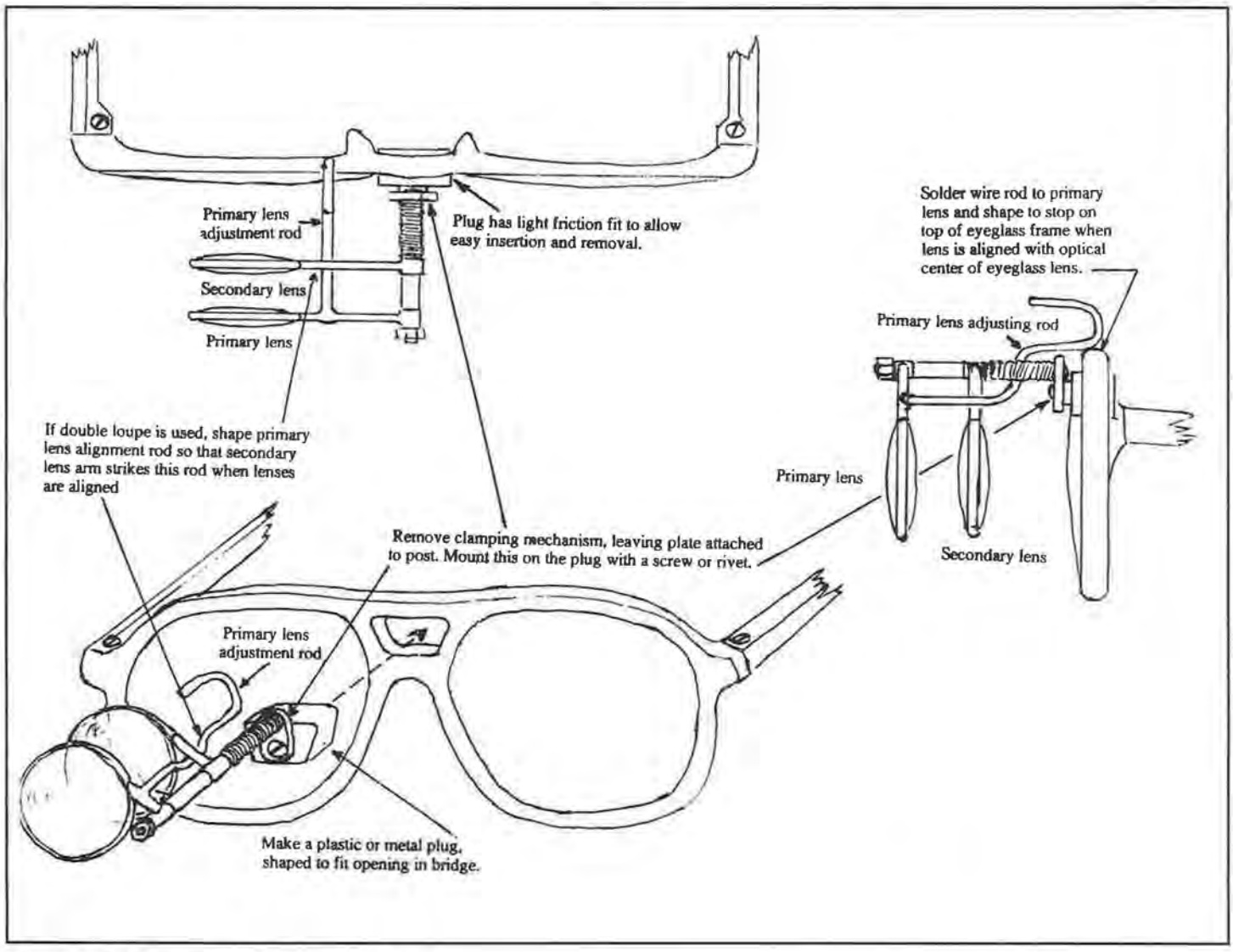


Figure 1. Center mount for eyeglass loupe.

Bob Bishop of Pennsylvania has constructed a device he uses to look through that murky solution in search of the missing part. Obtain a piece of plastic tubing with a diameter between 1-1/4 and 2 inches and a little longer than the depth of the ultrasonic tank. The diameter is not critical. A plastic drain extension tube from a plumbing supply store is good. Friction-fit a flat watch crystal to the end of the tube and seal it with cement to make it water tight. You are now ready to insert the tube, crystal end down, into the tank and probe the depths of it for the missing part. John Kurdzionak, a promising young clockmaker from Massachusetts, made the following suggestion for looking for parts in his ultrasonic tank. He takes a drinking glass of sufficient length and places it in the tank, bottom of the glass first, and peers through it in search of lost treasures. For clear vision you must put the bottom of the glass very close to the bottom of the tank.

It's a Snap to Open This Gucci

C. L. Crooks of North Carolina made the following suggestion for opening the case on a Gucci watch with a case back similar to that shown in the accompanying sketch. Insert a stout screwdriver with a sharpened tip into the joint between the case back and the bezel at the base of either gap on the back of the case. The tip of the screwdriver should be slightly narrower than the gap on the case back. Pry the case back open using the screwdriver. The case back should come off with ease. These cases have a water resistant gasket and usually require a case press to close properly. When pressing the case back onto the bezel, it is a good practice to remove the decorative colored plastic ring which is screwed to the front of the case. These can be easily cracked when closing the case using a press.

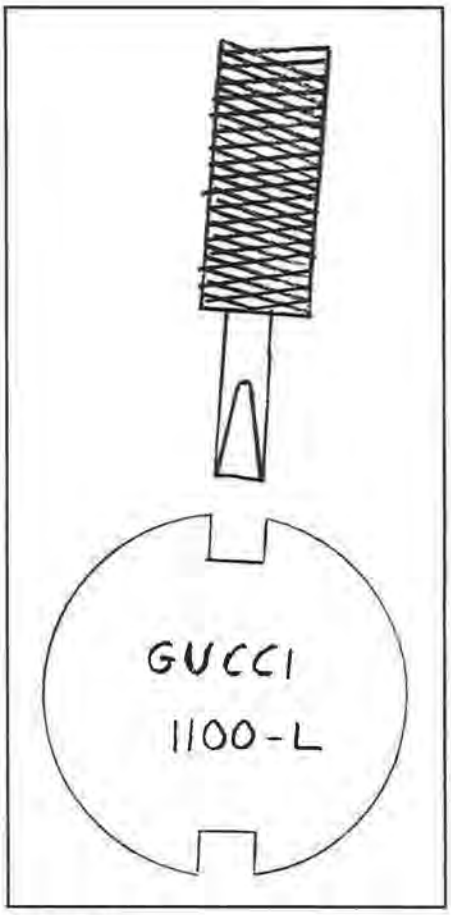


Figure 2.

UNIVERSAL
Watch Material

Phone (248) 358-9080 — Fax (248) 358-1168

Seiko • Pulsar Movement Exchange Program

1E20	V011	V802
1F20	V041	V892
2C20	Y148	V899
2E20	V220	&
2P20	V243	Many
3Y03	V254	More
5H23	V300	•
5Y23	V333	Rare &
7N00	V336	Discontinued
7N43	V33G	Including
H601	V652	Digital

Rare • Discontinued • Obsolete Material Is Our Specialty

Seiko • Lassale • Pulsar
Dials, Hands, Cases
Many Complete

Spare Parts

Movado • Gucci • Baume & Mercier
Wittnauer • Longines • Jubillee • LeCoultre

LeCoultre Baby Calendar Parts

ETA & Citizen Movement Exchange Program

Full Stock of Parts for Longines Calibers

4LL	5LN	3L	9L	9LT	10L	10LN
10LS	12L	12LN	12.38	13ZN	13.33	13.50
14L	14.16	14.17	17L	17.79ADS	17.89	18
18.19	18.72	18.89A3C	19A	19AS	22A	22L
23.0	23M	23MS	23Z	23ZS	24L	27M
27.0	30CH	37.9	72			

Authorized Distributor

Seiko
Citizen
Wittnauer
Bulova
Universal Geneve
Festine
Jaguar
Kelek
BB • Perfit Crystals
Renata
Acon Crown Co.
Sternkreuz Crystals
GS Crystals

CRYSTAL FITTING

28411 Northwestern Hwy. Suite 250
Southfield, MI 48034

CRYSTAL CUTTING

REPEATER, PETITE AND GRANDE SONNERIE CLOCKS

GEORGE GRAHAM BRACKET CLOCK, PART 30

By Leo A. Jaroslaw
©1998 (All rights reserved by the author)

Introduction

We now have the movement removed from the case. The dial has also been removed. Let's go on with the disassembly.

