

MARCH 1989

HOROLOGICAL TIMES™

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HOROLOGICAL TIMES™



Official Publication of the American Watchmakers Institute

ROBERT F. BISHOP	2	PRESIDENT'S MESSAGE
HENRY B. FRIED	6	QUESTIONS & ANSWERS A Special Flat Model of a Tavannes Watch
JOE CROOKS	10	BENCH TIPS Scratch Remover?
CHARLES CLEVES	12	OLD WATCHES Case Restoration
WES DOOR	16	SHOP TALK Quartz Material Cabinet System
FRED S. BURCKHARDT	20	ROCK QUARRY Are Things Going Your Way?
ROBERT M. OAKLEY	24	CLOCKS INSIDE & OUT 16th Century Style Foliot Clock
MARVIN E. WHITNEY	26	MILITARY TIME Comparing Watch - Hamilton
JOHN A. NAGLE	30	HODGE PODGE LODGE Beat Ya to the Punch
ARCHIE B. PERKINS	32	TECHNICALLY WATCHES Antique Watch Restoration, Part XXXIX Tools for Correcting Wheel Teeth
ROBERT D. PORTER	36	WATCHES INSIDE & OUT Fusee Chain Repair
MARSHALL F. RICHMOND	40	PICKLE BARREL Remounting Rings, Part 2
JAMES ADAMS	43	NOVICE WATCHMAKER Oil and Lubrication, Part 3
THOMAS H. WHITE	46	AFFILIATE CHAPTER COLUMN Dedication
HENRY B. FRIED	48	BOOK REVIEW "The Artistry of the English Watch" "English Dial Clocks" "The Pin-Pallet Escapement"

THE LATEST TIPS IN THE TRADE

10

REPAIRING WATCH CASES

12



26

HOROLOGICAL TIMES (ISSN0145-9546) is published monthly and copyrighted by the American Watchmakers Institute, 3700 Harrison Avenue, Cincinnati, Ohio 45211, for \$40.00 per year (\$4.50 per copy in the United States and \$50.00 per year; \$5.50 per copy outside the U.S.). Second class postage paid at Cincinnati, Ohio. POSTMASTER: Send address changes to HOROLOGICAL TIMES, P.O. Box 11011, Cincinnati, Ohio 45211.

OFFICE HOURS: Monday through Friday 8:00 AM to 4:00 PM (Eastern Standard Time).
Closed on all national holidays. AWI HOTLINE: (513) 661-4636 (24 hours, recording).

DEPARTMENTS
Forum/15
Bulletin Board/22
Readers Write/39
New Members/42
Association News/47
New Products/News in the Trade/50
Classified Ads/53
Advertisers' Index/56
Dates to Remember/56

HOROLOGICAL TIMESTM

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President's Message



Retirement—the word that has positive or negative meaning, depending on your mental attitude. For those who have planned well, it represents a welcome change from the day-to-day rigors of earning a living to the chance to do the things they have always wanted to do but never had the time for. To others, retirement represents a traumatic venture into the unknown. Their career has been their life and the thought of finding new activities to fill the time can be frightening.

It can be said that watchmakers and clockmakers never retire. We are fortunate to have skills that do not require an employer or expensive facilities to implement. We can set up shop at home and work as much or as little as we wish. I feel strongly that every retiree who continues to do some work should not make his repair charges reflect his new lower overhead. The price for his labor should be maintained and the extra profit used to his advantage. This will allow him to do even less work at greater profit. It is not fair to yourself or your fellow craftsmen to sell your labor at a sub-standard rate.

Of course, this option requires that we have a retirement plan to supplement our reduced income. It is sad for those who must continue at the bench until they drop in order to provide the necessities of life.

That time has come for me. After nearly 50 years at the bench, I have decided to hang up the tweezers and take some time to "smell the roses" for a while. I will have the time to travel to some of the places that were never possible because of the pressures of earning a living. I will have the time to pursue some of my hobbies. I may even have time to clean out the garage.

I do not intend to give up the bench entirely, however. The first task will be to sort out the accumulation of the years and consolidate everything into a small efficient work area. I am sure I will find some of the parts lost over the years tucked away in some of the crevices. Perhaps now I can restore some of the old watches that have waited so patiently for me to get around to them. I am looking forward to working only on what I want when I want.

I will continue to keep abreast of the technology in our field. I hope I will never be too old to learn and, of course, I will continue with my AWI activities.

There are few people entering our profession these days, and it would be sad if there are too few of us to supply the demand, but no man is indispensable. Each year we grow one year older. I strongly recommend that you begin your retirement planning early enough so that, when that day of decision arrives, you have a choice.

Robert F. Bishop

ON THE FRONT: An afternoon scene at Joshua Tree National Park (near Palm Springs, CA). Photo by Pierre C. Delacroix of Valley Center, CA.



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UP FRONT

OTTO BENESH LIBRARY COMES TO AWI

The extensive library of the late Otto Benesh has been donated by Mrs. Benesh to the AWI-Henry B. Fried Library.

This library consists of approximately 1000 volumes of the usual, unusual, and rare horological books that Benesh used for reference for his writings, teaching, and restoration work.

In addition to the bound volumes, the library contains files of notes Benesh made while restoring important pieces. It contains rubbings and sketches of antique clock markings, parts which Benesh fabricated by hand, and many drawings of the hands used on clocks made several centuries ago.

This is a most significant acquisition for the Library. AWI's gratitude goes to Mrs. Helen Benesh for making it available.

AWI REGIONAL SEMINARS

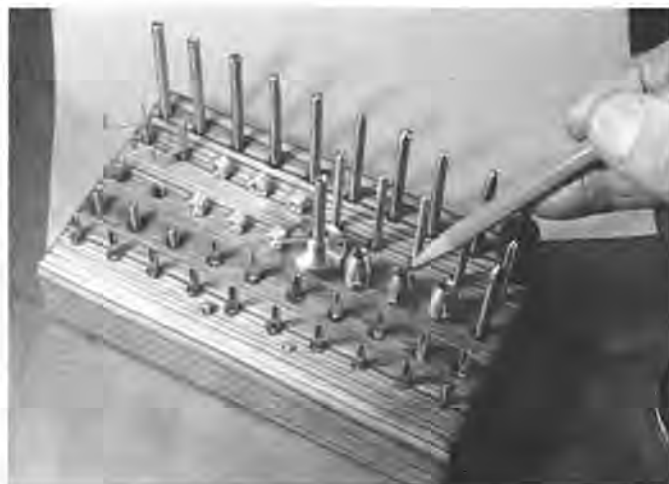
The first AWI Regional Seminar was held in Phoenix, Arizona, Sunday, February 12th. More than sixty members from Arizona and surrounding states took advantage of the opportunity to hear programs presented by Henry B. Fried, Gerald Jaeger, Marvin Whitney, and Robert Nelson.

AWI Regional Seminars will be held on a continuing basis throughout each fiscal year. A total of six regionals will be presented annually; they will be held at locations in the Northwest, Southwest, North Central, South Central, Northeast, and Southeast. The next Regional will be held in the Southeast region—Columbia, South Carolina, on April 2, 1989. See envelope dated 3-89 for details and registration.

RANDOM CLOCK TALKS VIDEOS

Another series of the "Random Clock Talks" video tapes by J.M. Huckabee are now available. In this series of six tapes, Huckabee provides the instructions which enable the viewer not only to master the various lathe operations, but also make a set of very useful pivot working tools. These tools are not available commercially; they will be a valuable addition to any serious clock repairer's shop.

Tapes may be secured individually in the usual manner from AWI Central. If you intend to make the set of pivot working tools, indicate your intentions when you order Tape #30. We will then send you the necessary drawings for completing this project. There is no charge to AWI members for the drawings. The entire series of tapes are numbers 30 through 35.



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CL-A1 (Save \$8.55 on Assortment).....\$29.95

Refills for CLA1 Assortment Gold Plated

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 CL-7.0Y (7.0mm).....\$3.95 ea.
 CL-8.0Y (8.0mm).....\$3.95 ea.
 CL-10Y (10.0mm).....\$3.95 ea.

Stainless Steel

CL-5.5W (5.5mm).....\$3.75 ea.
 CL-6.0W (6.0mm).....\$3.75 ea.
 CL-7.0W (7.0mm).....\$3.75 ea.
 CL-8.0W (8.0mm).....\$3.75 ea.
 CL-10W (10.0mm).....\$3.75 ea.

New!

Leather Strap Buckle Assortment

50 Pcs. Buckle Assortment
 with Spring Bars. (1/4", 5/16",
 3/8", 1/2", 9/16", 5/8", 11/16")



BB-BK50Y (50 Assorted Pcs. - YELLOW ONLY).....\$18.95
 BB-BK50W (50 Assorted Pcs. - WHITE ONLY).....\$16.95

48 PC. SCREW LUG ASSORTMENT

Contains lugs and screws as used on many Cartier,
 Gucci and other expensive watches. Assortment
 contains 12 sets each of 11mm (7/16), 14mm (9/16),
 16mm (5/8), and 18mm (11/16) lugs. Total 48 sets.

BB-SL48Y (Yellow).....\$17.95
 BB-SL48W (White).....\$17.95



New!

Quartz Watch Crown Assortments



Seiko Style Crowns with rubber
 washer on the crown post.

Bottle#	Size	Tap	Post Length
1	3.0mm	12	2.40mm
2	3.0mm	12	2.00mm
3	3.5mm	10	2.70mm
4	3.5mm	11	2.90mm
5	3.5mm	11	2.70mm
6	3.5mm	12	2.40mm
7	3.5mm	12	2.00mm
8	3.5mm	12	2.00mm
9	3.75mm	10	2.60mm
10	3.75mm	10	FLUSH
11	4.0mm	10	2.50mm
12	4.0mm	11	2.70mm

3 Yellow; 1 White (Per Bottle)

CR-90 (48pc. Crown Assortment).....\$36.00

Small "O" Ring Waterproof Crown Assortment for Quartz Watches



Bottle#	Diameter / Tube	Tap
1	3mm x 1.60mm	10
2	3mm x 1.60mm	11
3	3mm x 1.60mm	12
4	3.5mm x 2.00mm	10
5	3.5mm x 2.00mm	11
6	3.5mm x 2.00mm	12
7	3.5mm x 2.00mm	10
8	3.5mm x 2.00mm	10
9	3.8mm x 2.00mm	10
10	4mm x 2.00mm	10
11	4mm x 2.00mm	11
12	4mm x 2.00mm	12

3 Yellow; 1 White (Per Bottle)

CR-80 (48 pc. Crown Assortment).....\$46.00

New!

Seiko-Type Bracelet Parts Assortment

Assortment Contains:

4 pcs. Seiko-Type Guard Chains (Gold Plated)
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 12 pcs. Seiko-Type Chain Hooks
 15 pcs. Seiko-Type Guard Chain Screw Eyes
 6 pcs. Stainless Steel Band Screws
 6 pcs. Stainless Steel Band Screws
BB-WBP.....\$24.95

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Questions & Answers

Henry B. Fried, CMW, CMC, FAWI, FBHI, ★ FNAWCC



A SPECIAL FLAT MODEL OF A TAVANNES WATCH

Q My local jeweler suggested I write to you in helping me to identify a pocket watch and possibly establish its value.

It was not until I recently read an article in an old issue of *The Smith-*

sonian that I became aware a watch that had been left to me by my father who, in turn, had received it from his father, might be a Breguet. My jeweler has not been able to positively identify it as such because he has not found a serial number which he thinks may be under the dial. Unfortunately, the crystal is slightly cracked and he's afraid if he removes it, it will break completely. In view of the extreme thinness of the entire watch (particularly the crystal), he doesn't know of a source that would provide a dependable replacement.

I did write to who I was told is this country's agent for Breguet, the Chaumet firm in New York City, but they would require that I send the watch to them and I'm reluctant to do so.

Enclosed are some pictures of the watch and some sketches of the various markings and their locations on and in the covers of the watch. The dial itself has no identifying information on it and the outside of the front cover has my grandfather's monogram in raised letters.

I'm interested primarily in knowing if this could be a Breguet, and, if so, what its approximate worth might be. If your advice in this should require a fee, please let me know beforehand.



A closeup view of the outside of the inside back cover.



At the top of the inside front cover.

At the bottom of the inside front cover.



17029



Should you be unable to help me, could you possibly let me know what else I might be able to do to get this information?

Reinhold R. Klein
Wausau, WI

A I had not fully opened your letter when I glanced at the watch pictured and knew what it was. I had worked on these often as a young watchmaker on Maiden Lane in (Please turn to page 8)

Borel**SWISS
MADE**

No other replacement crown approaches Borel Crown in quality, looks or effectiveness. Borel Crowns are made by the top Swiss producer of crowns for new-watch production. Borel stocks the complete range of sizes, styles, tap sizes, post lengths, and tube openings. You'll find exactly the crown you need.

Newly updated Quartz Crown Asst.

Borel has assembled the 30 most common dustproof and waterproof types used on today's quartz watches, which require smaller sizes and taps. Includes diameters:

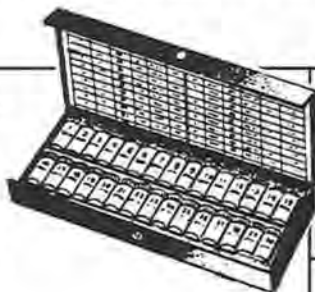
2.75, 3.00, 3.25, 3.50, 3.75 and

Taps 10, 11, 12 & 13

This new updated assortment includes a tap 13 size and more tap 12 crowns than previous assortment. 1 each yellow and white of 30 numbers. Total of 60 Crowns, in 28 bottle cabinet.

New 750/2 Asst. \$65

Dustproof Type



Diameter	Design	Tap 10	Tap 11	Tap 12	Tap 13
2.75mm	●	652/10	652/11		
3.00mm	●	656/10	656/11	656/12	
3.25mm	●	660/10	660/11	660/12	660/13
3.50mm	●	664/10	664/11	664/12	
3.50mm	●	666/10	666/11		

Waterproof Type



Diameter	Tube	Post	Design	Tap 10	Tap 11	Tap 12	Tap 13
3.00mm	1.60mm	Flush	●	756/10	756/11	756/12	
3.25mm	2.00mm	Flush	●	760/10	760/11		
3.50mm	2.00mm	Flush	●	764/10	764/11		
3.50mm	1.60mm	Flush	●	766/11	766/11	766/12	766/13
3.50mm	2.00mm	Flush	●	768/10	768/11	768/12	
3.75mm	1.60mm	Flush	●	770/10	770/11		



Japanese Style Crown Asst.

Borel has put together this unique assortment of crowns styled as those used on the popular Japanese brand watches: Seiko, Pulsar, Lorus and Citizens. Includes 45 numbers, most of which are the waterproof type with gasket, diameters from 2.5mm to 5.5mm. Total 90 crowns, 1 each of yellow and white of 45 numbers. Refills available in 60 bottle cabinets.