Spring Let-Down (Figure 30.1)

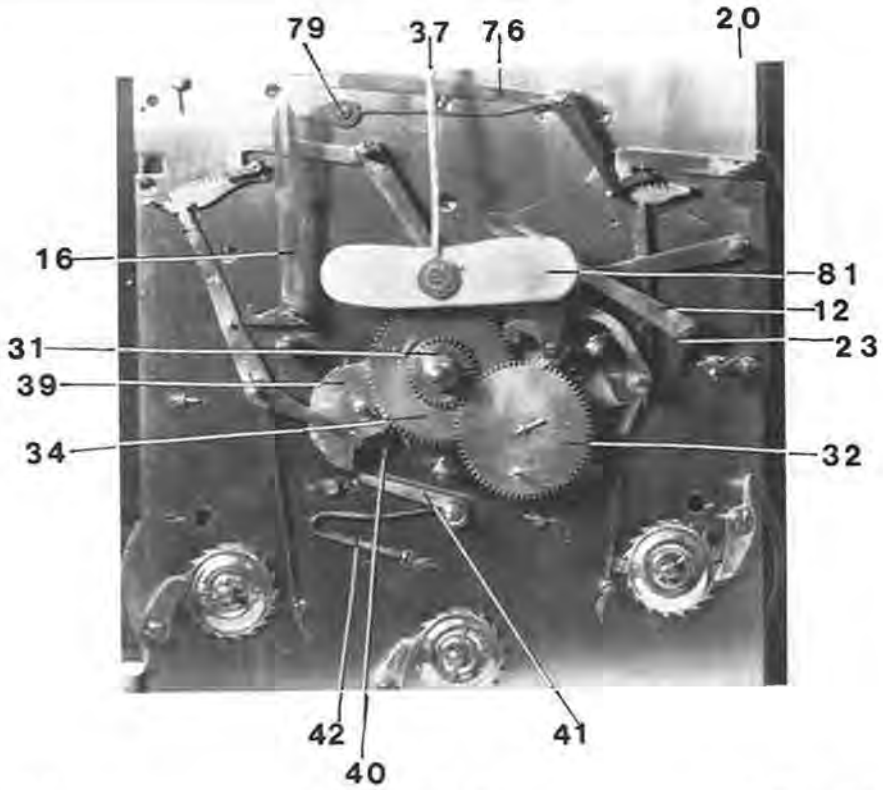
Note: This clock is fusee-powered for all three trains as has been previously discussed.

CAUTION: FUSEES CANNOT BE SIMPLY LET DOWN. AS WITH OTHER GOING BARREL TYPES. THE CLICKS FOR THE FUSEE SYSTEM ARE INTERNAL, INSIDE THE FUSEE, THEREFORE NOT ACCESSIBLE. THE CLICKS (83) AND RATCHET WHEELS (82) (FIGURE 30.5), ARE NOT TO BE TOUCHED AT THIS TIME.

3. CHIME TRAIN LET-DOWN (Figure 30.2).

3.1. Hold quarter rack hook (66) off the rack (64) allowing the train to run until all the cable is off the fusee (Figure 30.3).

Note: The fan will control the speed of the running train.



12 Chime/Silent Lock Lever
16 Strike/Silent Lock Lever
20 Front Plate
23 Chime Silent Assembly
31 Calendar Pinion
32 Calendar Wheel
34 Hour Wheel
37 False Pendulum
39 Hour Snail
40 Star Wheel
41 Jumper
42 Jumper Spring
76 Hour Warning Lever
79 Hour Warning Spring
81 False Pendulum Plate
82 Fusee Set Ratchet Wheel
83 Fusee Set Click
84 Fusee Click Holding Screw

Figure 30.1. Front Plate Components

4. STRIKE TRAIN LET-DOWN (Figure 30.4).

4.1. Hold hour rack hook (75) off the rack (19). Allow the train to run until all the cable is off the fusee. (Refer to Figure 30.3.)

5. TIME TRAIN LET-DOWN (Figures 30.1 & 30.6).

5.1. Remove rear pendulum, letting the movement run until the fusee is completely unwound.

5.1.1. When fully run down, remove the anchor pallet (85)/crutch (86)/false pendulum (37) assembly. If the movement does not run or fully run down:

5.2. Block train with a long thin screw driver into the crossing spokes of the escape wheel.

5.2.1. Remove anchor pallet/crutch/false pendulum assembly (Figure 30.6).

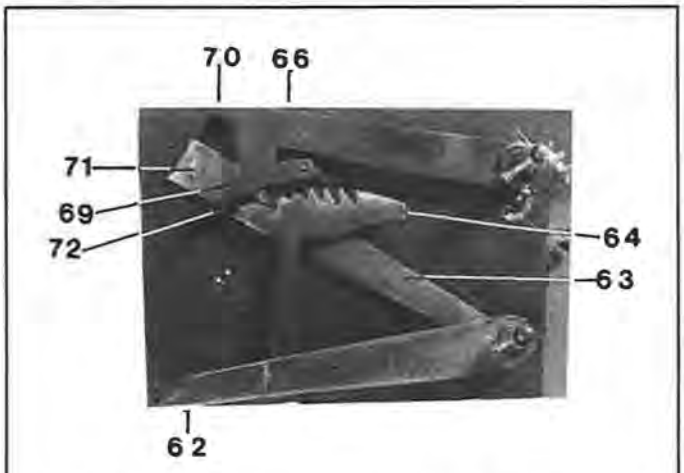
Note: The false pendulum (37) is attached to the anchor pallet arbor (87) by the collet (88). It will be removed when the anchor pallet is removed.

5.2.2. With finger lightly on the "scape wheel," remove the blocking screw driver.

5.2.2.1. Allow time train to run down, regulating the speed with your finger pressure on the "scape wheel."

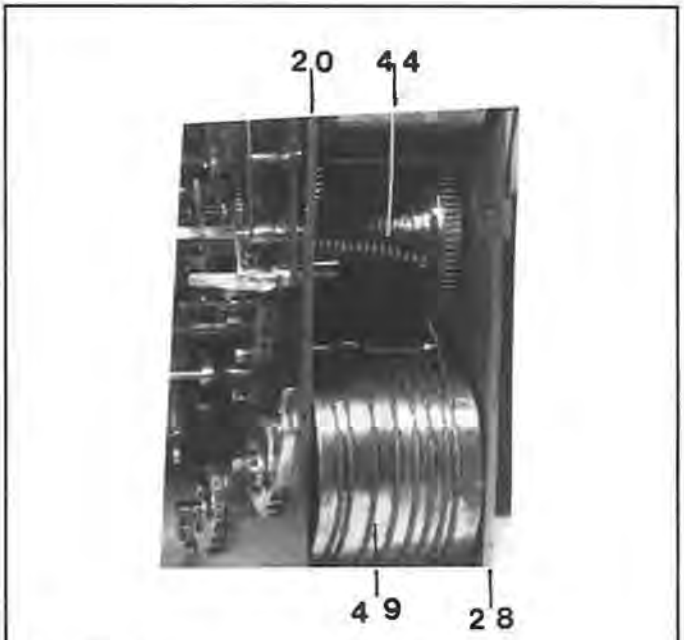
Note: If the movement is very dirty or the oils are all gummed up, it may be necessary on all three trains to manually manipulate the trains until all cables are off the fusees.

CAUTION: WHEN ALL CABLE/CORD IS UNWOUND OFF THE FUSEE, THE SPRING IN THE BARREL (49) IS STILL PARTIALLY WOUND. THIS IS CALLED THE "SET" OF THE FUSEE SYSTEM, WITH THE SPRING USUALLY WOUND 1/2-3/4 TURN OF THE SPRING ARBOR.



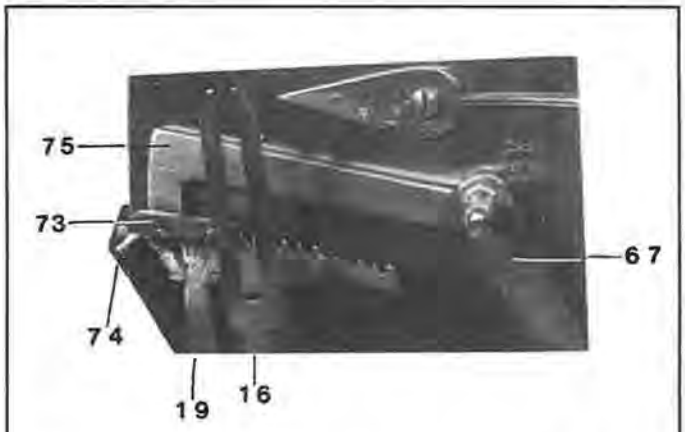
62 Lift Lever
63 Warning Lever
64 Quarter Rack
66 Quarter Rack Hook
69 Quarter Gathering Pallet
70 Warning Slot
71 Warning Tab
72 Gathering Pallet Stop

Figure 30.2. Chime Control Details



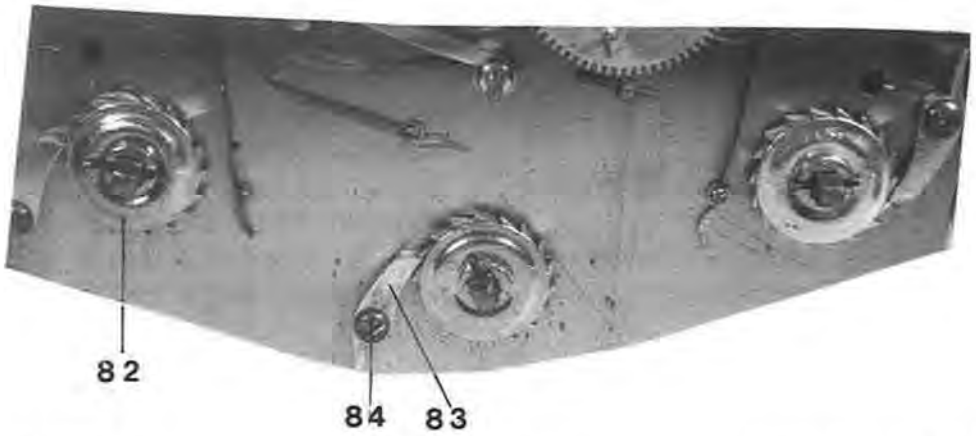
20 Front Plate
28 Rear Plate
44 Fusee
49 Fusee Spring Barrel

Figure 30.3. Fusees Let Down



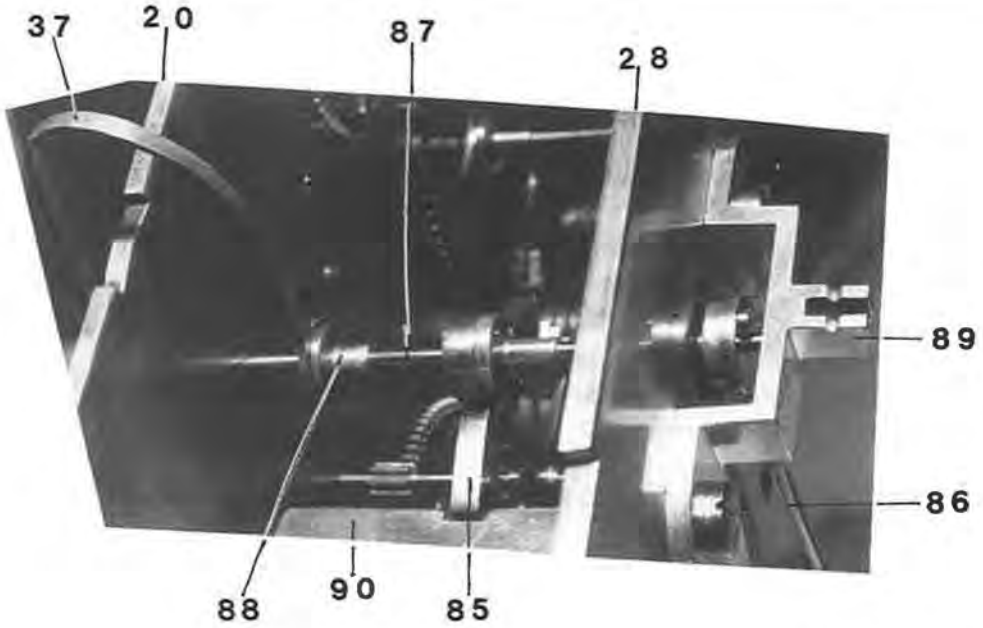
16 Strike/Silent Lock Lever
19 Hour Rack
67 Hour Rack Hook Tail
73 Hour Gathering Pallet
74 Gathering Pallet Stop
75 Rack Hook

Figure 30.4. Strike Control Details



82 Fusee Set Ratchet Wheel
83 Fusee Set Click
84 Fusee Click Holding Screw

Figure 30.5. Fusee Set Let Down



20 Front Plate
28 Rear Plate
37 False Pendulum
85 Anchor Pallet
86 Crutch
87 Anchor Pallet Arbor
88 False Pendulum Collet
89 Pendulum Suspension Bridge
90 Chime Fan

Figure 30.6. Anchor Pallet/Crutch/False Pendulum Assembly

6. RELEASE FUSEE "SET" ON ALL THREE TRAINS (Figure 30.5).

Note: The spring arbor square protruding from the ratchet wheel is fairly heavy. Most books on the subject recommend using a wrench. On this clock I found that a #11 key fit, I therefore successfully used a #11 let down key. The clicks are not the spring loaded shoulder screw pivoted clicks usually found. Once the springs are set they are locked in by the clicks being screwed in place, locking the ratchet wheel.

6.1. Engage let down key (or wrench) with arbor and hold.

6.1.1. Release click locking screw.

6.2. Wind spring carefully; enough to release the click.

6.2.1. With your finger disengage the click from the ratchet wheel.

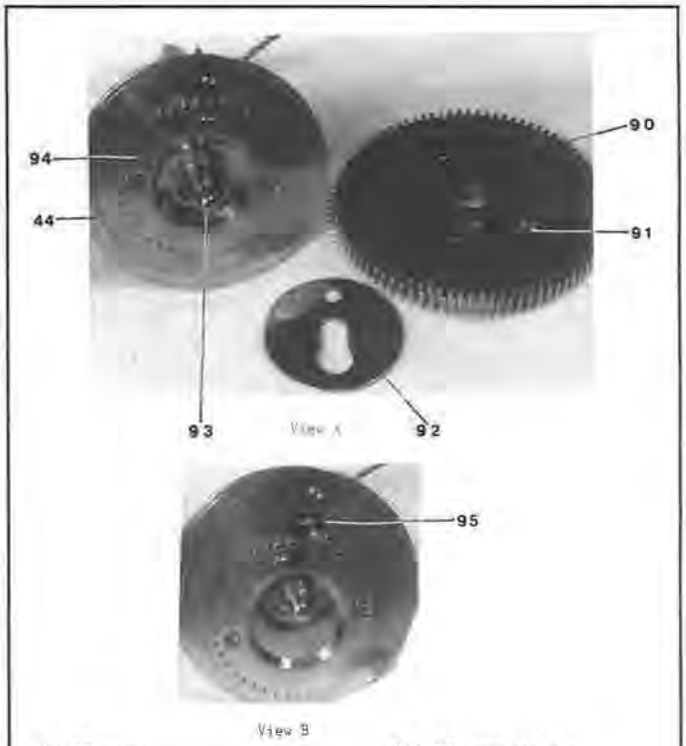
6.2.2. Allow fusee spring to unwind.

6.3. Repeat "set" release on the other two fusee springs, using steps 6.1 and 6.2 procedure.

Note: With a let down key, you can control the unwind (let down - set release). With a wrench let down the spring 1/4 turn, re-engage click. Repeat until completely let down.

7. FRONT PLATE DISASSEMBLY (Figure 30.1).

CAUTION: STUDY THE MECHANISM FOR ALL THREE TRAINS ON THE FRONT PLATE FOR LOCATION, RELATIONSHIPS NOTING DISCREPANCIES AND CONDITION, BEFORE ANY DISASSEMBLY. I TAKE POLAROID PICTURES, CLOSE-UP BLACK AND WHITE PHOTOS AND MAKE SKETCHES BEFORE AND DURING DISASSEMBLY. I ALSO MAKE WRITTEN NOTES OF ANYTHING UNUSUAL WHICH MAY NOT BE REFLECTED IN PHOTOS. LATER IN THIS SERIES I WILL DESCRIBE, ASSEMBLY, CHECKS AND ADJUSTMENTS IN DETAIL.



44 Fusee	93 Fusee Arbor
90 Mainwheel	94 Ratchet Wheel
91 Locking Washer Screw	95 Cable Knot Hole
92 Slotted Locking Washer	

Figure 30.7. Fusee Disassembled

GUENTHER'S

404 WEST 7TH STREET #408 WATCH MATERIAL SUPPLIES & TOOLS (213) 892-8033
LOS ANGELES, CA 90014 FAX: (213) 892-8035

VISA **CALL TOLL FREE (800) 462-1962** MasterCard

GENUINE OMEGA MATERIAL

MAINSPRINGS

OMEGA	484	MSPRG	$6.00 ea.
OMEGA	485	MSPRG	$6.00 ea.
OMEGA	540	MSPRG	$6.00 ea.
OMEGA	550	MSPRG	$6.00 ea.
OMEGA	640	MSPRG	$6.00 ea.

(PLUS ALL OTHERS)

CRYSTALS

OMEGA SEAMASTER DEVILLE	5072	$10.00 ea
OMEGA	5140	$10.00 ea.
OMEGA SPEEDMASTER	5077	$13.50 ea.
OMEGA TACHYMETRE-GLASS	5146TNTA	$34.05 ea.

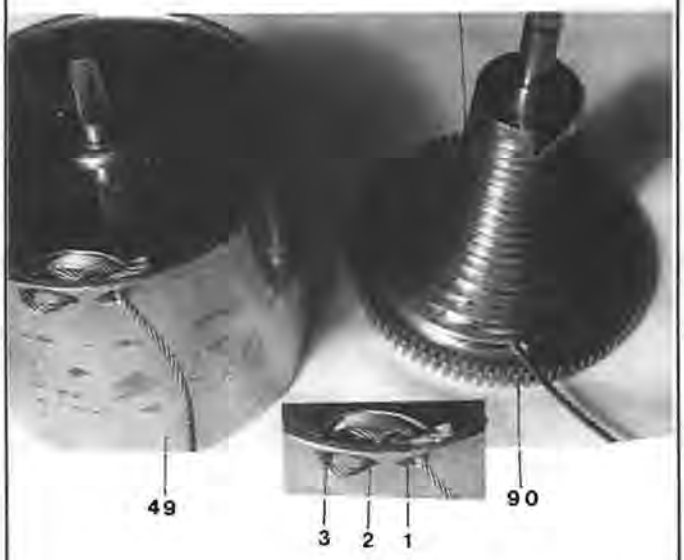
(PLUS ALL OTHERS)

OMEGA	330(500)-1110 SET BRIDGE	$10.00 ea.
OMEGA	145.0022 - BLACK ROTATING BEZEL	$55.00 ea.