Some of the numbers in the assortment are:

J-506-2254 J-25N02 J-35E09 J-30E02 J-35M10 J-40M17
J-506-2614 J-40M32 J-45M30 J-50D05 J-35D03 J-35N57
J-506-2847 J-40M24 J-45D01 J-45W29 J-55M06

950/1 Asst. \$99

Borel

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Otto Frei - Jules Borel, P.O. Box 796, Oakland, CA 94604
National Order Desk - 1-800-772-3456

Borel

QUESTIONS & ANSWERS
(Continued from page 6)

New York. They were imported by Adolphe Schwob down the block where I worked.

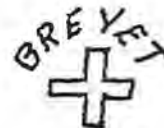
This is a special flat model of the Tavannes Watch Company and it had the particular name of Paliades after a small cluster of stars in the constellation Taurus because of the layout of the train wheel pivots with that extra small (few toothed) train wheel which resembled that constellation's configuration.



The trademarks are simple to understand as Tavannes Watch Company. Other names used with it were TACY and Cyma (still in business).

It is not a Breguet since this was made in the first quarter of this century, in the town of Tavannes in Switzerland. I see movements of this make and calibre on mart tables at meetings of watch and clock collectors. The owners tell me that they never get a nibble out of them . . . a pity, as they are interesting items.

The term Spiral Breguet on the watch case cuvette simply means



This is stamped on the back plate of the works.

that the hairspring used in this watch has the Breguet-type of overcoil which most good watches and almost all American watches had at that time.

As for an appraisal, AWI does not include appraisal services with their many other offerings. Perhaps the offices of Southeby's or Christies in Chicago might supply that service.

Henry B. Fried

Q We need some information on a clock. We serviced it two years ago. It was made in Germany, stamped FHS Germany on the back plate. The dial has Westminster on top and the name SIANKER underneath Westminster.

It is a long style mantel clock similar to one Seth Thomas makes. It has a floating balance movement. We don't know how old it is but the customer was supposed to have bought it in Germany when it was new.

Now our customer claims the movement and chime rods are not the ones that were in it when she brought it into our shop.

I realize we don't have much information, but anything would be appreciated—diagrams, addresses, or anything that would help us find out more on this clock.

William Warren
Springfield, MO

A I have read your letter quite carefully. I have the information you desire. The maker is Franz Hermle and Sohne of Goshen, Germany. Hermle also has a manufacturing and assembly plant in Amherst, VA 24521. Their phone number is (804) 946-7751. They are most cooperative and will supply any information you need.

I cannot understand how or why your customer can or should claim that the movement and/or chime rods were changed. This is not physically possible nor if it were, would it be profitable or practical. Such an opera-

(Please turn to page 11)

COMING ATTRACTIONS

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AS 976



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Orient 5FB	\$16.00		

*same as Seiko 1400A

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Bench Tips

Joe Crooks



SCRATCH REMOVER?

I've got three tips this month! The first is from Mr. Barney Feldmar of Los Angeles, CA.

Here's a tip to take out *minor* scratches (particularly on new watches or bands) that have the satin-type finish. Use cleansing powder, such as Ajax®, Dutch Cleanser®, etc. Dip a towel in water, then the cleanser, and work this over the scratched area *carefully*.

In most cases it will retain the original finish. Try it! It will amaze you.

Using a bristle buff may change the finish of the metal.

This tip is good for solid gold or stainless steel, but don't put an abrasive like Ajax or Dutch Cleanser on the new plated quartz watches we now service. Two rubs with an abrasive and the gold plate would be gone. In fact, don't even rub it much with a soft cloth with nothing on it!

* * *

The next two tips are from Mr. Earl Marshall of Devil's Lake, ND.

LETTING DOWN MAINSPRINGS

I have been reading your feature in the H.T. and find it very valuable. Now it's about time that I contribute something for the column.

I use a hose clamp, with the spiral cuts on the plain end, to secure the mainspring when disassembling a clock. The open end can be inserted around the spring with no interference with retainer studs or arbors. Your portable electric screwdriver or drill can be used with a 3/8 socket to close the clamp and bind the spring. The remaining spring tension will have to be let down, but there will be little tension remaining. This is much more efficient than using the heavy steel retainer rings with the required winding and let-down we used to do.

Since I mentioned the portable electric screwdriver, I will add that it is very helpful for let-down and rewinding the mainspring. Simply chuck in the required arbor and select the desired rotation. With the pawl spring released, a momentary forward thrust of the power will release the spring and the gears will control the unwinding of the spring. The movement must be secured in some way to accomplish this maneuver. (Keep up the good work, Joe.)

SEND YOUR TIPS TO: Jingle Joe, AWI Central,
3700 Harrison Avenue, Cincinnati, Ohio 45211.

Earl, your tips are the first ones I've ever received from North Dakota. Thanks!

The clamps Earl uses are automotive stainless steel hose clamps. They will open up to fit around loop end springs and post of the clock. They can be bought in assorted sizes from auto parts outlets. They have a slotted hex-head worm screw clamp that can be tightened with a screwdriver, wrench or socket. They give a positive pressure around the entire diameter of the spring.



Stainless Steel
HOSE CLAMP

Earl's second tip is the portable electric drill to speed up clock repair, removing movements from the case and re-assembly, letting down the power on the mainsprings, and rewinding (plus many other uses in the shop).

Eastern Steel makes one of the best cordless 46-piece drill and drive sets I've ever seen. It's a two-speed, reversible drill with 3/8" geared chuck, built-in key, with a rechargeable unit. It has drill bits, ten 1/4" drive SAE/metric sockets, and 20-piece screw assortment (Phillips, slotted, hex, torque, and Robertson), plus socket adapter and bit holder. It also has a nice case to store all the parts.

Your can buy this from C.O.M.B., an authorized Liquidator, at 1405 Lenium Lane N., P.O. Box 32, Minneapolis, MN 55440-9176. The retail price is \$99.95; C.O.M.B.'s price is \$49.00, plus \$6.00 shipping and handling (item #C42-7404-114).

* * *

We got another tip for removing mainsprings from the barrel from that guy with the marbles in his head (who writes the "Rock Quarry et tu" articles for the H.T.). His tip is how to get mainsprings out of the barrel pronto.

Tip: Put on some heavy Texas cowhide gloves and grasp one hand around the barrel. With serrated jaw pliers (to hold securely), grab the mainspring and jerk it out while holding your hands in a closet with the door shut tight to your wrist. The closet will catch the spring every time. You can make a modified "catcher" by slicking your hands under a tin tub. To get the kinks out of the spring, smack it with a ball-peen hammer on a blacksmith anvil.

I sure don't recommend this tip from Fred, and now we know where he came up with the Rock Quarry part of the title for his articles. But what about the "et tu"? Isn't that Latin for something or other that Caesar said to Brutus? . . .

WIS

QUESTIONS & ANSWERS

(Continued from page 8)

tion would be impossible to conceal. Such movements and the power required to wind them would require some strength and thus quite a strain on any mechanism held to the movement except with the sturdiest screws. Also, almost every available replacement, if at all possible, would not fit into the old screw holes nor could these be concealed so easily. Such an attempted operation would begin with a loss in the time and cost column of one's books. Such an attempt may end disastrously.

As for the chime rods, etc., they don't always align well enough to sound the progression of hammer strikes. Sometimes clocks, when moved from one piece of furniture to another or another part of a room, may sound differently due to the acoustical differences in and from certain angles of a room or the resonance of the table, chest of drawers, or table upon which it rests.

Henry B. Fried

The following question was referred to Henry Frystak for an answer.

Q Can an Accutron 700 test meter be used for testing and repairing quartz modules that are designed to operate on 3 volts?

Donn Kummer
Albany, OR

A The Accutron Service Kit, or more commonly called Accutron test set, as is, CANNOT be used to test quartz modules that are designed to run on 3 volts. At least not in its original state of design. You cannot measure and put three volts through it to make the movement step, not even with a Bulova variable power supply, as I taught in classes from 1981 to the end of 1985.

Let us try to explain why not. When the Accutron meter was designed, it was meant for the Accutrons back in 1960 when no one heard of quartz. It can measure from 1 volt up to 1.75 volts and from 1 up to 10 microamperes. By projection of the microampere scale, it can measure up to 25 microamperes. It was and still is a very fine and accurate meter and quite simple to use. It has a

clean, large, uncluttered dial plainly marked and easy to read.

When quartz movements came along, Bulova had to find a way to adapt the Accutron A.S.K. (as it was properly called) to be used for quartz modules. Quartz modules use 1.5 volts, but that's no problem, the meter can handle that. But quartz modules use a higher peak current at the instant of stepping, but a low current between the steps so the meter (as it was) couldn't handle the momentary drain of over 25 microamperes peak. The pointer would peg and oscillate from zero to peg every second so you could not get a reading; but worse than that, the movement would not run. The capacitance was not great enough to make the movement step. That's when Bulova brought out the Meter Accessory No. 6603 to be used for testing quartz watches. With this the meter could now be used to feed 1.5 volts to the module by using the 1.5 volt battery in the meter and connecting the accessory in the line, the movement would run. The accessory also did one other thing—it dampened the meter just enough that you can now read the current drain. By using a medium size capacitor in the accessory, the meter would oscillate slightly, thus showing you when the movement coil was receiving a pulse and should be stepping. If it wasn't, you knew you had a blocked train. By putting these facts together, you could now sensibly troubleshoot and service 99% of the quartz watches.

But Bulova was not satisfied yet. This is where they got the bright idea that a variable power supply was needed. Then you could check the movement at lower voltages to be able to determine the condition of the movement, whether it was free of excessive friction or gummed up and needing a cleaning and oiling. Just as you do on a mechanical watch, winding the mainspring only one turn or less, you can see if you have motion of the balance wheel. The variable power supply could deliver through the meter any voltage from 0 to 1.7 and Bulova published a list of the low voltages at which all Bulova movements should run. There also was a condition test that was called "starting voltage" test which could be performed with the variable power supply.

Then along came the one-piece circuit board and coil assembly. Now you need a meter that will put out less than a half a volt. Volt-ohm-meters put out 1½ volts on the resistance scale so they cannot be used on combination circuit boards. With the variable power

supply you can feed out through your meter as little as 1/10 of a volt. Then along came the 3 volt watch.

What's your solution? The cheapest and quickest way out is to use a good volt-ohm-meter with a variable power supply built for that which will deliver regulated 3 volts D.C.

If you own a good volt-ohm-meter of 20,000 ohms per volt or maybe more, and it has a low microampere scale of 0 to 10 or 15 microamperes, then all you need is a good regulated power supply that will deliver 3 volts D.C. to your meter and movement and you can, with the proper instructions, work on 3 volt quartz watches.

These variable volt supply units are available for purchase or AWI can supply a schematic to help you build your own.

Henry Frystak

The following question was referred to Marvin Whitney for an answer.

Q I would appreciate any information you can give me on a brass ship's clock. On the dial it has:

Roman Numerals
U.S. Navy E. Howard & Co.
Boston U.S.A.

The movement has no numbers or letters. I would appreciate any information you can give me.

Isadore Cohen
Vallejo, CA

A The clock which you requested information on is Howard's Model No. 69 marine clock. The 8-day, 7 to 11 jewel movement was housed in a heavy brass, bronze or nickel case. The dials measured 4½, 6, 8, 10 and 12 inches in diameter. The 4½, 6 and 8 inch dials had a porcelain finish while the 10 and 12 inch were silvered.

Those that I saw before and during the early months of World War II being returned to the Naval Observatory for overhaul were housed in brass cases and had 10 or 12 inch silvered dials. The Navy referred to them as "engine room" clocks.

Howard began manufacturing marine clocks just before the turn of the century. They were very sturdy and well made.

Marvin E. Whitney

WIB

Old Watches



Charles Cleves

Case Restoration

With the high rise in wristwatch prices over the past five years, it has become increasingly more important that they be restored properly. Most watchmakers spend much effort in repairing the movement and then just clean the case. Restoring valuable wristwatches requires case restoration also.

One of the first repairs I will discuss is removing dents from the case. Many times I have seen a slightly wavy caseback. Upon opening the case and inspecting the inside of the back, I sometimes see numerous scratches through the case signature. Burnishing out the dents from the inside is not acceptable to collectors. An acceptable way to burnish out the dent is to put a piece of clear tape over the dent on the inside and outside of the case. Then, after you rub out the dent, remove the tape and leave no unsightly marks. Do not use two pieces of tape overlapped, or butted up against each other; there will be a mark left by the seams of the tape. Buy tape wider than usual so that you can have the whole surface covered by one single piece of tape.

An alternate method, but not as good, is to put the back of the case in a plastic zip-lock bag, and then rub out the dent. Whenever possible, I prefer removing dents with a series of punches I made from large nails. The largest nail was approximately one foot long when I purchased it from the hardware store. It's the kind used for anchoring gutters. This is the punch I use the most. I shortened it to approximately 3½ inches, and resharpened it to a point with my grinding wheel. It is important to sharpen it to a point because you will always hit the punch in the center when using it. I then put the nail in a lathe, and cut away the head, so that it is flat in the middle and rounded on the edges (see Figure 1). Don't try to use a staking tool; you do not have enough surface area. You might want to make a couple of these larger punches, with some being more rounded than that shown in Figure 1.

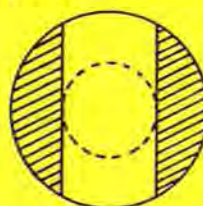


I usually use clear tape whenever I am hitting on a caseback so there will be no marks at all when I have finished. Once I tap out a dent from the inside, and there is still a slight indentation seen from the outside, I fill it in with a little gold solder. It is not good to keep beating on the case to try to remove the dent; it will only get worse. Removing dents on the front bezel can be trickier, since you are not dealing with a large flat surface. Most of the time I will have to alter a 10d nail or larger to make a specific punch for a particular surface.

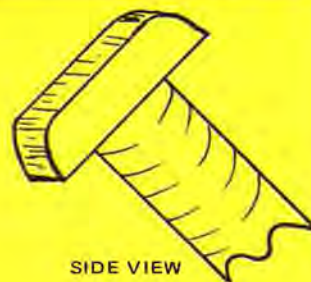
First, I cut the nail as in Figure 1. Then I grind two sides of the head until it is as wide as the bezel which I am trying to straighten (Figure 2). There is no easy way to straighten a bezel, but with punches the exact width of the bezel you can achieve good results. As I do with the back of the case, I also use tape on the fronts, so as not to leave any marks.

The second type of case problem I commonly encounter is worn gold-filled cases. The first step is to make sure the case has been thoroughly cleaned in an ultrasonic cleaner, and then by a steam cleaner, if possible. The cracks in the case

Figure 2

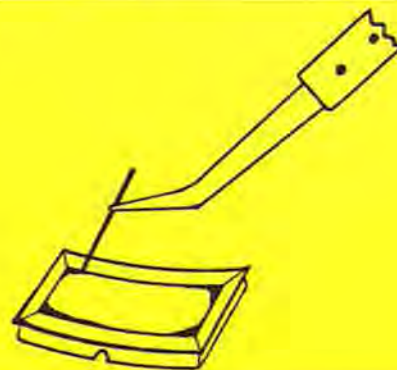


TOP VIEW



SIDE VIEW

Figure 3



must then be inspected to see that there is no dirt wedged in them. Sometimes there is dirt which can only be removed by using a small burr or engraving tool. While doing this, you must be careful not to put a hole through to the inside of the case. It is very important to remove all dirt, because solder will not stick to dirt, but instead will get pits in it. One thing you must *not* do at this time is polish the case. This is very detrimental to doing a good job, because it rounds off all the edges, making it harder to obtain sharp-looking edges on the finished project. The final goal is to make the case repair undetectable. The purpose for filling in the holes with gold solder is to then file the solder down to match the original shape of the case. This must be done without removing any gold from the surface next to the hole.

The easiest type of solder to work with and flow into all the cracks is 14k easy-flow solder. Unfortunately, this cannot be used on yellow gold cases, because the color of it is too green. I use mostly 14k yellow medium flow solder. The color matches most gold-filled cases very well. Occasionally, I will have to use 14k yellow hard solder to match the color on some cases. I make it a practice not to fill initials on gold-filled cases, because it usually does not turn out too well. Before heating the case, you must protect it from being burned and discolored. I prefer Aircosil® flux for this purpose. When I am soldering the back of a case, I fill the inside of the back with this flux to keep it from discoloring. As I start to heat the part, I make sure that it is covered everywhere with this flux. The longer you heat the case, the more flux you have to keep adding. Before you start soldering, clip a small piece of solder and test it on the bottom of a lug to see if the color matches.

There are a couple of different ways in which to fill in the holes. One way is to clip your sheet of solder into 2x2 millimeter squares and use a solder pick to apply solder as necessary. Another way, for someone more trained with a torch, is to cut the solder into long strips one millimeter wide. Then, using locking tweezers, hold the solder as shown in Figure 3. Heat the case and run as much solder as is necessary into each crack. When the crack is fairly long or deep, I try to shape a piece of 14k gold wire and lay it down in the crack before applying the solder. This way you will use much less solder.

Once you have sufficiently filled in the holes, the tedious task of removing the unwanted solder begins. I start (Please turn to page 14)

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by placing the back into an ultrasonic cleaner with soap water and ammonia. This removes all the remaining flux. Then I use a sanding stick with 330 grit paper on it, to start sanding away the excess solder. Depending on the location of the holes, I sometimes use transparent tape next to the lumps of solder, in order to keep from sanding on the original surface of the case. Remember, you are trying to make the solder come down to the original level of the hole without removing any metal from the original shape of the case. That's the most difficult part. After the 330 sandpaper, I use 660 grit. Then I switch to tripoli on my polishing machine, followed by yellow rouge. It takes much practice to keep from sanding off sharp corners. There are a lot of people doing cases this way but not worrying about sanding through the layer of gold-filled in other spots. They simply gold-plate the case when they have finished. This changes the original color of the case slightly,

and in most instances makes the repairs stand out rather than disappear. Do not start working with a very valuable case first; this does require some practice.

SOME FINE POINTS OFTEN OVERLOOKED

Do not try to fill in with gold a case that has been filled in with soft silver solder. The only way this is possible is if all the soft solder can be removed. Even the small residue must be ground away, or silver streaks will appear in the gold solder.

Even if the hole has never been filled with silver solder, you may finish repairing the case and still have silver streaks in the gold solder. This will occur when the hole is all the way through the case to the soft silver layer which holds the back of the watch to the inner back.

Always make sure you have added enough gold solder to fill the holes completely. The more times you have to re-heat the case, the worse it gets, and the harder it is to bring back the original finish.

7-13

Classic Tour of Russia

May 13 - June 3, 1989

HENRY B. FRIED,
Tour Guide

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FORUM

The FORUM is a column devoted to the discussion and debate of horological piffle, practices, and problems. Comments can be controversial, but should always remain within the bounds of good taste. Responses should be sent to: **AWI FORUM, P.O. Box 11011, Cincinnati, OH 45211.**

Albert Dodson
CMC

Ralph Geiger
CMW, CMC, CEWS, CMBH

THE DEVIL'S ADVOCATE

Do you believe the tripe that gets printed in this magazine? Every month it's the same. Cover-to-cover platitudes from people who are represented as horological saints. Each one claims to have dedicated themselves to the task of being the best horologist they are capable of being. Always searching for new methods of repair or for a greater understanding of the timepieces on which they work. Always helping their peers selflessly. Never doing anything but the best work they are ca-

pable of doing and never violating the AWI Code of Ethics.

Who do they think they are fooling? Everybody knows that's all a bucket of bilge water. Nobody learns anything at those bench courses. We all know that AWI is just trying to get into our pockets and part us with another hundred dollars by telling us that we 'should' learn to repair quartz watches. After all, it is for our own good. (Yeah, right.)

And all this striving for excellence stuff is garbage too. Who really

cares? The customers sure don't, so why should we? There is no point in giving them anything better than what they are satisfied with. Customers are just looking for the cheapest price anyway so they will be getting exactly what they paid for. And that is another reason not to go to bench courses—why waste your time and money when no one appreciates it?

We live in a dog-eat-dog world whose golden rule is: Do unto others before they do unto you. Trying to follow the saintly advice in *Horological Times* is just going to increase your chances of being done unto first. Instead of all the 'noble' New Year's resolutions our President set for AWI, perhaps we would be better off resolving to join the real world instead of the idealized one we read about in the HT. Failing that, perhaps we would be better off changing the name of the magazine to *Hypothetical Times*.

Comments, both pro and con, are invited.

**GOT AN OPINION?
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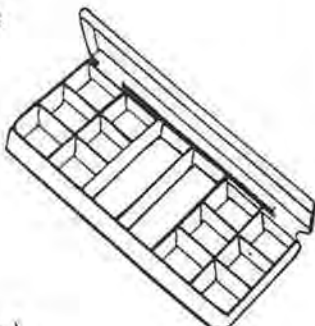
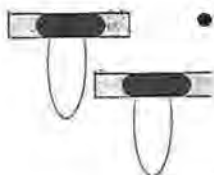
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	A	B	C	D
	1			
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MODULE PARTS & MATERIAL	4			
	5			
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MECH. MOVE.	10			
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	41			
	42			
	43			
	44			
	45			
CASING PARTS	46			
	47			
	48			
	49			
	50			
	51			

Quartz Material Cabinet System

The last three "Shop Talk" articles were Quartz Movement Interchangeability Charts. We showed a listing from 3 3/4 ligne through 13 ligne. Within each ligne size, the listing is "roughly" in alphabetical order. However, the dial feet positions (Column F) and features of interchanges (column E) are grouped together with some disregard for the alphabetical order.

We notice that the first listing shows mostly Swiss and the Japanese are listed at the end of the 6 3/4 ligne listing. There are exceptions like the French Ebauches (FE 6820). This quartz movement, listed as a 5 1/2 x 6 3/4 ligne movement, is available to use as a replacement for the AS 1012 or the Seiko 11A and other similar mechanical watches.

Although we cannot stock all of the watch modules listed, we should have a few each of the various sizes. Obviously some modules are better than others and we must select either an exact replacement (using the same model) or a different and better one. Using a better than original module gives us the privilege of charging a little more. Also, we can assure our customer that there is a better chance that it will keep better time and hopefully parts will be available. The better modules are easier to work on and they seem to have a better quality control.

It is not our purpose to recommend which modules to buy for stock, as each of us have our personal preference. It will suffice to say that if it costs \$1.00 to \$3.00 more for a better module, then it seems worthwhile to spend this additional amount for a better module.

MATERIAL CABINETS

Some quartz material like stems, crowns, and hands can be placed in bottle cabinets like our other watch material. It is desirable to have assortments of all of these parts. Stems break and do need replacing. Crowns for quartz now come with additional smaller tap sizes to match the newer stem

thread sizes. Crown assortments include some with very small diameters and also some that are made with the gasket on the crown tube. These are referred to as the "Japanese type".

Some second hands are counterbalanced for quartz. Hour and minute hands are made as light as possible. Also they are preferably not made of steel as the magnetic attraction from the rotor may cause the watch to either stop or to lose time.

QUARTZ MODULE CABINETS

Since modules (movements) will not fit into a bottle we need a larger storage space. I have found that the same type of plastic utility drawer cabinet that most of us use for our AWI batteries works equally well to house our modules. The following is my latest rearrangement and hopefully it will last for a reasonable time. You will notice I have many blank drawers to allow for expansion. If you have a good system you are not required to read the following.

I happen to have several plastic cabinets so I arranged them as shown in Figure 1. Four of these have 36 drawers each and one has 24 drawers. I stacked them and numbered them as shown from top to bottom (numbers 1 through 51), and from left to right I used letters A, B, C and D.

The top section is used for material supplies such as

LCD polarizers, L.C. panels, oscillating crystals, battery clamps, etc. The next section of drawers are numbered 10 through 15. Drawers 10 and 11 are used for mechanical movements (the exception to this "all" quartz cabinet). Drawer number 12 is for electrics, 13 is electronic, and 14 is for Accutrons. Drawer 15 is for quartz "trade ins". New and used parts are in the same drawer but carefully marked. Drawers 16 through 42 are for modules. Notice that we use column A for baguettes and 5½ ligne, B for 6¾ ligne, C for 10½ and 11½ ligne, and D for LCD. When retrofitting a new module it is easy to select the proper size by using our chart. The last section, drawer numbers 43 through 51, are casing parts.

Referring back to our Quartz Movement Interchangeability Chart (December, January and February issues), may I suggest that you photocopy these charts. You may use these for help in ordering modules and also to set up your own drawer system. Notice that Column A is marked "Our No." We use this column and place our drawer number on it.

Naturally we do not stock all of the 265 modules shown on these charts, but we carry a few each of the most used sizes and modules. Several suppliers carry the module you want or an updated newer one,

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The Bulova Thermatron Watch

David A. Christianson, CMW, CMBHI



A number of items have crossed my bench or my reading that have piqued my curiosity. Some are rarities, maybe written about briefly and never heard of again, such as the topic of this article. Perhaps it will satisfy your curiosity as it has mine.

Do you remember the Bulova Thermatron? It was the watch that was powered by changes in body temperature. It was the hope of the struggling Bulova Watch Company. What ever happened to this hope or this watch?

In May of 1980 the Bulova Watch Company announced to the horological world that they had developed what seemed to them a new generation of timepieces. The principle involved the use of a tiny thermoelectric generator which could produce electricity by sensing the difference in temperature between the back and the top of the case.

This was a dramatic concept for this watch company which once was the giant among watch producers. Bulova's dominance in the industry slid dramatically as other companies out distanced them in the fast-paced business of quartz watch development.

The Bulova Accutron was their forte—what an achievement in technology, marketing and service. Bulova led the world watch industry for several years in an unparalleled style, but the quartz watch caught them off guard and eclipsed what had come before.

With the announcement in Switzerland in May

1980 of the Thermatron watch it was obvious that Bulova felt they had come upon another Accutron—a revolution that would propel the company to its former dominance and power. Yet it didn't happen. After numerous industry news releases in the world and a national release in Switzerland, nothing else was heard. What happened? Where was this revolutionary watch that Bulova so desperately needed?

Before we proceed any further, let's take a look at one of the few Thermatrons that was produced. The particular watch is part of AWI's collection in the Orville R. Hagans Museum at AWI Central in Cincinnati. The watch is model #SR4106, serial #10651106, manufactured in 1981 (Figure 1).

TECHNICAL DETAILS

The Bulova thermoelectric development contains three operating stages (Figure 2).

STAGE 1 (warm source): This is the sensing source for the watch caseback. Body heat is detected through a special surface.

STAGE 2 (cold source): The upper part of the watch case, if fully insulated from the caseback, provides the environmental difference in temperature necessary for operation.

STAGE 3 (converting device): The thermoelectric converter utilizes the difference of temperature between Stage 1 and Stage 2 to produce electric energy.

FIGURE 1. AWI Watch No. 906. Bulova Thermatron, model no. SR4106, serial no. 10651106, manufactured in 1981.



FIGURE 2

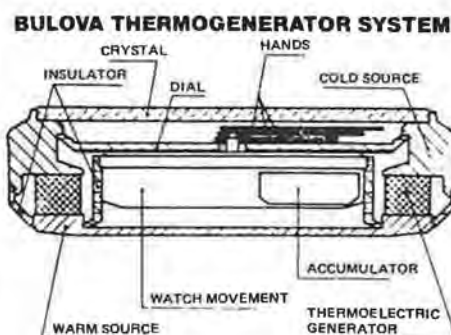


FIGURE 3. Outside caseback.





FIGURE 4. Inside caseback.

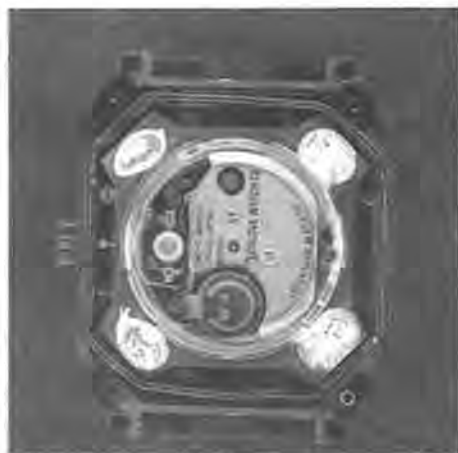


FIGURE 5. Encased watch with back removed. Note the white adhesive that bound the caseback to the movement retaining ring.

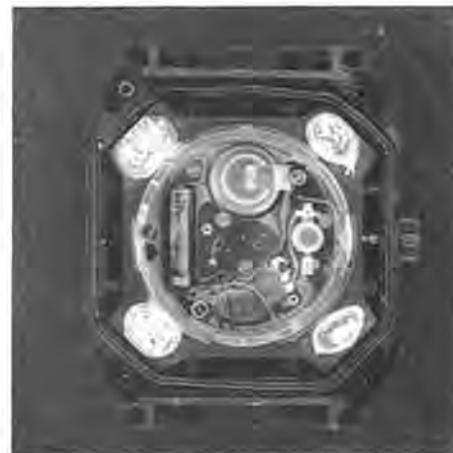


FIGURE 6. Encased movement with movement shield removed.

FUNCTIONING: The voltage produced from the thermoelectric elements is transformed through a sophisticated electronic circuit to the required voltage necessary to operate the watch. Upon attaining the proper level of voltage, this energy is directed toward an accumulator. An accumulator is, in effect, a battery which allows repeated recharging. The electronic circuit constantly monitors the input of electricity and has been engineered to prevent overcharging the accumulator. Indefinite recharging is theoretically possible.