CROWNS

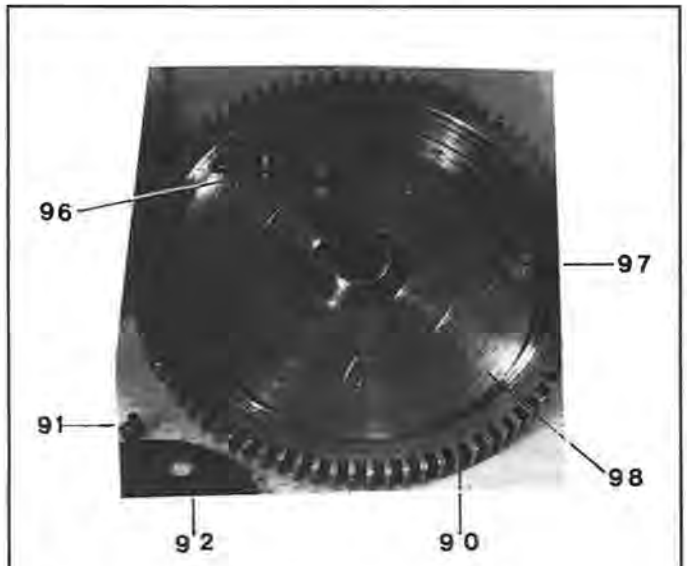
OMEGA SEAMASTER DEVILLE		Y.	$19.50 ea.
OMEGA SEAMASTER DEVILLE		W.	$17.50 ea.
OMEGA SEAMASTER DEVILLE		PINK	$20.00 ea.
(OLD STYLE) 8100/1053			
OMEGA	42023 CROWN	Y.	$10.50 ea.
OMEGA	42023 CROWN	W.	$9.00 ea.
OMEGA	42023 CROWN	PINK	$15.00 ea.
(EARLY CONSTELLATION - 4 NOTCHES)			
OMEGA	32005 CROWN	Y.	$10.50 ea.
OMEGA	32005 CROWN	W.	$9.00 ea.
OMEGA	32005 CROWN	PINK	$15.00 ea.

OMEGA Y.	DUSTPROOF CROWNS 4.50/4.00/3.50	$7.50 ea.
OMEGA W.	DUSTPROOF CROWNS 4.50/4.00/3.50	$6.50 ea.



44 Fusee
49 Fusee Spring Barrel
90 Mainwheel

Figure 30.8. Fusee & Spring Barrel Assemblies



90 Mainwheel
91 Locking Washer Screw
92 Slotted (keyhole) Washer
96 Click Pawl
97 Click Spring
98 Main Wheel Recess

Figure 30.9. Mainwheel Inside View

Engraved Brass Name Plates
Computer Engraved - and you won't believe the prices - OR the quality!
BIRELEY'S Engraving INC. Since 1966
Call or write for Free Brochure and Sample!
548 Hightop Rd., West Chester, PA 19380
Call: 610-696-3211 or Fax: 610-696-0779

8. Complete the balance of the inspection and disassembly of the movement. No special sequence or procedure is required except for the fusee itself. This will be described in step 9.

8.1. Repair and clean as necessary.

9. FUSEE DISASSEMBLY (Figure 30.7).

9.1. Remove screw (91) holding slotted locking washer (92).

9.1.1. Slide locking washer off of fusee arbor (93).

9.2. Remove mainwheel (90) from the fusee (44).

Note: Figure 30.9 shows the inside of the mainwheel recess with the click pawl (96) and spring (97).

9.3. Disconnect cable from fusee.

9.3.1. Remove ratchet wheel (94) to gain access to the knotted end of the cable.

Note: Figure 30.7, View B is shown with one screw removed from the ratchet wheel to show the cable knot hole (95).

Note: Figure 30.8 shows the fusee (44), fusee spring barrel (49) and the cable attachments. It also includes a close-up of a special knot used to attach the cable to the spring barrel, using three holes. The cable is threaded into hole 1, then out of hole 2 leaving a little slack, then back into hole 3. The cable is then threaded into the slack left between holes 1 and 2. The knot is tightened by pulling the end and the main cable taking up all slack. It is a very secure knot.

Note: The procedure for removing and replacing the fusee spring from, and to the barrel is similar to the procedure for music box springs. (See part 10 of this series, May 1996,* Horological Times.*)

This ends Part 30. In Part 31 we will start reassembling the movement.

EDUCATION UPDATE

By James E. Lubic, CMW

It is time again to organize and schedule our training activities for the six-month time frame of June through December 1998. I have recently received many communications asking questions about Bench Courses. So, I thought I should share the answers to a few of the more frequently asked questions and comments. At the same time I am asking for any requests you might have.

"Why doesn't AWI send Bench Courses to our section of the country anymore?" The answer to that question is very simple. We didn't know you wanted one! Let me expand on how we go about scheduling Bench Courses. Because of the tremendous amount of time that goes into the process of setting up a program off location, we want to be sure that there is interest in the course. So, if no one communicates their wishes to the AWI Headquarters, nothing happens. Any individual member of our Institute or Affiliate Chapter Representative can call, write, fax, or e-mail a request for a specific course to me here at AWI Headquarters, and most likely it will be scheduled. Now to be perfectly honest, we would much rather have your request accompanied with eight or more AWI members' names and membership numbers, And of course the most sure way of getting a particular course is to send either a check or credit card number from each member with your request.

The next question is..."**How soon can we get the course here?**" This depends on the availability of the instructor, where we are in the current cycle of Bench Courses, and how it affects the budget. This is where everybody groans. But not to worry. What this really means is how many courses have gone out previous to the one you want. For instance, this year at the January Mid-Year Board of Directors Meeting it was reported that barely one-third of the budgeted moneys for Bench Courses had been spent thus far. This means that presently the wait might not be very long. In the past if there was a lot of activity with Bench Courses you might have had to wait six months in some cases. On some rare occasions, because of popularity, you might have had to wait slightly longer.

The next comment that I've heard several times is...."**I heard AWI is cutting back on the number of Bench Courses.**" This might be because the member sees how many courses are actually scheduled on the back cover of the magazine. Granted, there are less than there were in previous years, but this is because we have become more responsible with your money. Instead of sending Bench Courses to places we *thought* they should go, we are now sending them where we *know* they should go.

I hope that everyone now has a better understanding of how the system works. Remember, communication is the key.



Nelson Cruz works on a project during the 12-Day Lathe Program conducted in Harrison, Ohio, on August 18-30, 1997.



Russ Charlier works on a project during the 12-Day Lathe Program conducted in Harrison, Ohio, on August 18-30, 1997.

ALL THE TIME IN THE WORLD?

By Jay Foreman

No one has a guarantee on time. All too often we become just too serious and forget to look at the lighter side of life. Since I am probably more guilty than anyone of being too serious, I decided to take a look at some of the good times, the crazy times, and the often humorous times that make this profession so worthwhile. The lack of uniformity in this article can be attributed to the way things really happen in life.

A diving watch was received for repair, accompanied by the following letter:

"Dear Gentlemen: Here's Matilda again! She has been well and happy since your superb surgery and tender-loving-care of several years past. She adjusted to my husband's new Timex and, in fact, they have formed a fast and loving relationship. Unfortunately, having to keep up with all his youthful activities, the old gal has slowed down considerably, has bursitis in the right shoulder, and obviously needs a face lift. Again I place her in your gentle, healing, professional hands for TLC and again pray for a speedy recovery. Your loyal client, Betty Walker, M.D."

Backfire

As some of you may know, our company provided factory warranty service for various watch manufacturers. Sometimes when the factories became inundated with watches they would send some repairs to us, at which time we perform the service and return the repaired watch directly to the factory for reshipping to their customer.

One day a customer brought in an old watch for repair and insisted that it go to the factory for service. I took one look at the watch and was more than happy that he wanted it to go to the factory because it was a real basket case. We sent the watch to the factory as requested.

About a week later we received a shipment of factory repairs from the manufacturer in their unmarked envelopes. Said watches were put into service, repaired, and ultimately returned to the factory upon completion.

In about three weeks we received our customer's watch back. Upon receipt of the returned watch from the factory I examined the accompanying invoice and guess what? In the space provided for repairman number, guess who repaired the watch? We had repaired the watch. We had billed the factory and returned the watch to them. Only to have them send the watch back to us and invoice us for the repair. Wow! Talk about a long way around for a shortcut.

Murphy's Law

Not long ago we had a super rush repair. The customer was leaving the country. (Have you heard that one before?) The watch was a forty-year-old Audemars Piguet. As you know, parts for such watches are very scarce. The watch merely needed cleaning, no parts necessary. I gave the watch to one of my most careful and most skilled watchmakers and said I needed it the same afternoon.

When I came back from lunch, I saw about a half-dozen watchmakers on the floor with brooms and magnets. I asked, "What are you guys doing, playing marbles?" The watchmaker who had the rush watch for repair looked up rather sheepishly and said, "I can't find the pallet fork!" I replied, "Get off the floor and go buy a new one." He said, "You don't understand! It is for the watch you need this afternoon." So my heart went to my throat and then there were seven of us on the floor. I was on my hands and knees sweeping the floor and searching too.