ENERGY RESERVE: The average body temperature

of 98.6°F delivers more than 1000 microwatts of "heat" power at the caseback. The power consumed to operate a typical quartz wristwatch containing a battery is approximately two microwatts. The device that Bulova perfected receives approximately 8-12 microwatts from the thermogenerator. Therefore, the electric energy produced is four to six times greater than that which is consumed in operating a watch.

The principle of the Theratron watch involves the
(Please turn to page 21)

ARE YOU OLD ENOUGH TO REMEMBER WHEN . . . BACK ORDERS FOR WATCH PARTS WERE FEW AND FAR BETWEEN?

It's really surprising to hear that people have problems getting watch parts.

It is true that many distributors have cut back on their stock of watch material, while emphasizing the more lucrative jewelry and diamond lines. **Twin City Supply** has remained in the watch parts field, expanding to accommodate the new quartz technology. Through the years, we have also purchased the stock of other material houses, and continue to inventory the older watch parts as well as the so called "hard to find" Japanese watch material.

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Fred S. Burckhardt



Are Things Going Your Way?

Blessed is the person who, at the end of the day, is satisfied with life and can look in the mirror and say, "I've done my best!"

Unfortunately, this doesn't include watchmakers and clockmakers. Don't ask me why, but we are not a happy lot. When was the last time you met someone in this business who said, "Gee, I'm happy in my work"?

I did, one time. He was an inmate in Happy Hills Farm. I found out the reason he was there: He cracked at the bench when he couldn't replace the hairspring on one of those jobs that has a split hook type piece where the hairspring stud snaps into rather than a screw. From what I could find out, it must have been a terrible sight when he broke down. He threw his lathe through the front window, emptied his staking set on the floor, pulled all his tweezers in two, and smashed his loupe with a hammer. If this wasn't enough, he set fire to his crystal system. They say it took three years before he could look at a screwdriver.

I remember another fellow I met one time. He had pure white hair, stooped shoulders, and walked with the help of a cane. I held the door open for him when we were going into the supply house. I even let him go ahead of me at the counter because I always respect my elders. When he left, I asked the material man who he was. He told me that the guy was only 26 years old and has only been in the business for three years. He couldn't take the pressure of keeping his battery assortment up to date. It seems that when he would stock up on a certain number, it wouldn't be popular anymore. Whenever he opened a new watch, it would have a battery that he didn't have in stock.

And then there was the clockmaker I met at a convention. I noticed him as soon as I walked into the room. He had a red stripe, about an inch wide, running from his forehead all the way down to his chin. I couldn't help but ask him if it was a birthmark or what. He said no, it was the result of an accident that took place several years ago. He was removing a clock mainspring from the barrel and it got away from him. Slapped him right across the face. I made mention that he must have thought about giving up the business after that happened. He said, "Are you kidding? I love this business. I wouldn't even consider doing anything else." I think that spring must have knocked a little of his wallpaper loose.

It's true, there is a lot of pressure in this business. For example, take the other day. A little old woman came in carrying a wall clock that was about twice her size. I told her she shouldn't carry anything that heavy by herself and that next time she should bring someone else with her. It was an old regulator. The wooden pendulum rod was broken, the weight was laying on the bottom of the case, the movement was hanging loose, and the glass on the door was cracked. I asked, "Did you drop it?"

She said, "Oh, no. I don't know what happened. It was running fine and all of a sudden it stopped. I hardly ever looked at it except on Sundays."

Don't ask me why, but my finely tuned intuition suggested that the old girl was telling a nontruth. I told her that just from what I could see, we were talking heavy bucks to repair it. She tried to get to me with the same old sob story about being on a fixed income and couldn't afford to spend a lot of money. I did feel a little sorry for her so instead of having her sign the house over to me, I let her send the social security checks directly to me. I wouldn't have let her off so easy except she is a relative. I guess all of us have a soft spot for our mothers.

All of us do receive some satisfaction out of doing a good job on a watch or clock. I don't know about you, but the best feeling is when a repair you really hate to do turns out to be an easy job. You know the kind I mean. The one you try to talk the customer out of having done and you set the price extra high thinking they'll say no. Instead they say yes so you try to kick yourself for not setting the price higher. This is the one you keep putting off, dreading even having to start on it. Finally the day of reckoning comes and it turns out to be a gravy job. This is real satisfaction. (On the other hand, how about the job you think will be a gravy job, and it turns out to be the opposite of Heaven!)

All in all, the good times outshine the bad. No one ever told me this would be an easy trade. Then again, they could have mentioned something about being in a bottomless pit with an everlasting fire.

When things don't seem to be going your way and you feel life is a real bummer, remember these words of a wise old man who said, "A wet bird never flies at night!"

THE

THE BULOVA THERMATRON WATCH

(Continued from page 19)

use of a tiny thermoelectric generator which produces electricity as a result of sensing the difference in temperature between the back and the top of the case. The generator can sense a difference of as little as 2°F; any difference in temperature over 2° is directed to an accumulator where it is stored in case the watch is not worn (Figures 3, 4, 5 and 6).

In addition to a revolutionary new watch power source, which Bulova engineers predicted could last indefinitely, Bulova dreamed of a whole range of future product applications; for example, hearing aids. But their four years of research resulted in only a few hundred watches being produced. In the words of Henry Fried, the project gained some publicity to bolster Bulova's image in the wake of "Seiko's surging position in the industry."

Perhaps that is all Bulova wanted or expected. The Thermatron watch was large and bulky by the standard watch styling in the early 1980s. In a time of dramatic reductions in the size of the quartz watch, due to the longevity of new generation power cells, the Thermatron was outclassed. The "indefinite life" of the Thermatron power source seemed a mute point in comparison to the "five-year battery life" being introduced by Seiko at this time.

The reasons for the short life and quick demise of

the Thermatron remains a curiosity and is left to speculation. Who knows? But it seems obvious that the concept of the Thermatron was obsolete before it was even test marketed.

The rights, titles and interest, including all technical materials and watches, were sold to a Mr. Friedrich K. Migowski of West Germany. Patents were applied for and/or obtained strictly on Bulova's unique application of a thermoelectric generator when applied to a wristwatch movement and case.

Perhaps the current owner of all rights, titles and interests is more interested in the "other" applications of the thermogenerator that Bulova engineers speculated about in the beginning.

Perhaps you too remember the excitement that surrounded Bulova's announcements of a revolutionary power source for their exciting new watch. If you do, perhaps this story might satisfy a forgotten curiosity. Nevertheless, it was fun to look into and speculate on what facts were at hand.

REFERENCES

- Unpublished news release of May 1980 from the Orville R. Hagans' files
- Swiss national news release of May 1980
- Correspondence with Henry Fried
- Correspondence from Herb Novick, Bulova Watch Co.

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BULLETIN BOARD

A. NEW REQUESTS

"CROWN" CLOCK: JAPANESE 31-DAY

Member J. Campbell has a 31-day clock made in Japan and marked with the name "Crown." The clock was marketed by the Colonial Clock Co. of Zeeland, MI. Colonial has been out of business for a few years; therefore, he cannot turn to them for information.

Perhaps "Crown" is not the name of the manufacturer of the clock; if this is true, hopefully someone can identify the actual maker. Mr. Campbell is seeking a source in the United States who can supply a replacement movement or information about assembly, especially details about the installation of the mainspring.

FLASH FLOOD FLUX

C.F. Miller sent in the label from a box which contains the following information:

New Improved
Flash Flood
Flux (TM)
Use Water to Thin

The product was manufactured by La Ray of Miami, Inc., 36 N.E. 1st Street, No. 530, Miami, FL 33132. Efforts to find this firm in the directory have not been successful.

"PRECISE" WATCH TIMING MACHINE

"HERSEY WATCH TIMER SERVICE" OF CHICAGO

W. Kiser has a "Precise" watch timing machine that is quite old. About 20 years ago it was serviced by "Hersey Watch Timer Service" of Chicago. A local radio/TV repairman advises that he would need a schematic if he were to attempt to repair it. Mr. Kiser seeks to know if the Hersey company is still in business, or whether someone can supply a schematic or repair this machine.

WATCH HAIRSPRING VIBRATORS

Since the Hairspring Vibrating Co. has discontinued its operation in New Jersey, AWI is attempting to put together a list of firms or individuals who vibrate watch hairsprings for the trade.

B. RESPONSES

EXCESSIVE SPRING BARREL WEAR

The responses we have received tend to indicate that premature wear of clock mainspring barrels is more prevalent than we had supposed. Solutions range from replacement to rebushing the barrel and/or its cover.

IDENTIFICATION OF GERMAN-MADE CLOCK

The maker of the German clock which displays a half moon with the letters D.R.G. around it and below that a lion and the letters U.M. has been identified as the Uhrenfabrik Wilhelm Muller & Co. Muhlheim/Donau Clock Factory

which was founded in 1867 and bankrupt in 1959. The letters D.R.G. are reported to mean "trade sample."

RCA 812-A TUBE

Several sources have been named for the RCA 812-A Tube which Lorraine Cusher was seeking for an "Interlab" ultrasonic cleaning machine.

C. ITEMS STILL NEEDED

"CORNIOLEY" AIRCRAFT CLOCK

Jackson, Ohio member Walter Zian is seeking a source for spare parts for an aircraft clock which has the name "Cornioley" on its dial. We have checked with sources in our files, but find no leads for this brand clock.

PARSON'S HOROLOGICAL INSTITUTE

Member David Nicholson of Enid, OK is trying to locate someone who might still have records from the Parson's Horological Institute which was located in Peoria, IL. His grandfather graduated from this institution in 1898.

SCHEMATIC FOR WATCHMASTER CLEANING MACHINE

Paul Montigny, an AWI member from Reading, PA, is seeking a schematic for a Watchmaster cleaning machine, type A-1. If you have a schematic, we will copy it and return it to you.

WINDING COILS FOR OLD ELECTRIC CLOCKS

Howard Thompson of Owatoma, MN writes: *Are there any publications available on rewinding coils for some of the older electric clocks? It would be relatively simple to do if one knew how many turns, wire diameter, etc. Some of these clocks are well worth restoring, especially if they are a family heirloom.*

If anyone has details that might help Mr. Thompson, we are sure other "Bulletin Board" readers would also be interested. Please let us hear from you.

LUBRICANT ABLE TO WITHSTAND EXTREME COLD

Raymond Sambs of Rhinelander, WI is seeking information about lubricants that might be suitable for the platform escapement of timers used by the Forestry Service where the temperature can reach -30 degrees Fahrenheit.

DO YOU HAVE INFORMATION REGARDING THIS MONTH'S REQUESTS?

DO YOU NEED INFORMATION ABOUT ONE OF THIS MONTH'S RESPONSES?

If so, send a self-addressed stamped business-size envelope and your request to the address below

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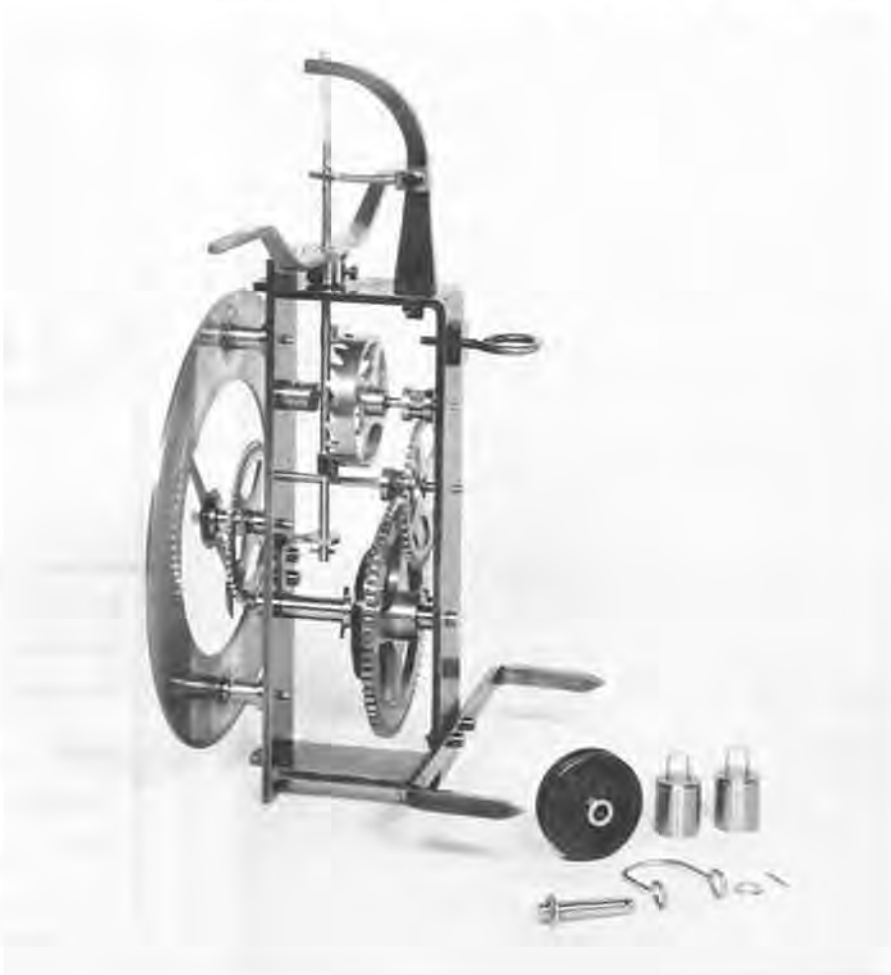
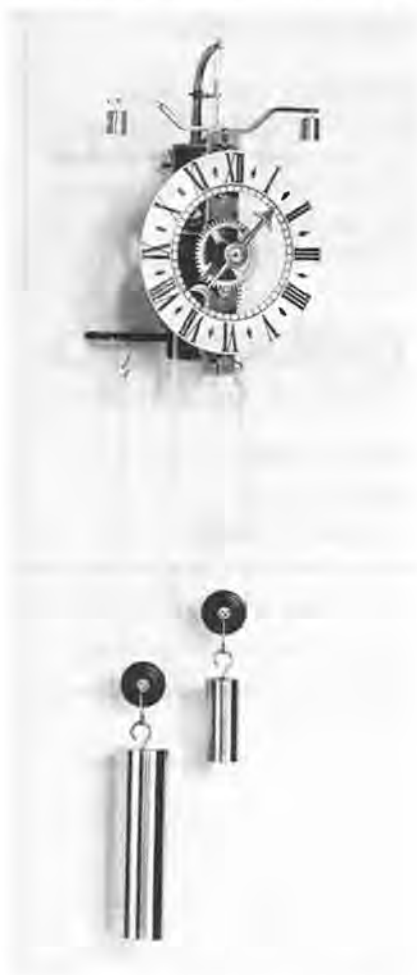
16th Century Style Foliot Clock

Mr. Henry B. Fried's excellent review a number of years ago of the John Wilding book, *How to Make a Simple 16th Century Style Clock*, raised the question of whether it might be possible to make this clock using an older model Unimat lathe. For the benefit of thousands of owners of the old Unimat lathe (previous to the current model), the answer is indeed it is. I am happy to share my notes on the 16th Century Foliot Clock along with details of its construction with the readers of *Horological Times*. Credit for the design of the clock goes to John Wilding; credit for the excellent photos belongs to Brasher-Rucker Photography in Memphis, TN; I will take credit for the project itself which is now housed in the NAWCC Museum in Columbia, PA.

The mechanism is more correctly described as a "timepiece," since no device for striking the hours is incorporated into the design.

While the origins of the mechanical clock are shrouded in some doubt, probably the earliest were tower or "turret" clocks, of a considerably larger scale than this one. The first of these likely made its appearance around the latter part of the thirteenth century. Mechanically, they were not unlike this one.

Although its origins go back some four hundred years, this clock contains all the essential elements of a mechanical device for the measurement of the passage of time that would be incorporated into a modern mechanical clock,



namely:

1. **A power source.** In this case, a large weight performs the function; the smaller or "jockey" weight serves to keep the line against the driving groove.
2. **A gear train.** A system of wheels and pinions transmits the power produced by the descending weight to the various working components of the clock.
3. **An escapement.** All, or most all, of the mechanical elements used in this clock were known and utilized in various ways for centuries before their actual combination into a clock—except the escapement, that device which interrupts the flow of power by stopping the train so the passage of some time unit may be counted. The first of many escapement designs became known as the "verge," having a rotating "crown" wheel whose motion is interrupted by reciprocating surfaces called "pallets" mounted upon a shaft or "arbor." This is what you see in this clock.

The verge escapement was in general use in clocks and watches for four hundred years after its earliest appearance and not entirely superseded in its application to the purpose for another hundred more, or until about the beginning of the nineteenth century.
4. **An oscillator.** Some device must be present to regulate the rate at which the mechanism will dissipate the energy which is stored in the driving weight at the top of its travel and delivered to the mechanism as the weight descends. In this case, the oscillator is the "foliot," the arm on the top of the pallet arbor which moved with a reciprocal motion as the weight descends. The speed of the motion—that is, the number of traverses the foliot makes per hour and hence the rate at which the hand will move around the dial—is rendered faster or slower as the small weights on the ends of the foliot arm are moved closer or farther from the center of the rotation.
5. **A device for marking the passage of time,** either visibly or audibly, or both; in its simplest form a dial with a hand, as we see here. Early clocks had but one hand, a reading of a quarter hour being considered close enough for ordinary purpose, so the space between the numerals is divided into four periods. Later, when the two-hand system came into general use, the markings were increased to provide five spaces, as in current day clocks and watches.
6. **A winding device.** When the weight has descended enough to exhaust the length of the cord or to be stopped at the floor, some means must be pro-

vided to get it once more to the top, that the cycle might be repeated. Next to the pulley over which the driving line passes on this clock may be seen a "ratchet and click" mechanism, which is a mechanical contrivance which will permit the line to be drawn, in this case by hand, in a reverse direction to that used in driving the clock without disturbing the clock mechanism, resulting in the raising of the weight to its maximum height so that the wind cycle might begin again.

Obviously, the time between windings would vary according to the height above the floor at which the clock was installed and the length of the line used. A convenient utilization of both factors would be that which would allow the clock to run a full 24 hours, or slightly more, between windings.

A careful study of a modern mechanical clock will enable one to readily recognize the same six elements in it as appear in this representation, albeit in varied form.

This clock was made during the winter of 1979-1980. The principal machine tool used in the construction was an obsolete model Unimat "SL" lathe, which was used for all the turning operations, including the wood turning for the pulleys and the gear cutting for the "wheels" in the power train. All of the parts in the clock, including the nuts, screws, and pins, were handcrafted on a "one-at-a-time" basis, using the same equipment as for the rest of the clock. Exceptions to the foregoing include the dial, which was procured from a small shop in England, and, of course, the drive cord, which is 9/64" drapery cord, and the thread from which the verge arbor is suspended, which last was procured by stealth from the sewing cabinet of the maker's wife.

With the exceptions noted, all material was purchased in the United States, and all threads were accomplished with U.S. taps and dies. The finish on the steel parts is obtained with gun blueing. The gear teeth were cut using a single-tooth, homemade "fly" cutter turning at about 3500 RPM. The crown wheel was made from a piece of 1-5/8" diameter brass bar 7/16" long, bored out to form a hollow shell about 1/16" in wall and bottom thickness. The teeth were then sawed out by hand with a jewelers saw and finished by filing.

The verge escapement is sensitive to changes in the driving weight, so the size of the driving weight must be about right to achieve good performance. The driving weight in this clock is a solid piece of steel 1½" in diameter and 5¼" long. It weighs 2 pounds, 10 ounces. The small jockey weight weighs about 8 ounces. These weights, plus a proper adjustment of the position of the small weights on the foliot arms, will permit accuracy within about five minutes a day, which is probably a better performance than the originals were capable of.

The invention of the verge escapement as seen in this clock made possible mechanical measurement of the passage of time and was therefore the key to all later horological advance. It was, at the time, a completely original idea on the part of the unknown and unheralded inventor. With some justification, therefore, the verge escapement might be said to be "the greatest horological invention of all time." 



Marvin E. Whitney, CMW, CMC, FAWI

COMPARING WATCH- HAMILTON

MODEL 2974B
16 SIZE, 17 JEWELS

The term “comparing” was coined from the French word *compteur*. French naval regulations stated that every ship carrying a ship’s or marine chronometer should be furnished a compteur for the purpose of comparison. They defined a compteur as a small chronometer fitted in a wooden box without any gimballed suspension and used for “taking sights.”



Figure 1. Hamilton Comparing Watch, model 2974B, 16 size, 17 jewels.

Naval regulations prohibited the moving of their ship’s chronometer about the ship. NOTE: Accurate time is of the utmost importance when the navigator moves on deck to make his celestial observations, for when he measures the angle between the sea horizon and the celestial body with his sextant, he must record the exact time of each observation. In preparation for making such observations, the navigator compared his watch with his ship’s chronometer. After noting the error, he was free to go anywhere on deck to make his observations.

In February 1942, when the U.S. Navy revised its comparing watch specifications, it stipulated that each watch be designed with a seconds-setting device which would permit the synchronizing of the hands to a master time source, such as the chronometer. This device enabled the navigator to set his comparing watch to that of the ship’s chronometer, even to the second.

The Hamilton comparing watch had a white porcelain dial with the manufacturer’s name appearing in black under the twelfth-hour numeral. The hour orbit was divided into minutes and numbered every five minutes to indicate hours from 1 to 12, with the six omitted. The numerals were of the upright Gothic type. The seconds dial orbit was located at the 6 o’clock position and was divided into seconds, with ten-second divisions indicated in small Gothic numerals. The hands, figures, and line marking were all painted black (see Figure 1).

The movement was fitted in a three-piece screw-back and bezel case with an unbreakable crystal. The movement was also protected by a snap-type dust cover. A circular grained finish was applied to the chrome-plated, nickel-



Figure 2. Movement view of Hamilton's model 2974B, 16 size, 17 jewels, Comparing Watch.

silver case. The edges of the back and bezel were knurled. The exterior back of the case was engraved *BUREAU OF SHIPS, U.S. NAVY, COMPARING WATCH* and the serial number.

The movement was stem wound and set, the stem being held in place with a detent screw.

Hamilton's model 2974B comparing watch was fitted with a monometallic balance wheel and their Elinvar Extra overcoil hairspring (Figure 2). The balance staff was of the friction type which was readily removed and replaced without disturbing the poise of the balance wheel. A seconds-setting mechanism was incorporated in the movement so the time could be synchronized to that of a master time source when the stem was pulled out into a setting position.

Production was started in 1941, and as of December 31, 1956 Hamilton had produced 16,483 model 2974B comparing watches. The initial unit price was \$26.45, but later the Navy was paying \$25.22 per watch.

COMPARING WATCH: U.S. NAVY DEPARTMENT SPECIFICATIONS

Comparing watches purchased by the U.S. Navy were covered by Specifications 18W3c, dated 1 February 1942; 18W3 (INT), 1 February 1942; and 18W3d, 2 August 1943. However, requirements concerning the movement, methods of inspection, and timing tolerances remained unchanged. Although the specifications may specify a particular style, type, etc., often, after the design specifications were drawn up or

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production got underway, a change was in order without affecting the quality control factor. A case in point: The Navy's comparing watch specification regarding the style of hand, stated that the hands be "of the heavy spade type." Yet, when Hamilton designed and submitted their new 2974B model comparing watch drawing specifications to the U.S. Naval Observatory, they pointed out that the parallel baton style of hand not only improved it aesthetically, but the ease in reading the time, to which the Navy concurred.

Although an amendment to the specifications was in order, to my knowledge it was never put in writing—only orally. However, this was not an uncommon waiver as long as the change did not adversely affect the performance of the instrument.

The following articles are the salient features of the above specifications. The numbers preceding the paragraphs are as they appear in Bureau of Ship's Comparing Watch Specifications.

E. DETAIL REQUIREMENTS.

E-1. MOVEMENT.

E-1a. General. The movement shall be reliable, shall have lever escapement, shall be made to run for not less than 36 hours on one winding, and shall be rigidly constructed of nickel-silver plates and bridges. The pillar plate shall be not less than 1.70 inches in diameter nor more than 0.28 inch thick. The nickel silver shall be grade A, as covered by Navy Department Specification 46S3, except that the nickel content shall be not less than 12% nor more than 13%.

E-1b. Jewels. The movement shall have not less than seventeen jewel bearings located at bearing points most essential to reduce friction of train and escapement parts. Train and escapement jewels shall be mounted in adjustable bushing in such a manner that they will not become loose while in service, and endstone jewels shall be securely mounted in a readily removable cap to facilitate cleaning and re-oiling.

E-1c. Marking of bridges or mounting plates. Bridges or mounting plates shall be stamped or engraved to show the number of jewels, name of manufacturer, grade or model, number of the movement, number of adjustments, and that it is adjusted to temperature. The pillar or foundation plate shall be stamped or engraved with the manufacturer's serial number.

E-1d. Balance. The balance shall be of nonmagnetic material, uncut, and fitted with not less than 14 screws (of which at least 4 shall be meantime regulating screws), located in such a manner as to facilitate rapid adjustment to position timing.

E-1e. Balance staff. The balance staff shall be of a type which may be readily removed and replaced without disturbing the poise of the balance wheel.

E-1f. Hairspring. The hairspring shall be of the Breguet type and of an approved nonmagnetic rustproof material, or equal.

E-1g. Winding and setting of movement. The movement shall be stem wound and stem set, with the winding and setting mechanism incorporated as part of the movement and operating independently of the case.

E-1h. Second setting mechanism. There shall be a second setting mechanism incorporated in the movement, which shall be operated through the stem and crown of the watch in such a manner that a flexible spring will come in contact with the rim of the balance when stem is pulled into setting position, and be immediately released when stem is returned to winding position. The second setting mechanism shall be so constructed that it will not impair timekeeping properties of the watch by repeated contacts with the balance wheel.

E-1i. Interchangeability of parts. All parts shall be completely interchangeable with like parts of the same grade or model.

E-1k. Regulator. The movement shall have a micro-metric type lever regulator for varying the rate and the watch shall be furnished with a lever regulator approximately in its middle position.

E-2. DIAL AND HANDS.

E-2a. Face of dial. The face of the dial shall be of white porcelain, full face single or double sunk. The hour orbit shall be divided into minutes and numbered every 5 minutes to indicate hours from 1 to 12, with the 6 omitted. The numerals shall be of upright Gothic type, at least 0.180 inch high. The manufacturer's name shall be an integral part of the basic porcelain, and shall be black.

E-2b. Seconds dial. The seconds dial orbit shall be at least 0.580 inch in diameter and shall be divided into seconds, with 10-second divisions indicated in Gothic numerals. Figures and marking shall be an integral part of the basic porcelain, and shall be black, with figures flush with the surface of the porcelain, or slightly depressed.

E-2c. Hands. The hour, minute, and second hands shall be dark-blue or black-finish steel of the heavy spade type, distinctly different in length.

E-3. Case. The movement shall be protected by a plain case of nickel silver, and shall have a medium and circular grained finish, chromium plated. The bezel shall be fitted with a nonbreakable, permanently clear, nonfading, transparent plastic crystal. The

crystal shall be electrically welded or sealed permanently into the groove of the bezel, and shall be dust-proof and waterproof. The case shall have an inside snap cap. The back and bezel shall be threaded and have knurled edges. The stem and crown shall be of dust and moistureproof construction.

E-4. Marking. Each comparing watch shall be engraved with the name of the manufacturer preceded by the following:

"U.S. NAVY, BuShips (N) (Serial #), 19____."

The monogram is the letter N encircled by a larger letter O. It should be followed by the serial number of the comparing watches, as furnished by the Bureau of Ships, and the year of the contract. (The **N** stood for Naval Observatory and was engraved on most instruments purchased by the Bureau of Ships and tested at the Naval Observatory.)

F. METHODS OF SAMPLING, INSPECTION, AND TESTS.

F-2a. Timing tests.

F-2a(1). Period 1, 72½°F, rating test—horizontal position, dial up, 3 days.

F-2a(1)a. The watch shall be placed in the horizontal position, dial up, and subjected to a temperature of 72½° F. After allowing the watch to run for 1 day to settle down, daily observations of error shall be made for 3 consecutive days with daily winding.

F-2a(1)b. Tolerance. The mean daily rate obtained during this period shall not exceed 6.0 seconds per day.

F-2a(2). Period 2, 72¼°F, rating test—vertical position, stem up, 3 days.

F-2a(2)a. The watch shall be placed in the vertical position, stem up, and subjected to a temperature of 72¼°F. Daily observations of errors shall be made for 3 consecutive days with daily winding.

F-2a(2)b. Tolerance. The difference between the mean daily rate obtained during this period (stem up) and the mean daily rate obtained during period 1 (dial up) (72¼°F) shall not exceed 12.0 seconds per day.

F-2a(3). Period 3, 55°F, rating test—horizontal position, dial up, 3 days.

F-2a(3)a. The watch shall be placed in the horizontal position, dial up, and subjected to a temperature of 55°F. Daily observations of errors shall be made for 3 consecutive days with daily winding.

F-2a(3)b. Tolerance. The difference between the mean daily rate obtained during this period and mean daily rate obtained in period 1 (72½°F) shall not exceed 6.0 seconds per day.

F-2a(4). Period 4, 90°F rate recovery test—horizontal position, dial up, 3 day.

F-2a(4)a. The watch shall be placed in the horizontal position, dial up, and subjected to a temperature of 90°F. Daily observations of error shall be made for 3 consecutive days with daily winding.

F-2a(4)b. Tolerances.

F-2a(4)b(1). The difference between the mean daily rate obtained during this period and the mean daily rate obtained in period 1 (72½°F) shall not exceed 6.0 seconds per day.