An hour-and-half later, after looking everywhere, we came to the conclusion that the pallet fork really was lost. As there was no chance of getting another pallet fork, at least by the next morning, I asked my wife, Susan, to go home and pack my suitcase. She inquired what for. I said, "I am sure the customer is going to put me in jail and I want to be ready." The next morning we came to work super early and Susan and I again looked all over and all under the watchmaker's bench. No pallet fork.

I decided I would loan the customer one of my good watches and hopefully he would understand. When I told the sales clerk who had waited on the customer to ask the man if he would take this loaner

watch, she said, "Oh, Mr. Foreman, I wish you would suggest it. He really is a mean, old guy and I know he is going to hit the ceiling." Oh great!

About 9:00 A.M....coffee break....and up to my desk comes my prize watchmaker with a big smile on his face, "I found it! I found it!" "The pallet fork?" I asked. "Yes," he replied. I then asked, "Where was it?" "In my coffee," he replied. "In your coffee?" I asked in amazement. "Yes," he replied, "I had my box of sugar with the little metal spout open yesterday and that pallet fork jumped through that little hole, and when I poured out my sugar into the teaspoon this morning I saw the pallet fork just before I put the sugar in the coffee." All ended well, and the customer never found out that he had the only watch with a sugar-coated pallet fork!

A notation on a recent job received from a jewelry store read:

"Gentlemen: The customer claims we have done something to the dial of this watch. I know and you know this is not true, but the policy I have maintained in my store is never argue with a client if you cannot prove to him successfully that he is wrong. Will you please refinish the dial silvertone, and get it back to me as soon as possible? Since I have to pay for this, can you take it easy on me please? Thank you."

The watch in question had a diamond bezel with 10 pointers, very white stones that circled a heavily diamond-studded dial encased in 18K white gold with bracelet to match. The watch had been recently overhauled, the case and band rhodiumed, and a new crystal installed. That was all that was requested initially.

Conclusion: The dial was already faded, but looked even worse after the case and diamonds were cleaned and the new crystal installed (the old crystal was so scratched you could hardly see the dial). It would have been better to have sold a dial refinish in the first place.

One Sunday afternoon found me restoring an old antique pocket watch. When I removed the dial I noticed some nineteenth-century-type penmanship engraved on the back of the brass dial. The dial measured about two inches in diameter. I had to get my ten-power loupe to read the inscription. And here is what it said:

"My name is F. Beneche of Waterbury in 19th April 1860.
Mainspring installed for Daniel Wells in 1865 in Waterbury.
1867 Daniel Wells made big trouble.
Repair watch free of charge.
Daniel Wells is a 'damn' fool.
My watch now.
Daniel Wells died in Waterbury, 1st July 1874."

I wonder what is written under your dial?

Note received from a commercial diving company in Florida:

"Much thanks on helping us with some difficult customers. A pleasure doing business with you!"

My personal comment on this type of note....you get more flies with honey than with vinegar. This is one of the good people of this world who took time to say thank you. Surely all of us try to do the best job we can and to help people every day of our lives but unfortunately get very little thanks for extra effort.

Was looking through some old papers in my desk drawer the other day and found the following thought that I had written down in 1977 when the solid state watch was all the rage:

"Solid state watches. Nothing moves but more things can go wrong that require more sophisticated equipment to repair, far more equipment than any mechanical watch requires. Never in the history of horology has there been the need for so much equipment, special tools, case openers, ovens, magnetizers, oscilloscopes, electronic counters, etc., etc., to repair a watch that has no moving parts. Not to mention the new type of technology and knowledge that is required of a watchmaker to repair this type of watch. But you know what? Today's watchmaker will learn it all and will do it in spite of the lack of funds that are being spent in the area of education. The future of watchmaking of whatever type still lives in the hands of after-sales service...the watchmaker!"

Even though the type of timepieces watchmakers are seeing today may have changed from those of 1977, the basic principal is still true....after-sales service is still the key to success.

P.S. When I read this above thought of twenty years ago, it reminded me of a very funny incident. We were doing warranty service for the first Pulsar watches (remember the LED). Pulsar representatives showed up with all sorts of special equipment, including a special oven that was to be used to heat the crystals in order to remove them from the case. Well, our watchmakers found out that the oven worked great for heating their burritos for lunch. Would you believe, one day several months later, the same company representatives appeared at our shop at lunch time? You can well imagine the comments.

AFFILIATE CHAPTER COLUMN

By Jerry Kincaid, Publicity Chairman

Mid-Atlantic Horological Symposium Planned for October

Three AWI Affiliate Chapters have joined together to plan a large horological symposium to be held in October 1998. Their combined strengths should result in an educational experience that AWI members, vendors, and industry representatives should find exciting and will not want to miss. We hope to draw participants from not just AWI, but from all horologically interested persons along the mid-Atlantic coast.

Informal discussions among various members of all three organizations over the last several years led to this joint effort. Members felt that the synergism of a multi-state symposium would provide significant educational benefits to not only the three sponsoring state's memberships, but other nearby states as well.

It is our goal to develop an annual technical event in an educational environment, convenient for industry participation, offering a program in size and scope that would produce interest even on a national level. We hope to provide an atmosphere where potential service providers can meet and learn from industry representatives, sales personnel can acquire service skills, and general interest in the industry can be generated.

The Mid-Atlantic Horological Symposium is a joint undertaking of the Horological Association of Maryland, the Watchmakers Association of Pennsylvania, and the Horological Association of Virginia. The group has already held numerous planning meetings and the Constitution and Bylaws were approved in September. The date for the first symposium has been set for October 3-4, 1998. We are also discussing the possibility of having some courses on October 1 and 2 to give pre-registered course participants a chance to attend some of the skills workshops and other activities on Saturday and Sunday.

We have selected the Baltimore-Washington area due to its central location and convenient interstate and airport access. The symposium will be held at a particularly well-suited major education and conference facility between Baltimore and Washington and very near the BWI airport. The facility is the Maritime Institute of Technology and Graduate Studies, which is situated on a large campus in Linthicum Heights, MD. It contains complete conference facilities, dining and overnight lodging.

The general thrust of the symposium is to present: (1) AWI training courses and programs, (2) participating states-sponsored programs and (3) vendor/industry-sponsored programs. Programs and workshops will cover areas from training for store counter personnel to current state-of-the-art horological technology. We also intend to include equipment/material vendors as well as watch and clock industry representatives.

The elected officers for the Mid-Atlantic Horological Symposium are: Dan Fenwick, president; Dan Spath, vice president; Dewey Clark, secretary; and Stan Palen, treasurer. The Board of Directors include: Virginia - Stan Palen, Keith Clark and Bob Bruckhart; Pennsylvania - Dan Fenwick, George Jones and Dewey Clark; Maryland - Dan Spath, George Painter and Stan Craig. The Publicity committee includes: Jerry Kincaid, chairman; Dan Fenwick, Rodney Graves and Herb Hollander.

Please stay tuned for additional information as the planning progresses and reserve the dates of October 1-4, 1998 on your busy schedule.



An aerial view of the Maritime Institute of Technology and Graduate Studies in Linthicum Heights, Maryland.



Front row: Bob Bruckhart; back row: Stan Palen, George Jones, Dan Spath, Dewey Clark, Dan Fenwick, Stan Craig, Keith Clark, and George Painter.

ASSOCIATION NEWS

MINNESOTA

The January meeting of the Minnesota Clockmaker's Guild was held at St. Paul Technical College. Ron Saboe demonstrated a variety of handmade and modified tooling that he uses in his daily work. Among the items discussed were: a collet holder and draw bar, special Dremel chucks, cutoff wheel and table, diamond laps, small drills, and many other devices. A lively discussion on diamond compounds and pivot polishing followed Ron's program.

The February meeting featured a slide program and discussion on the restoration of a Dutch clock by Susan Wood. The clock has wooden plates and some of the internal movement is also wooden. She also described some restoration to the dial.