F-2a(4)b(2). The difference between the mean daily rate obtained during this period and the mean daily rate obtained during period 3 (55°F) shall not exceed 10.0 seconds per day. **THE ENTIRE TEST MUST BE MADE IN 12 CONSECUTIVE DAYS WITHOUT INTERRUPTION.**

F-2b. Mean deviation from mean daily rate.

F-2b(1). The deviation of each daily rate, from the mean daily rate for the period in which that rate occurs, shall be determined for each daily rate throughout the entire series of tests.

F-2b(2). Tolerance. The mean of all the above noted deviations in daily rate shall not exceed 2.0 seconds per day.

F-2c. Variation in rate. The maximum variation between the daily rates for any 2 consecutive days in the same period shall not exceed 6.0 seconds throughout the entire series of tests.

TIME



**HAVING
TECHNICAL
PROBLEMS?**

**AWI HOTLINE
(513) 661-4636**

HODGE PODGE LODGE

John A. Nagle

Beat Ya to the Punch

Everyone owns a staking set. With a basic starter set to the deluxe Inverto units, you still can't handle all situations, especially if you are doing clock work. The staking sets were made with the watchmaker in mind, but that isn't a problem for us. We just make our own punches or sneak over to other occupations and borrow their ideas. Figure 1 has a few of the different punch sets that are helpful in clock work. LaRose has two sets of four punches each that are handy and should be in your tool collection. One set has a flat ended punch and the other has a rounded end punch. Both are holed with larger than staking set punch holes. I purchased both sets years ago and they have paid for themselves many times over.

The punches with larger holes are useful, but here again you will run into situations that will require another type of punch. I found that I required a longer punch with a deeper hole so that I could handle the longer arbors of the clocks. Sessions and Gilbert eight-day time and strike clocks are notorious for split cannon pinions. Because the pinion is split, it isn't hard to remove it from the arbor as there is no tension. After repairing the pinion, I have found it easiest to support the other end of the arbor and, using a special punch, drive the repaired pinion back into position on the shaft.

Figure 1



This is a prime example of needing a long punch with a deep hole. This is an easy punch to make. Just chuck a piece of round stock in your lathe, pick up center, and drill just as you would in a repivoting job. Whenever you make a punch, keep in mind that the working end (at the least) should be hardened.

If you have never experienced a split cannon pinion, I will give you a quick tip. The pinion must be clean. Squeeze the pinion to close the crack, but don't use too big a clamp as it will act as a heat sink. Do not squeeze it too hard or the pinion will collapse. Silver solder will crack (see my article in the October 1988 *Horological Times* for silver soldering tips).

Wheels can occasionally work loose from their mountings or be driven free when a mainspring breaks. It isn't a big job to correct this situation, we just need the correct punch. If the wheel is mounted to a pinion we want to fix it firmly back into position. If the pinion is a solid, cut type, set the base of the pinion against a solid surface. For an example see Figure 2, a corresponding hole in your bench block. I then place the wheel on top of the pinion (Figure 3) and slide the punch over the shaft. A few light taps will usually rivet the wheel in place (Figure 4). When riveting,

Figure 2

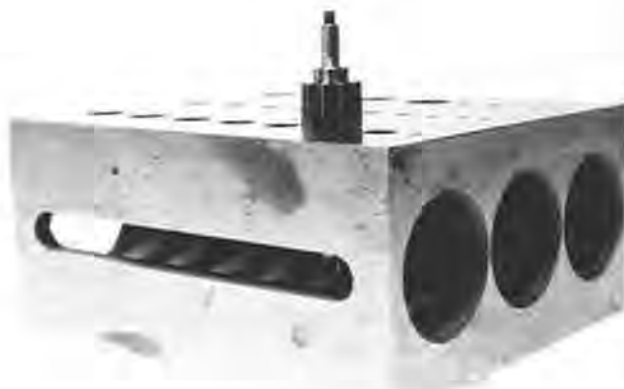


Figure 3



never use heavy hammer blows to force metal. A series of light taps will eventually accomplish what you want to do. Another reason to use light taps of the hammer is that you will run into pinions that are soft and will collapse under the pressure of a hammer blow. NOTE: You don't have to remove the wheel as I have done here. Often a wheel will be loose but still in position. It is best to rivet the wheel in its original position if at all possible. While we would like everything perfectly true and centered in some clocks, especially the older hand-made ones, wheels were fit in relation to each other. Changing this relationship can cause some problems to occur, especially if there is any amount of wear to the tooth profile. This has often been called "wearing in". This is a situation where the wheel and pinion teeth are worn from years of operation but the clock is still functioning properly. Sometimes light re-finishing of the tooth profiles will allow the clock to run another 100 years with the original materials intact. In this instance, returning pivots to original centers through bushing, with little or no attention to tooth profile, could give you a clock on the critical edge of performing or stopping. It was not my intention to discuss antique restoration techniques in this article. I point this out just as something that you could run into when repairing a wheel.

When you are repairing a wheel that is mounted on a lantern pinion or you have a situation in which two or more wheels are mounted on the same arbor, some form of support will be required. The riveting procedure remains the same. I usually support the end of the pinion on which the wheel is to be attached. This prevents the pinion from collapsing or working apart. On better constructed clocks, where pinion ends are closed, riveting can be done as you would with the solid pinions. Good tools for providing support for lantern pinion work are the split stake and the crow's foot.

Another situation that can occur is when a wheel is mounted to a hub and then driven into position on the arbor. These can occasionally work loose. Note the position of the wheel on the arbor. Place the wheel on the crow's foot and remove it from the arbor by driving it off. In this instance you might want to make a punch from bronze or brass to prevent damage to the pivot.

Figure 5 shows some hole closing punches. These are often maligned because of their improper use in bearing work. In this case they will be a useful and proper tool. They come in various sizes so you will have to get one that corre-

Figure 4



Figure 5



Figure 6



Figure 7



sponds to the hole in the mounting hub. You want the punch to be larger than the hole so that you can close in the metal to tighten the hole. Do this on both sides of the hub. This is a trial method. Lightly close the hole and fit it to the arbor. You want it to be snug but not so tight that it splits when you drive it back into position on the arbor. When you have the wheel ready to remount, emery board the hub to remove punch marks left by the hole closing punch. This will enable you to replace the wheel without any evidence of a repair. As in bearing repair, if the wheel hub material is not of substantial stock, it would be best to bore out the wheel hub and insert a bushing. I leave it to you to make that decision. Along with

(Please turn to page 35)

Archie B. Perkins, CMW, FNAWCC, CMBHI
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Part XXXIX

TOOLS FOR CORRECTING WHEEL TEETH

When one is restoring an antique watch which has a faulty train, in most cases, the faulty train can be corrected or at least improved by the use of special equipment.

One piece of equipment which is a necessity when restoring antique watches is the rounding-up tool. Another very useful tool is the Ingold fraise (cutters). These two tools will be discussed in the order named.

A rounding-up tool is shown in Figure 1. This particular tool was made by Carpano in France many years ago. It is well made and an excellent tool for wheel work. This tool was found in, of all places, a pawn shop which is a once in a lifetime find. The person who found this tool surely is a lucky person. It had with it a complete set of cutters and accessories in the original wood case all in excellent condition. The case of 24 cutters and accessories is shown in Figure 2.

The rounding-up tool is used for the following purposes:

1. To reduce the diameter of a wheel.
2. To round-up a wheel so the wheel teeth will be concentric with the pinion axis.

3. To shorten the addenda of wheel teeth.
4. To thin wheel teeth.
5. To correct teeth which lean forward or backward.
6. To cut train wheels which have first been accurately divided with a circle saw.

A rounding-up tool **WILL NOT** correct a wheel which has been unevenly divided (wide and narrow teeth). Any burrs must be removed from the wheel teeth prior to using the rounding-up tool; otherwise, the width of the teeth will become irregular because burrs can cause an incorrect positioning of the spaces causing the cutter to cut irregular tooth widths. If a wheel is very much out-of-round and is rounded up, the teeth on the high side of the wheel are likely to be more narrow than the teeth on the low side of the wheel. If a wheel is much out-of-round, then it should be removed from the pinion, chucked so the teeth run true at their tips, the hole in the wheel bored out, and the wheel bushed so the wheel runs true on its pinion.

A description of the rounding-up tool is as follows: The rounding-up tool is hand driven by turning crank A, Figure 1. This crank is fastened onto a shaft which also holds

Figure 1

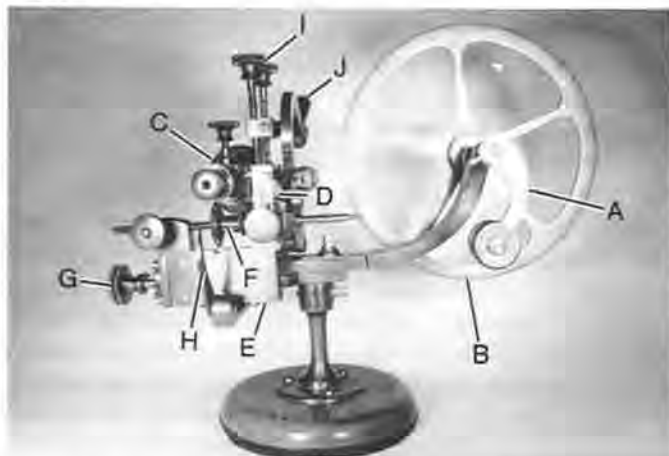


Figure 2



the drive wheel B of the tool. A very thin belt connects the drive wheel to the pulley on the spindle C of the rounding-up tool. The spindle carries the cutter and its guide. The spindle can be adjusted backward or forward axially to center the cutter with the centers for holding the wheel. The index arm used to indicate when the cutter is centered is shown in View D. The wheel being worked on is held between centers in frame E of the tool as the wheel is resting on wheel support F. This frame is also adjustable back and forth by turning knob G to center the wheel with the cutter. Index arm H is used to indicate when the wheel is centered with the cutter. The height of the cutter is controlled by the two screws shown in View I, Figure 1. The handle shown in View J is used to raise and lower the cutter in relationship to the wheel. Pressure is applied downward on this handle to hold the height adjusting screws against their stop when the tool is being used.

A description of the accessories in the wood case shown in Figure 2 is as follows: View A shows one of the 24 cutters. View B shows one of the 24 wheel supports. View C shows one of the three cutter guides. View D shows the wrench for the tool, and View E shows some extra runners for holding wheels between centers.

Figure 3 shows a close-up view of the cutter and guide in position on the spindle of the rounding-up tool for rounding-up the wheel which is also in position to be rounded up. Some cutters have a guide which is part of the cutter and other cutters have separate guides. The purpose of the guide is to index the wheel to the next space after the cutter has gone through one space. The guide gives a helix type motion to the wheel as the guide moves through a space in the wheel. This lines up the next space so the cutter will enter the space centered.

Figure 4 shows a cutter which has a separate guide. View A shows the cutter spindle. View B shows the cutter. View C shows the guide. The guide has spring action and is controlled by two adjusting screws. View D shows the block



Figure 3

which holds the guide, and View E shows the nut which holds the cutter and guide on the cutter spindle. The adjusting screws for the guide are shown at "a" and "b". About one-third of the teeth have been eliminated on the cutter. This is to allow space for the guide. The adjusting screw "a" is used to align wing "c" of the guide with the cutter when the cutter is in position against the guide. At this point, the edge of the cutter has been thinned down until the edge of the cutter is the same thickness as the edge of the guide. This almost eliminates the teeth on the sides of the cutter at this point. It is this point on the cutter that first enters the space between the teeth as the cutter starts cutting.

Wing "d" of the guide is adjusted by the screw "b" in the guide block. The wing of the guide is adjusted so it is centered in the space between two teeth just as the cutting edge of the cutter is ready to leave the space between two teeth. Figure 5 shows this correct condition. If the guide is not centered correctly, then the end of the guide will likely strike a tooth as it is trying to enter the space between two teeth. As the guide goes through the space, it gives a spiral

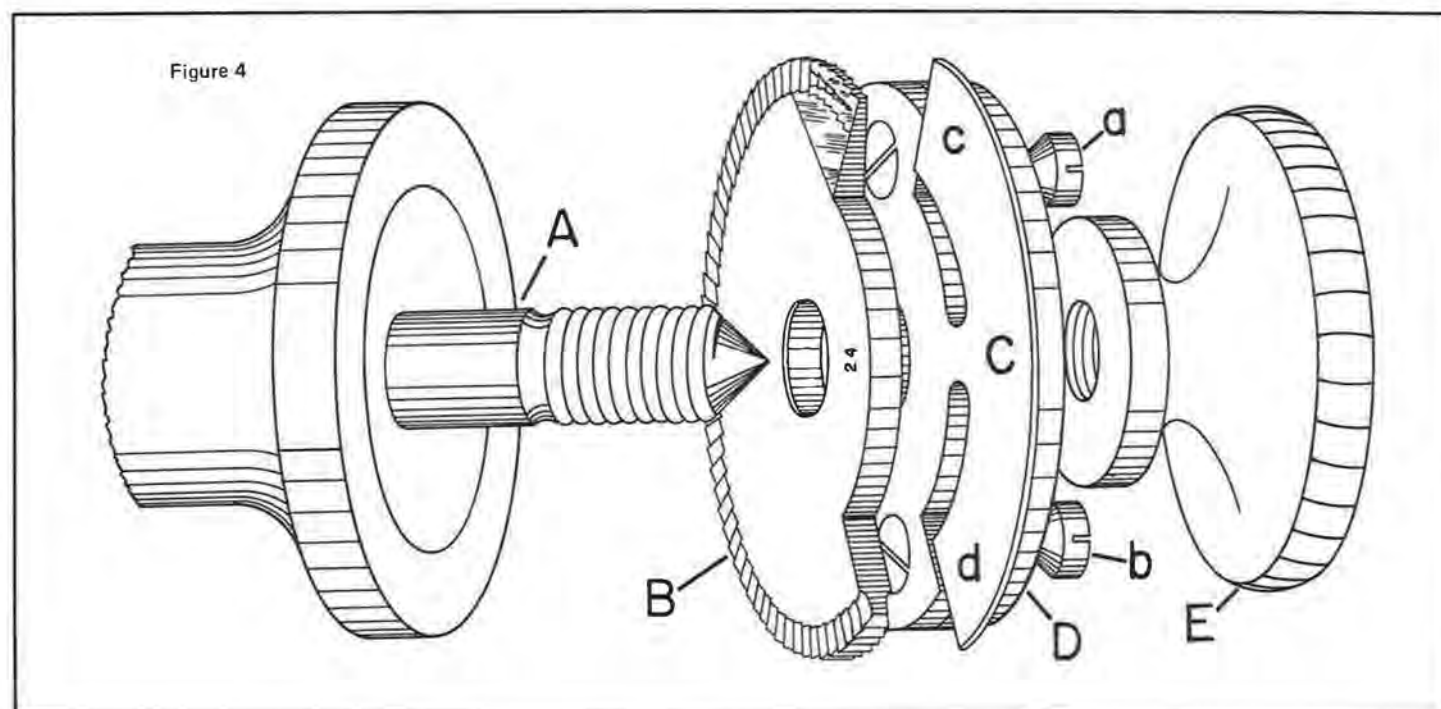


Figure 4

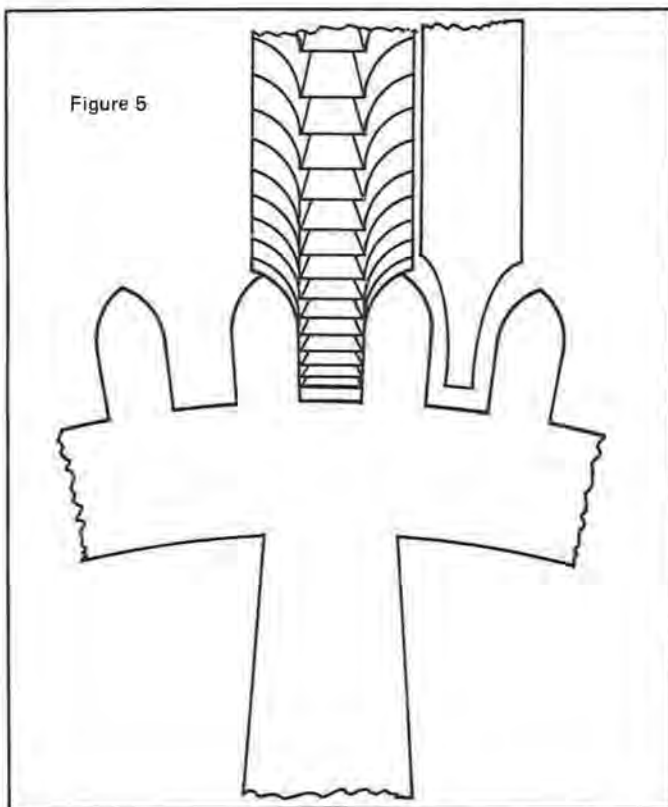


Figure 5

effect and moves the wheel around so the next space is in position to receive the cutter. This action gives automatic indexing to the wheel. Note: If the guide is too thin for the space between two teeth, it will not move the wheel around far enough, causing the cutter to be out of alignment with the next space. This causes the cutter to catch on a tooth as it is trying to enter a space. If the guide is too wide, it will not enter the space safely.

The second type of rounding-up cutter is shown in Figure 6. This cutter has its own guide made as part of the cutter. The guide shown in View A has a spring action and can be adjusted in and out by turning the adjusting screw shown in View B. The guide takes up about one-third of the circumference of the cutter. The teeth have been completely removed from the guide part of the cutter. The guide is hollow ground on both sides so it is the proper thickness for the cutter.

Figure 7 shows how the rounding-up tool is set up for rounding-up a wheel. The pivots of the pinion which contain the wheel fit between two centers called runners as shown in the illustration. The wheel is just free enough to turn. The wheel itself is supported on a proper size wheel support shown in View A. The diameter of the support should be slightly less than the root diameter of the wheel. The back end of the support has a tapered hole which fits onto a matching taper on the wheel frame. To set up the work, the wheel frame is shifted until the index arm shown in View B is centered up with the edge of the wheel. Then the spindle holding the cutter is shifted until index arm C is centered with the edge of the cutter. If the cutter is not centered correctly, it is likely to cut teeth which are leaning. Then the guide is adjusted to its correct position.

When the rounding-up tool is operated, the cutter should turn in a direction which presses the wheel tighter against its support. The depth of the cutter is adjusted in the wheel so the cutter takes a very light cut. Then the wheel is examined to see if the cutter is removing metal at the proper places on the wheel teeth. The cutter is lowered slightly and the tool operated until the cutter is no longer removing metal from the wheel. The handle is used to lift the cutter from the wheel so the wheel can be removed and checked. The wheel should be checked in the watch or a depthing tool

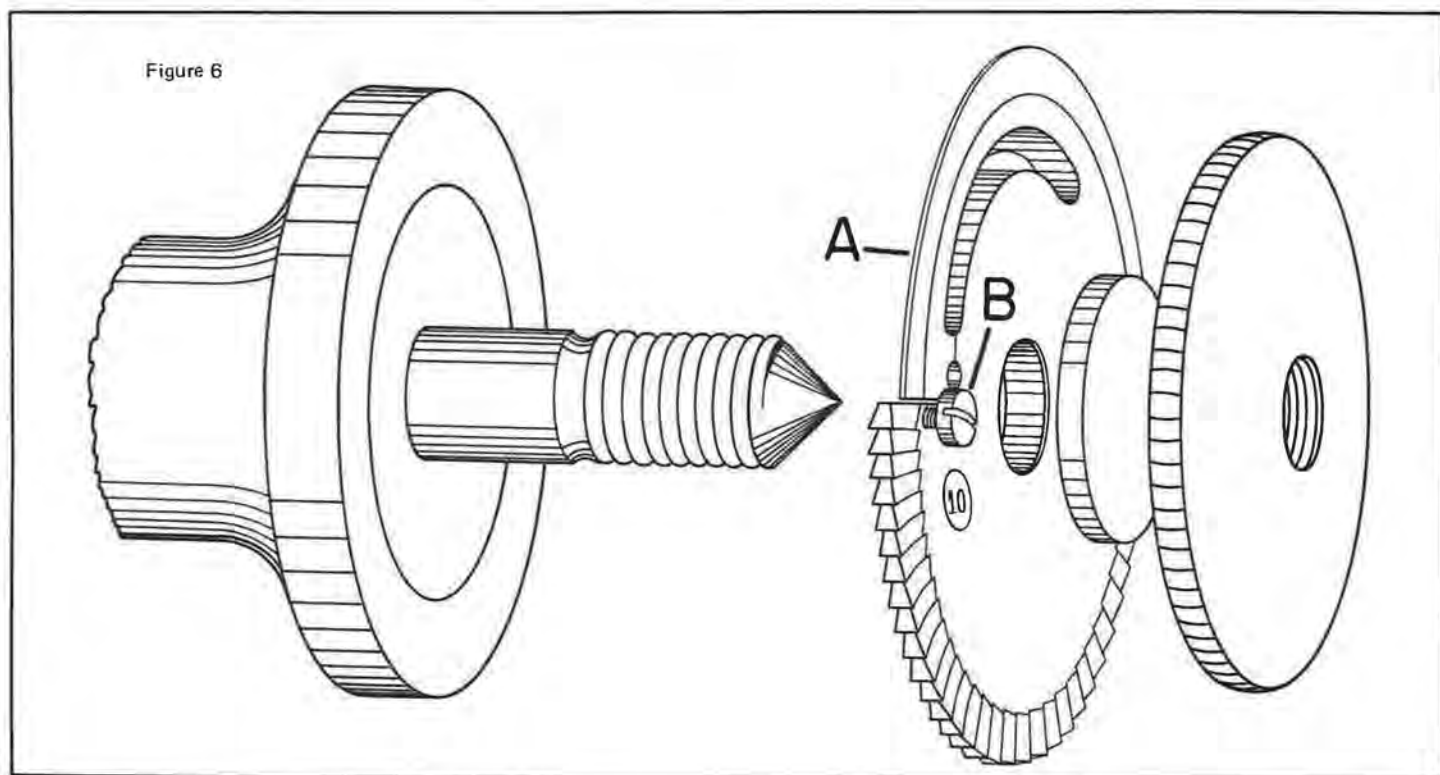
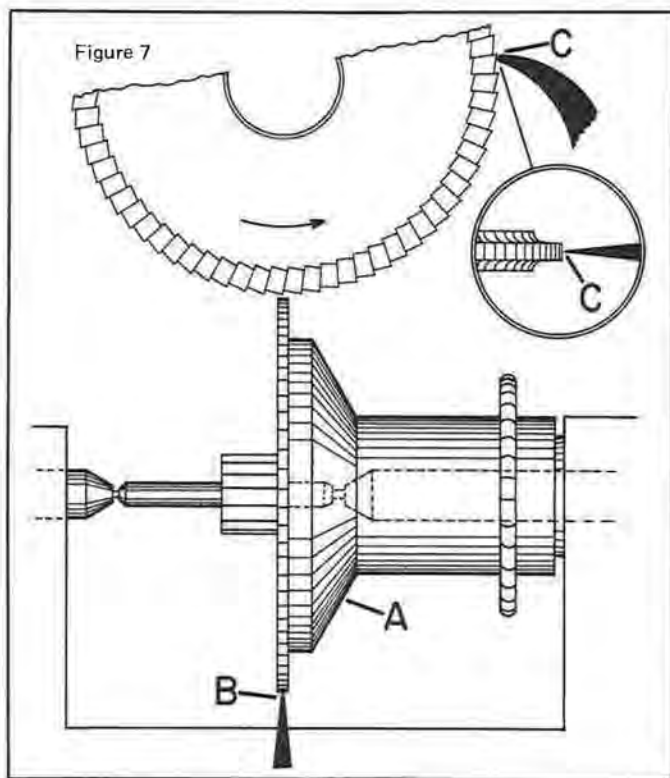


Figure 6



to avoid over-doing the rounding-up operation. To avoid over-doing the operation, one should measure the wheel with a micrometer before it is worked on, and check quite often with the micrometer as it is being reduced by the rounding-up tool. Note: The cutter selected should fit correctly in the space between two teeth. The cutter should fit closely but free. To check the fit of the cutter, the cutter can be moved backwards between the teeth. If only the addendum of a wheel needs to be shortened, then the cutter should be such that it will cut only at the tip of the teeth.

Sometimes it is found that a wheel has one or more short teeth. In this case, the short teeth are stretched and then the wheel is rounded up with the rounding-up tool. A wheel stretcher is shown in Figure 8. This tool fits into a bench vise and is actually a small staking tool with an adjustable frame for holding the wheel that is to be stretched between centers. The frame A that holds the wheel is adjustable back and forth to allow for different diameter wheels by turning knob B. The punch that fits into the main frame is shown at C. The punch has a pin inserted crosswise in the punch which works up and down in a slot in the frame. This prevents the punch from turning in the frame. This is done so the punch will contact the wheel in the same manner each time the wheel is turned to a new position for stretching. The spring shown at D works in connection with the pin on the punch to control the punch. The punch must be tapped very lightly to prevent doing damage to the wheel. It is possible to stretch the complete wheel and then round-up the wheel to make all teeth uniform and true in the round.

Some wheel stretchers use the principle of two rollers, one on each side of the wheel to stretch the wheel near the base of the teeth. As the rollers are turned, they automatically turn the wheel which allows for uniform stretching.

The rounding-up tool is excellent for cutting wheels

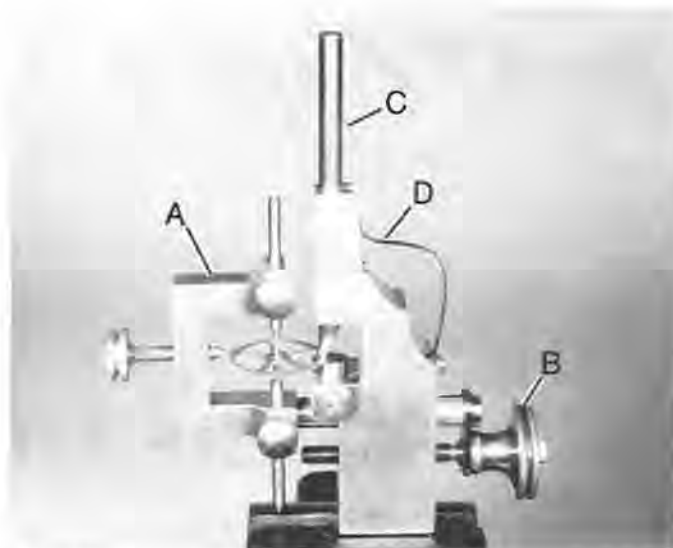


Figure 8

which have first been notched with a circle saw to the full tooth depth; then a rounding-up cutter is used to form the addenda of the wheel. The rounding-up tool can also be used to form the addenda of teeth that have been replaced in a wheel. After a plug has been inserted in a wheel which has broken teeth, the new teeth are laid off with a circle saw. Then the curved addenda is gotten with a rounding-up cutter in the rounding-up tool.

"Correcting Wheel Teeth" will continue next month.

TMB

HODGE PODGE LODGE

(Continued from page 31)

this repair to the hub, I often use a sharp pointed punch to strike the arbor at an angle to raise a little of the metal in the area where the wheel is to be mounted. It doesn't take much. When I drive the wheel back into position, this metal will dig into the collet and help strengthen the seating.

Sometimes you will want to rivet a post to the clock plate or firm up a part in an awkward, out-of-the-way position. Figure 6 is a photo of such a punch. This could be made in a variety of ways and is very handy as it enables you to get under and between to rivet. You could make this tool even more versatile by grinding different widths and angles at the tip.

You might also want to consider other materials for making punches (Figure 7). Wood and some of the new plastics might be of some use as soft-faced punches. General Tool, to mention one of many companies, manufactures a set of flat end punches for use in the auto industry that could be just the right tool in a certain situation. When you are in the mood for an interesting break, browse through some tool supply catalogs. Look for tools that could be useful to you in your work. It isn't inscribed in stone that we have to use strictly horological tools and supplies. Try something new. Don't let the other guy beat you to the punch.

TMB

FUSEE CHAIN REPAIR

Repairing antique watches can be a rewarding and challenging change of pace from replacing power cells, coils, and plastic parts in modern quartz watches.

It is rewarding monetarily and challenging intellectually because nearly every repair of an antique watch involves the restoration of existing components and often requires the making of parts. Those antique watches equipped with a chain driven fusee will often be found to require repairs to the miniature chain. Links will be cracked or broken and hooks will be missing. The purpose of this article is to present a method of making and fitting replacement links or hooks.

Figures 1 and 2 show how the chain couples the mainspring barrel and fusee cone together. A small dab of Rodico® (a product of Bergeon, stock No. 6033) is used to hold the chain in place during assembly. The fusee is a grooved conical pulley used to equalize mainspring torque from the fully wound to the run-down condition by varying the applied leverage by changing diameters. The fusee is credited to Jacob Zech of Prague in 1525.

Figure 3 illustrates the various components that make up the fusee chain. After carefully removing the fusee chain from the watch, it should be soaked in penetrating oil to loosen the links. Rusty chains may also require soaking in

a rust removing solution. The chain may be carefully drawn between a folded piece of 600 grit wet or dry silicon carbide abrasive paper to remove surface oxidation.