NEW YORK

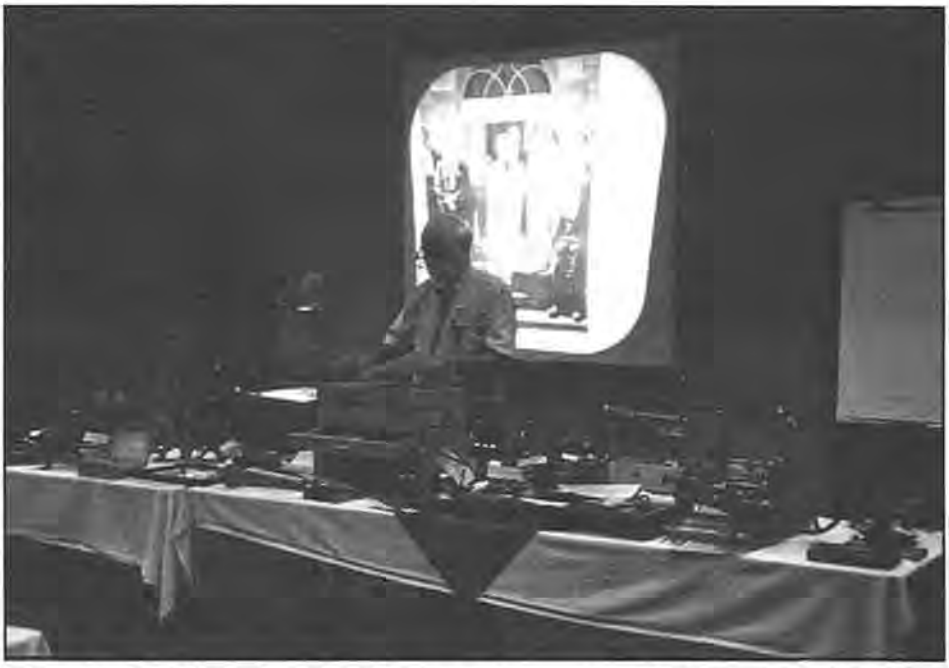
The New York State Watchmakers & Clockmakers Association held their annual convention at the Holiday Inn in Waterloo, NY on October 4 & 5. Highlights from the weekend included: "Twenty-First Century Watchmaking" by William O. Smith, Jr., CMW, CMC, FAWI; "AWI Certification" by Robert Ockenden, CMC; "Zantech, Inc. Plans and Direction" by Marc Young; "Spiedel's History and Merger with Hirsch" by James Brown; "Rochester Findings' Products" by Howard Merimsky; "1997 Henry Fried Memorial Tour" by Harry Blair; and "Historical Tour of Gear Cutting" by Mel Smith. (Photos at right.)

NORTH CAROLINA

The North Carolina Watchmakers Association will be holding its Annual Business Meeting and Convention on May 29, 30 & 31. This year's location is the Holiday Inn in Salisbury, NC. For more information contact Alice Carpenter at (919) 823-2944.



William O. Smith, Jr. giving a demonstration to (L to R): Fred Vaughan, John Young, Amedeo Sylvester, John Buerger, Mr. Smith, and Stearns Cummings.



Harry Blair talking about his trip to visit George Daniels during the 1997 Henry Fried Memorial Tour.



Prior to the convention, Robert Ockenden, CMC, conducted the AWI Bench Course "Organize Your Work Habits for Success" on October 2 & 3. Mr. Ockenden is shown demonstrating clock repair techniques to the group.

CLASSIFIED ADVERTISING

REGULATIONS & RATES

Ads are payable in advance 85¢ per word, 95¢ per word in **bold** type. Classified display ads are $35.00 per column inch, 2-1/4" wide. Ads are not commissionable or discountable. The publisher reserves the right to edit all copy. Price lists of services will not be accepted. Confidential ads are $7.50 additional for postage and handling. The first of the month is issue date. Copy must be received 30 days in advance (e.g. May issue closes for copy on April 1st).

HOROLOGICAL TIMES
701 Enterprise Drive
Harrison, OH 45030
Phone (513) 367-9800
Fax (513) 367-1414
E-mail: Donna@awi-net.org

TRADESMAN

POCKET WATCH CASE REPAIR -- Bezels, hinges, springs, dents, etc. HARRY MAZAR, Tick-Tock Specialties, 308 N. McLeansboro St., Benton, IL 62812. Phone (618) 439-6995.

CLOCK, MUSIC BOX MAINSPRINGS, GEAR PINION CUTTERS, MATERIAL & PARTS CUSTOM MADE. **TANI**, Box 338, Atwater, OH 44201; (330) 947-2268. Catalog $3.00.

DIAL REFINISHING



BEFORE AFTER

Quartz Conversions
Diamond Dial Conversions
Emblem & Name Personalization

Write for Brochures
INTERNATIONAL DIAL CO., INC.
58 W. SUGARTREE
P.O. BOX 970
WILMINGTON, OH 45177
(937) 382-4535

FAST TURNAROUND
Over 1,000 quartz movements in stock, mechanical movement to quartz in 3 days.
WATCH CASE REPAIR
We manufacture bezels in gold, silver and platinum. Electroplate in 14 and 18 kt. gold, case hinges, reblock, remove dents, etc.
W.E. Benjamin Co., Inc.
39 Park St., Attleboro, MA 02703
(508) 222-6868 or visit our Web site at:
members.aol.com/weeben9769

TIMING MACHINES – NEW AND REFURBISHED. Quality Service and Repair. DON HOLDEN, Box 56, Penna. Furnace, PA 16865, (UPS Del. - 6866 W. Whitehall Rd.) Call (814) 692-2285.

CLOCK WHEEL & PINION CUTTING
BARREL RETOOTHING
Bill Curley, Jr., 265 Plank Road, Waterbury, CT 06705, Phone (203) 755-6480.

TRADE CLOCK REPAIR
Steadily growing trade shop business. Guaranteed work for all clocks. Bill Callaway, 413 Granite Ave., Mattoon, WI 54450; (715) 489-3126.

DIAL REFINISHING CO. FAST SERVICE, FINEST QUALITY, quantity works welcome. Specialize on changing dial feet positions to fit the quartz movement. Send your works to: **KIRK DIAL OF SEATTLE,** 4th & Pike Bldg., Suite 625, Seattle, WA 98101; (206) 623-2452.

CLOCKS: gear cutting, repivoting, jeweling, rebushing. Aircraft clocks. ROY H. NIEGEL, CMC, CMW, N31552 Saint Joe Drive, Spirit Lake, Idaho 83869-9544. SASE or CALL (208) 623-4330.

CHRONOMETER REPAIR & RESTORATION BY FELLOW OF THE BRITISH HOROLOGICAL INSTITUTE. All work to high standards. I am also looking to buy old chronometers, parts, boxes, etc. Phil Howard, 4220 Virginia Beach Blvd., Virginia Beach, VA 23452; (757) 481-7633, Fax (757) 481-1784.

CRYSTAL CUTTING SERVICE
Flat Mineral Glass Crystals
Quality Work
1-Day Turnaround
R.A. Time Capsule
Montoursville, PA
You'll love our price.
For more information call
1-800-WATCH-50

CLOCK WHEEL AND PINION CUTTING
Fast service -- Write for free Brochure and price list. Fendleys, 2535 Himes St., Irving, TX 75060. (214) 986-7698.

HAMILTON ELECTRIC WATCH REPAIR
Expert, experienced service on all Hamilton 500 and 505 Electric watches. Hamilton electric watches and parts always wanted. René Rondeau, P.O. Box 391, Corte Madera, CA 94976. Tel: (415) 924-6534. Fax: (415) 924-8423.

MURPHY'S CRYSTAL SERVICE
FAST -- QUALITY WORK
- **24-hour** turnaround on most jobs.
- Complete crystal fitting service for new and old wrist and pocket watches.

CALL OR WRITE FOR PRICE LIST
FAX or PHONE (209) 531-1738
1839 N. CENTRAL AVE., SUITE B
CERES, CA 95307

ATMOS BY JAEGER-LECOULTRE
Overhauled with a
three-year (3) warranty on all labor
MIKE'S CLOCK CLINIC
1326 Stanford Street
Santa Monica, CA 90404-2502
Established in 1982 & AWI Trained
I also overhaul 400-day clocks
Please Call **(310) 828-6707**
http://www.webcom.com/z4murray/

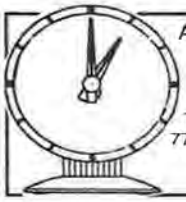
ELECTRONIC INSTRUMENT SERVICE
We are Factory Authorized Service for:
• VIBROGRAF & PORTESCAP
• TICK-O-PRINT & L&R
We service all makes of ultrasonics, all makes of watch rate recorders, and related equipment. 25 years experience.
JACK PHILLIPS
ELECTRONIC INSTRUMENT SERVICE
757 Lincoln Ave., #26 San Rafael, CA 94901
For Information
Call (415) 453-9266

RESTORATION & PARTS MANUFACTURING FOR ALL TYPES OF WATCHES & CLOCKS

We restore all types of watches including tuning fork, electronic, quartz, mechanical, antique, high grade, etc. All types of clock restoration and custom watch, clock parts manufacturing including gear cutting, balance staffs all types, stems (regular and oversize), repivoting, etc. Over 35 years experience in watch, clock restoration and parts manufacturing. J.S. Park, CMW, CMEW, member AWI & NAWCC. Satisfaction guaranteed. **WATCHES UNLIMITED MAIN OFFICE**, Time Word, Seminole Towne Center Mall, 200 Towne Center Circle, Suite 280, Sanford, FL 32771; Phone **1-800-352-7056**, Fax (407) 302-3233. Hours: Mon-Sat 10-9; Sun 1-6.

ALVIN KRUTOLOW FOR ROLEX SERVICE

Master Watchmaker, 47 years experience. Awarded technical certificate from Rolex in 1977. Service includes case & bracelet refinishing & waterproofing of case. All watch parts are genuine Rolex. We specialize in the repair of high-grade watches & clocks. Not affiliated with Rolex Watches, Inc. USA. Ask for Alvin or Marcus, (203) 792-4539.



A complete selection of spare parts for the Golden Hour Clock

The Golden Hour Clock Co.
7745 East Redfield Road #500
Scottsdale, AZ 85260
602-483-3711

CASIO WATCH PARTS

No Minimum Order Required

Kaben Enterprises
3529 Chamblee Tucker Road
Atlanta, GA 30341
Official Casio Distributor
ORDERS (800) 418-2345
INFORMATION (770) 939-4511

SCHOHL MACHINE, INC.

CRYSTAL CUTTING TOOL



USER FRIENDLY

The machine uses the watch bezel itself to trace and cut a precise pattern on the mineral glass material. You simply break off at the cut, grind and finish the edges. You can make crystals for both men's and ladies' watches in 6-7 minutes at a nominal cost.

CRYSTAL GRINDER



This is the ultimate mate for the Schohl Crystal Cutting Machine. 5-inch diamond wheel grinds quickly without heat or buildup. A light spray of Windex is all that's needed.

Contact your supplier or call direct

208 Barber St., Spring Lake, MI 49456
Phone 1-800-470-4217 Fax (616) 842-2198

ARTICLES FOR SALE

MINI QUARTZ MOVEMENTS. Guaranteed lowest prices--as low as $2.30. Two-year guarantee. Large selection of hands and numerals. Free delivery. SASE or call (704) 333-0221. HALL CLOCK SHOP, 1512 Central Ave., Charlotte, NC 28205.

USED WATCH MOVEMENTS. We buy and sell. "Don" 4325 N. 5th St., Fresno, CA 93726; (209) 229-8423.

GLASS OVAL DOMES & ANTIQUE FRENCH/DUTCH CLOCKS
Theo Burger, 3335 Birch St.,
Palo Alto, CA 94306. Ph/Fx (650) 917-8775
Morbier1@ix.netcom.com

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

Retail watch repair business dissolved due to transfer. Approximately 300 Speidel watch bands to sell in lots, individually or complete assortment at cost. For list of availability, contact Richard Mazza at (818) 907-9643 or fax (818) 501-7727. E-mail: QltyWatch@aol.com

HAMILTON MILITARY MATERIAL. Many parts available for 992B, 4992B, M23, M22 deck watch, M21 marine chronometer, brass hardware for boxes. Robert Ravel Co., Box 32, Devon, PA 19333. Phone (610) 644-4272.

POCKET WATCH CRYSTALS

Finally, the repairer is offered an excellent alternative when glass is not available and "high walls" just won't do. Specially designed to perfectly simulate obsolete glass styles, these optical quality acrylic crystals are individually hand crafted in the USA and are suitable for even the highest grade timepieces. Available from 35-50 mm in .2 mm increments and can be used with standard flexible crystal inserting tools.

Original
Cazadero Railroad™
BRAND

CAZADERO RAILROAD CRYSTAL CO.
POST OFFICE BOX 201, CAZADERO, CA 95421
707-632-5631



Send $3.00 for our new clock supply catalog!

Timesavers
Box 12700
Scottsdale, AZ 85267
602-483-3711

CLOCKS

Howard Miller & Ridgeway
Grandfather, Wall & Shelf Clocks
Curio Cabinets

Best Prices Anywhere!

Call Before You Buy

A Time to Remember
Mel Taylor ❖ Nashville IN
1-812-988-2463 or 1-800-267-7756

High Quality Leather

WATCH BANDS

AT LOW PRICES



STC 720 K STREET SACRAMENTO, CA 95814
(916) 446-6592 FAX (916) 492-1745
ORDER TOLL FREE 1-800-583-1906

BUSINESS FOR SALE

Well-established and highly reputable clock shop. Family-owned and operated for 34 years. Retail sales and repair located in West Central Florida near the Gulf beaches. Commercial building includes upstairs apartment. Sale of business can be negotiated with or without building. Send replies to: Box BFS198, c/o *Horological Times*, 701 Enterprise Drive, Harrison, OH45030.

HELP WANTED

We are looking for a WATCHMAKER who is able to repair all types of watches. Benefits include health and dental insurance and paid vacations. Send resume with salary requirements to Pollak Watch Service, Inc., 13910 Cedar Rd., Cleveland, Ohio 44118 or fax to (216) 932-2191.

Run your own business from within an established jewelry store with trade accounts. Retiring Certified Rolex Technician earned approx. $50,000 in 1997. Located in Mt. Pleasant, SC. Call Loy (803) 881-0111.

WATCHMAKERS
Universal Geneve Service Center
Top Salary & Benefits
Southfield, MI
(810) 358-9084

Cartier

Experienced
WATCHMAKER

For our expanding service locations in ***Dallas-Ft. Worth and Las Vegas.*** Competitive benefit package offered; salary commensurate with experience. Please send/ fax resume or letter of interest to **Cartier, Inc., Box 610508, DFW Airport, TX 75261-0508; Fax: 972-574-2635.** An equal opportunity employer.

SITUATIONS WANTED

High-grade watchmaker with 2 years experience graduating from AWI Academy of Watchmaking June 1998 looking for position in pleasant working enviroment. I have very good case refinishing experience. If interested, write, call or fax Adrian Hendry, c/o AWI Headquarters, 701 Enterprise Dr., Harrison, OH 45030; Phone (513) 367-9800; Fax (513) 367-1414.

Experienced watchmaker and goldsmith seeks pleasant smoke-free environment. Formal watch and jewelry training. Proficient in mechanical and quartz. Strong interest in quality repair and restoration. Available July 1998. If interested, write, call or fax Ken Price, c/o AWI Headquarters, 701 Enterprise Dr., Harrison, OH 45030; Phone (513) 367-9800; Fax (513) 367-1414.

WANTED TO BUY

We pay 97% of market for karat gold scrap (any amount)! Also, buy filings, gold fill, sweeps, silver, platinum! Immediate 24-hour payment return mail! Ship insured/registered mail to: AMERICAN METALS COMPANY, 253 King St., Dept. HT, Charleston, SC 29401. Established 1960. Phone (803) 722-2073.

WOULD LIKE TO BUY: Used watches, movements, materials, cleaning, and timing machines, etc. Mayo's Repair Services, (904) 389-2019.

WATCH MATERIAL DISTRIBUTORS
Please call us if you are interested
in selling your business.
All replies confidential.
Contact Pat Cassedy
Cas-Ker Co. (513) 241-7073

WATCHMAKER'S OPPORTUNITY



Due to our success, we are seeking experienced Watch Technicians for our store in South Coast Plaza, California and our service facilities in New York.

We offer excellent benefits and opportunities for growth. Join the country's largest premium watch dealer and work on the finest timepieces available.

Send or fax your resumé to: Tourneau
Att: National Service Director
488 Madison Avenue, New York, NY 10022
Fax: 212-755-7944 or call: 1-800-528-5871

TOURNEAU
Where you meet Your Other Face.
NEW YORK • PALM BEACH • BAL HARBOUR • SOUTH COAST PLAZA • HOUSTON

WANTED

Antique wheel cutting engines, fine lathes and accessories. Antique and newer factory wheel cutting machinery, cutters, etc.

Greg McCreight, Collector/Restorer
1336 Allentown Rd., Lima, OH 45805
Phone/Fax (419) 229-4349

TOP BUYERS OF WATCHMAKERS TOOLS, MATERIALS, EQUIPMENT, ETC. We travel for prompt settlement. Retirements and estate specialists. Please call Tom Mister at (757) 426-1155, Fax (757) 426-3133; e-mail: dashto@erols.com. View all lists at http://www.erols.com/dashto/

Buying pocket watches, movements, keywind cases. Need Am. keywinds, fusees, bull'seye crystals & good glass crystals. Bob Niemeyer, RR#1, Spencerville, OH 45887; Phone (419) 647-4818.

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

BUYING lists of watchmakers typically from supply houses, salesmen, associations, etc. BUYING watchmaker's accumulations. Finder's fees paid. Ken (248) 399-3067.

ANYTHING ILLINOIS

Want to buy Illinois wristwatches, dials, movements and cases (complete or parts) in any condition for avid private collector. Please call 800-421-1968, x5520, Fax 714-725-9787 or mail to Fred Friedberg, c/o TAMS, P.O. Box 2068, Tustin, CA 92681-2068.

WANTED: Paying high prices for chronograph and high grade watches, movements, dials, cases, & parts. Dean Sarnelle, 25 W. Beverley St., Staunton, VA 24401, phone & fax (540) 885-6064.

WANTED

- Watches: Rolex, Patek Philippe, Audemars Piguet, Vacheron, LeCoultre, IWC, Etc. Also Buying Low Grades--Gold-Filled & Gold (Hamilton, Bulova, Elgin, Gruen, Etc.)
- Sterling & Plated Trays, Dishes, Service Sets, Etc.
- Scrap--Gold-Filled, Gold, Silver, Platinum, Watch Batteries (Silver or Mixed)

CALL TOLL FREE **1-800-426-2344**



Ron Fried, President

SPECIALTY METALS REFINING COMPANY
1915 Black Rock Turnpike
Fairfield, CT 06430
Members:
Better Business Bureau
Jewelers Board of Trade
Our 155th Consecutive Ad

WANTED

GOLD FILLED SCRAP
SILVER, GOLD, PLATINUM
WATCH BATTERIES

WORN OR BROKEN
WRIST & POCKET WATCH CASES
• WATCH BANDS (GF & GP) • CHAINS
• LOCKETS • BRACELETS • EYEGLASSES

NO ASSAY or REFINING COST
NO MINIMUM AMOUNT
DAILY QUOTES - FAST PAYMENT

GF SPECIALTIES, LTD.
P.O. Box 17216 • Milwaukee, WI 53217
1-800-351-6926 • IRV BARD
Mon-Fri 10-4 Central Time
— 30 Years of Experience —

We Don't Want Your ROLEX!
What we want is:
HAMILTON • BULOVA
BENRUS • ELGIN
WALTHAM • GRUEN
LeCOULTRE • OMEGA • Etc.
Buying 1 Watch or Your Entire Inventory
Parts Partials Non-Running
$ HIGHEST PRICES PAID $
Call: John G. or Lee B.
Phone (813) 522-6475
Fax (813) 522-7318



WANTED

Original old watch, clock & tool (lathes, etc) catalogs, clock/watch company and individual trade cards and horological books.

Greg McCreight, Collector/Restorer
1336 Allentown Rd., Lima, OH 45805
Phone/Fax (419) 229-4349

Jewelry Industry Distributors Association Convention

"Jazz Up Your Business in '98" will be the theme for the upcoming Jewelry Industry Distributors Association Convention. The group will be meeting in New Orleans at the Marriott beginning with the President's Welcome Reception on Wednesday, April 29th and ending on Saturday night, May 2nd with a special group event.

Mark your calendar now and plan to attend. **It is important to make your reservations early since we will be in New Orleans during the Jazz Festival.** To register and make hotel reservations, please call JIDA Headquarters at (813) 914-8756. Special travel rates are available by calling 1-800-453-1962.

AWI Material Search

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

1D8 Salem ship's bell strike balance staff and regulator, W400, 75mm round

1E3 Kienzel clock pendulum leader and pendulum, German-made Fabrik-Wa Schmid 2/06

1E10 Bulova pocket watch balance complete, 17 ligne, Model 17A, Serial #54054

1F9 Patek Philippe 4th wheel and pinion, balance staff, crown wheel (wolf teeth) and cannon pinion, 18¾ ligne, 17 jewel, 32mm



1F10 Chinese #3955 vest/pendant watch balance complete and balance bridge complete, 14½ ligne, 32mm, OF, KW-KS jewel, lever escapement, center sweep



1F13 Champ 22-17 escape wheel s/s pivots, 17 ligne, (#705)

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

Continued from page 37.

is a scrap of building material, heavily oil soaked and always covered with an oiled rag. Each collet is wiped with an oiled rag before it is returned to the block. Collets can last for several generations.

Another question is how many collets does the clockmaker need? What ever number you own is not enough. In the real world that statement is not true. The block of collets in Part 1, Figure 1 has 30 pieces. About eight of these are watch sizes, which I no longer use. The remaining 22 meet about 98% of the jobs I do. So, in the real world about 20 will fill the needs of most clockmakers.

Conclusion

The conclusion of this series boils down to a few simple items. Don't look for a pie-in-the-sky lathe solution to problems that can be best solved with skill, workmanship, careful thought, and care of your tools. That is your key to enjoyable work, excellence of workmanship, and profit in business.

ADVERTISING INDEX

Bireley's Engraving 46

Borel & Co., Jules 5

Butterworth Clocks, Inc. 25

Cas-Ker Co. ..... inside back cover

Esslinger & Co. ... inside front cover

Eveready Battery Company .. 28, 29

Grobet USA-Vigor 4

Guenther's 45

S. LaRose, Inc. 33

Livesay's, Inc. 17

McCaw Company, William S. 3

S.T. International Supply 21

SMEA 7

Smith Supply House 31

Twin City Supply 25

United Tool & Material Co 27

Universal Watch Material 41

Vibrograf U.S.A. Corp. 39

Witschi Electronics USA Ltd. 23

Zantech 11

Increase Your Productivity with These Great Additions

CAL-PAL Analyzer

An Intelligent Countertop Quartz Watch Analyzer.

- Calibration of time accuracy in sec/24 hrs.
- Tests silver oxide, mercury and lithium batteries.
- Gear train evaluation via adjustable output voltage.
- Measures current in micro-amps.
- Coil resistance in Kilo-ohms.
- Audio continuity tester.
- 16 character display.
- Motor pulse audio and visual feedback.
- Check battery without opening watch.
- Temperature compensating internal crystal oscillator.
- Solid state computer technology.
- Compact break resistant case 6" x 3.5" x 1.5".



New!

- Self test at turn on; auto-off after 30 minutes of non-use.
- High standard service center accuracy.
- Engineered and made in USA.

590.903 Cal-Pal **$689**

The ACCELERATOR

High Speed Quartz Watch Gear Train Tester. The Accelerator operates by induction power and allows the user to drive the gear train of a sealed watch single steps or variable high-speed control. And it will determine if a sealed watch is operating electrically.

The Accelerator features:

- Single step watch motor impulse control.
- Variable motor impulse speed control.
- Variable intensity control.
- High-speed gear train test.
- Release locked gear trains.
- Restart sealed watches.
- Improve gear lubrication.
- Set hands.
- Check battery without opening watch.



New!

- Test electric circuit.
- Motor impulse indicator.
- Quality break resistant case.
- Engineered and made in USA.

590.905 Accelerator.. **$249**

New Low Price On Our Bergeon Case Opener





Swiss made wrench comes with six milled chucks, diameters 18.5, 20.2, 22.5, 26.5, 28.3 and 29.5mm to fit Oyster case backs made by Rolex.

590.080 List $165.50 ..... **$89.95**

Rolex Style Regulating Wrench

New!



Precision tool for regulating Rolex watches has solid brass tip. 2 5/16" long.

590.814..... **$24.95**

NOT AFFILIATED WITH ROLEX USA IN ANY WAY

Non-marring Dies For Rolex Bezels



New!

Straight

Set of 4 straight plastic dies for fitting bezels on Rolex watches. Especially designed for diamond bezels, also good for fitting regular bezels.

590.812 Straight Dies..... **$23.50**

Tapered

Set of 7 tapered plastic dies for closing cases without marring. Dies interchange with most BB style crystal/case presses.

590.813 Tapered Dies..... **$29.50**

Crystal/Case Press

New!

Compare to BB Press at $239.50





Securely installs all types of plastic watch crystals and snap back cases. Sturdy, heavy base has a space which allows for expansion bands to stay on the case when fitting crystals. Plier-grip extension for pressure control. Spring return. Complete with 16 double sided straight wall aluminum dies on a wood base.

590.107 Case Press..... **$165**

Cas-KerCo.

Call Today 1•800•487•0408

FAX 1-800-487-5848 CINCINNATI CALL 513/241-7073 FAX 513/241-5848
2121 SPRING GROVE AVENUE PO BOX 14069 CINCINNATI OH 45250-0069

AWI Bench Courses

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

DATE	CLASS LOCATION	INSTRUCTOR FEE
MARCH 1998		
6-9	Phase V - Making Cutters Charlotte, NC	Roy Hovey $440.00
13-16	Phase II - Lathe Program Orange County, CA	Roy Hovey $260.00
20-22	Advanced Clock Repair Columbus, OH	Ron Iverson $195.00
APRIL 1998		
3-6	Phase V - Making Cutters Austin, TX	Roy Hovey $440.00
MAY 1998		
2-3	Cutting Clock Pinions Eagan, MN	Roy Hovey $150.00
16-17	Repair of the Atmos Clock Austin, TX	Gerald Jaeger $130.00

If you are interested in scheduling a Bench Course in your area, please read Education Update on page 47 of this month's issue for details and then contact AWI Headquarters with your requests.

WATCH NEXT MONTH FOR THE COMPLETE BENCH COURSE SCHEDULE JULY - DECEMBER 1998



AWI Project Extend

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

PROJECT EXTEND WATCH CLASSES

DATE	CLASS	INSTRUCTOR	FEE
MARCH 1998			
9-13	Mechanical Chronographs	Jim Lubic & Tamara Houk	$250.00
23-27	Precision Timing *(Full Class)*	Antoine Simonin	$375.00
30-April 3	Basic Electronics & Meter Reading	Gerald Jaeger	$250.00
APRIL 1998			
15-17	ETA Products	Alessandro Betti	$150.00
20-24	Advanced Quartz Watch Repair	Chip Lim	$250.00
MAY 1998			
4-8	Repair of the Bulova Accutron	Henry Frystak	$262.00
14-16	Shop Management	Fred Burckhardt	$150.00
18-22	Advanced Turning Between Centers	Ron DeCorte	$250.00
JUNE 1998			
1-5	CEWT & CMEW Examinations	Jim Lubic	$250.00
8-12	CW & CMW Examinations	Jim Lubic	$250.00

PROJECT EXTEND CLOCK CLASSES

DATE	CLASS	INSTRUCTOR	FEE
MARCH 1998			
2-6	French Clock Repair	Ron Iverson	$250.00
9-13	Clock Case Repair	James Williams	$250.00
16-20	Antique Clock Restoration	David Christianson	$250.00
23-27	Clock Escapements	Jerry Faier	$250.00
APRIL 1998			
20-24	Organize Your Work Habits for Success	Robert Ockenden	$250.00
MAY 1998			
4-8	Advanced Cuckoo Clock Repair	James Williams	$250.00
11-15	Clock Repair Operations	David Carlson	$250.00
18-22	Wooden Clock Movements	David Christianson	$250.00