HOW TO MAKE A REPLACEMENT LINK AND HOOK

Let's suppose we need to make several new links and a hook to repair a damaged chain. Carefully measure the chain links to determine the length, width, and center distance between pin holes. Figures 4 and 4A show the making of a link punch from 0.1875 inch diameter by 4 inch long drill

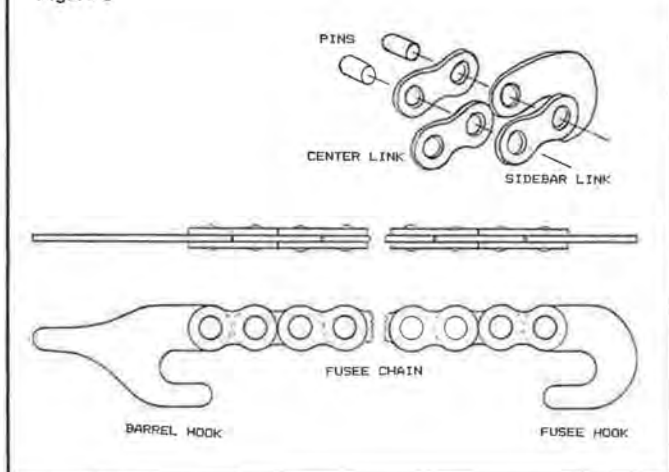
Figure 2



Figure 1



Figure 3



rod. The reduced section of the example shown was turned back approximately 1/8 inch to a diameter that matched the length of the link (0.068 inch). The two holes (No. 80, 0.0135 inch) were drilled to a depth of approximately 1/16 inch with a milling attachment on the lathe, the distance (0.040 inch) between the holes matching those in the chain link being duplicated. The locking pin in the end of the lathe and the hole pattern on the back of the pulley being used to lock the spindle in place while drilling the two hole punch retaining holes.

Figure 5 illustrates the use of a grinding wheel in the milling attachment to grind the sides of the punch parallel to the holes to a thickness approximately 0.010 inch larger than the finished link width of 0.030 inch. The extra thickness

is needed in case the holes are not on the exact center line of the punch, the punch being filed and stoned by hand to the final shape and width of 0.030 inch. The reduced section in the center of the punch was formed by using an assortment of escapement files, a carbide graver, and a triangular shaped coarse grain stone. Heat the tip of the punch to a dull red and quench in water to harden.

Figure 6 illustrates how the shank end of the No. 80 drill is about to be cut to a length of approximately 1/32 inch after having been dipped in Super Glue® and inserted into a hole in the punch. The second hole punch should protrude approximately 1/16 inch to make what is called a progressive punch. The cut off wheel used was a Dremel®, catalog No. 409, mounted on its arbor. Notice that the tip over tee rest has been aligned parallel to the side of the cut off wheel and is used as a support for the punch. The ends of the hole punches should be ground flat with sharp edges. Figure 7 shows the completed link punch.

Figure 8 shows the feeler gauge material used for the links and hooks. It is a precision ground tool steel and is available from machinist supply houses in strips approximately 12 inches long by 1/2-inch wide by (in this case) 0.003 inch thick. Other thicknesses are available. It is also an excellent suspension spring material for clock repair work.

Figure 9 shows that the link material has been penetrated by the longer hole punch. Figure 10 shows the penetration of the material by the second punch. The punch is then tapped sharply to form the link. The backup material is the end grain section of a flat piece of walnut wood, which makes a natural "die," although nearly any close-grained hardwood can be used. The completed link is then removed from the

(Please turn to next page)

Figure 4



Figure 4A



Figure 5

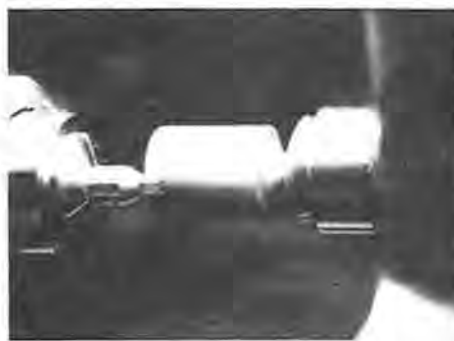


Figure 6



Figure 7



Figure 8



Figure 9

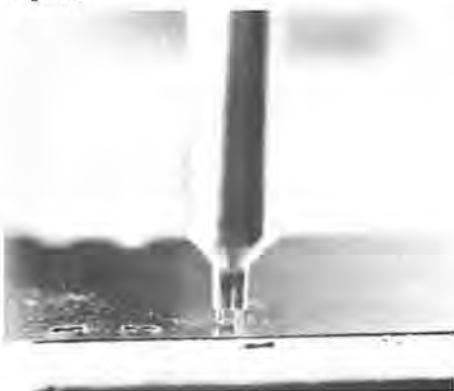


Figure 10

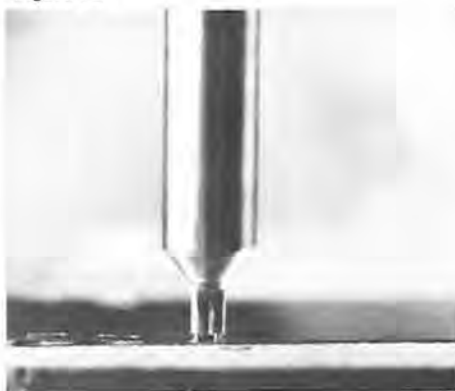


Figure 11



Figure 12



Figure 13



Figure 14



Figure 15



Figure 16



Figure 17



punch by carefully prying it off the punch with a screwdriver. Figure 11 shows the completed link.

In order to make a replacement hook, it is necessary to first fashion a punch with which to remove the old pin in the chain and to make a hole in the hook material. Figure 12 shows the grinding of a staking punch to reduce its diameter to 0.014 inch. The lathe spindle should rotate in the opposite direction to the grinding wheel during the grinding operation.

Figure 13 shows the punch being aligned with a close fitting hole in the staking tool die plate. Figure 14 shows the hole being punched in the hook material.

Figures 15 and 16 show the fusee hook being formed with the cut off wheel in the lathe while the material is supported on the tee rest which has been adjusted very close to, and parallel with, the side of the wheel.

Figure 17 shows how the hook is held with needle nose pliers so that the ground edges of the hook can be smoothed with a hand-held stone of medium or coarse grain.

Figure 18 shows the finished hook ready for attach-

ment to its chain. Heavy grease is used to help hold the parts in place. The holes are aligned with a tapered broach.

Figure 19 shows a link pin that has just been turned from a steel finishing nail. This material is ideal for making pins because it is just about the right toughness, temper, and is peenable. The pin, in this case, is 0.013 inch in diameter by about 0.020 inch long. A "V" nick is turned at the back of the pin section to facilitate breaking off after staking. The nail section serves as a convenient handle while staking.

A hole in the hook or link is aligned with its matching hole in the chain. The pin is inserted into the assembly, which is resting on a steel bench block and tapped with a brass headed hammer. The hook that has just been staked is then held with tweezers while the "handle" is bent back and forth to break the pin free. The staking is then completed on the die plate of the staking tool as shown in Figure 20. Excess material is then stoned off by hand to match the appearance of the rest of the fusee chain. The finished chain should then be cleaned, dried, and lubricated throughout its length with

Figure 18



Figure 19



Figure 20



light clock oil. The chain is now ready for installation in the watch.

An excellent source of information regarding the operation of the fusee watch may be found in the February 1983 issue of the *Bulletin* of the National Association of Watch and Clock Collectors in an article written by Mr. Henry B. Fried titled "Understanding the Verge Fusee Watch." It is, without a doubt, the best article on the subject that I have read in over 35 years at the bench.

Another good source of information is *The Science of Clocks and Watches* by A.L. Rawlings, Ph.D., B.Sc., published by the Pitman Publishing Corporation. It has an excellent section on the fusee. It is probably available from most horological book dealers.

For those of you who are more comfortable working with millimeters, the decimal inch values used throughout this article may be converted to metric values by multiplying by 25.4.

Try a rewarding change of pace by taking a trip back in time with these old-timers. You will enjoy it.

WJMS

KEY TEST FOR QUARTZ WATCHES

The "KEY TEST FOR QUARTZ WATCHES" by Ewell Hartman, CMW is a quick and simple method of locating the problem in a quartz analog movement. The only tool required is a meter.

Material and instructions for learning this test is supplied by the AWI-ELM Trust as part of their educational work. There is no charge to any group wishing to learn this test. There are great benefits to learning this in a group setting. However, for individuals who may not be able to participate in a group, it is available to them also.

For more information call or write to the AWI office for an information sheet and application form.

WJMS

Our Readers Write

Although I retired from a retail location, I am kept busy doing watch and clock repair in my home.

Recently my wife and I were updating our wills. Since neither of our children are associated with the jewelry business, an idea occurred to me.

I have quite a few old movements that I still use for parts. I am not ready to part with these while I am still active in watch repair. I thought it would be a good idea to leave instructions in the will for these movements to be sent to AWI for their Movement Bank, when I no longer have a need for them.

Although this is not an immediate help to the Movement Bank, I think, if promoted, it will eventually be a good source of old movements. There must be a lot of senior citizen watchmakers around the USA.

Hugh Metzler
Mineola, TX

Could this be a record? A man brought a watch in to be repaired. I checked it and all I could find wrong was it had a lot of sand in it. I told him I thought cleaning was all it needed. He said O.K., but he didn't think I should charge him because it has not run since I cleaned it. I checked my number in the case and got my card from the file.

I asked him if he had a receipt. He said he didn't. I said I must have forgotten to put it on the record because the last record I have is January 1, 1976! He said yes, that's about right.

C.H. Grantham
Odessa, TX

THE PICKLE BARREL

REMOUNTING RINGS

PART 2

In last month's article remounting rings was discussed and many of the advantages were pointed out as well as some of the problems encountered. This month we will give step-by-step instructions on how to assemble a four-prong ladies' solitaire, set the stone, and complete it with polishing and cleaning.

Findings needed are a four-prong setting and a full shank. The shank can be either yellow or white gold—that is, unless a diamond or any other clear transparent stone is to be set, in which case the setting should be white gold. This is because the transparent clear stones will pick up a yellow color from the setting, making the stone look yellow. Color or non-transparent stones will not be noticeably affected. Since both pieces are new, there will be no need for pre-cleaning; however, the setting prongs can easily be melted when applying heat, so a good precaution is to sink the prongs into the asbestos pad leaving the bottom of the setting protruding. By holding the bottom of the shank in the tweezers of the third hand tool, the shank can be aligned on the setting (head) ready to solder.

Next with a flux brush apply flux to the shank ends and setting, then heat until it turns white. Then with the flux brush place a small chip of solder on one side of the setting where the shank end joins the setting. Apply heat with the torch flowing the solder on one side, bonding the one shank end to the setting (head). At this point check the alignment of the shank with the head, and if a little out the other side, it can be aligned by bending the shank. The ring may have to be removed from the third hand tool to do this. When the alignment is satisfactory, the other side can be fluxed, a small chip of solder placed between the end of the shank not soldered, and the setting not yet soldered heated until the solder flows. Then check to make sure the solder has flowed completely around both ends of the shank making a solid bond between the shank and the head. While this is still hot it can be immersed in the pickling solution, then rinsed with water.

The next step is to put it on a ring mandrel and round it with the rawhide mallet. Check the size: if it is not the correct size, now is the best time to make it the desired size. If it needs to be larger, a piece can be added. To make it smaller, a piece can be removed from the bottom of the shank. If you choose to use a butt joint, the bottom of the shank should be cut with a saw; if with a "v" joint, it can be cut with cutting pliers which will leave the ends of the shank almost the shape needed to match the filed notches of the piece to be added. Very little filing would be required on the shank ends for adding a piece, but if making it smaller, the piece to be removed

Marshall F. Richmond, CMW



should be sawed out, the notch started with the jewelers saw, and then filed in with a triangular file. When the piece has been removed or a piece added, apply flux with a flux brush. Then heat the area to be soldered until it turns white. Now add the solder, heating until the solder flows. Put this on the ring mandrel, tapping on the solder joint to make the joint smooth.

Tapping can stretch the ring to the exact size needed. It is a good idea before setting the stone to finish out the sizing by filing the solder joint or enlarging a piece to shape, matching the rest of the shank. Also, file away any excess solder around the head where it joins the shank. It is a good idea now to go ahead and polish the ring by starting with first pickling it and rinsing in water. After pickling, I usually put a bronze bristle wheel on the polishing motor and use this on the ring which will remove any residues from the surface of the ring. It also has a burnishing effect, making it easier to polish. Next, a bristle brush wheel charged with tripoli will polish between the prongs on the head and around where it is soldered to the shank. As the stone has to be set, this is as far as it is necessary to polish before setting. (Figure 1 shows a solitaire ring with a miracle or illusion type head indicating the parts and showing where it is soldered. The four- and six-prong heads are soldered to the shank in exactly the same manner.)

The correct size head has been installed, so the next step is to cut a seat in the four prongs in which the stone is to be set. We will measure the diameter of the stone with a millimeter gauge or vernier caliper, then pick a setting bur the nearest diameter to it as possible. With prongs, it is wise to have the setting bur a little smaller than the diameter of the stone. After the seat is cut the stone will press in snugly, making it easier to bend the prongs over the girdle of the stone. Put the set bur in the flex-shaft tool, and using a moderate speed, cut the seat. The thickness of the girdle will govern

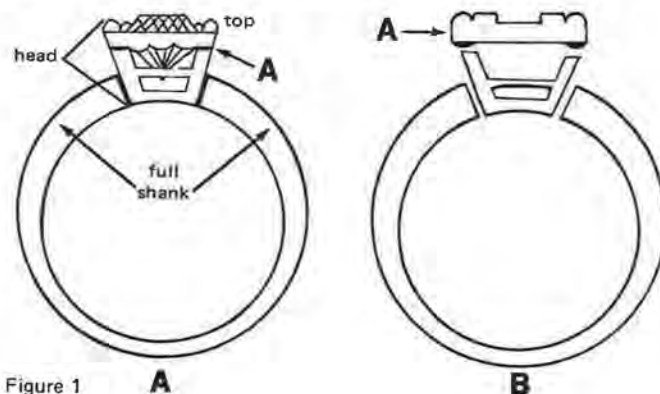


Figure 1

how deep to cut the seat. (Figure 2, point "a" shows the bur resting in the seat and about how deep the seat is normally cut.) If too much metal protrudes over the stone, it will only make it easier to bend the prongs over the edge of the stone. After they are bent over, if they are too long they can be cut off with the jeweler's saw. (Figure 2B shows the stone seated in the four-prong head.)

The next step is to bend the prongs over the stone. Setting pliers are excellent for this, but it can be done with smooth jaw chain nose, parallel, or most any smooth jaw pliers. It is best to have one jaw of the pliers on the edge of the opposite prong of the one that is to be bent. Then bend the one opposite the one already bent, and repeat this process on the other two. The tips should now be bent over the edge of the stone but not down tight. Each prong can then be tightened by placing one jaw of the pliers under the head where the shank joins and the other on the tip of the prong, and with utmost care apply enough pressure to bring the tip down tight against the stone. (Figure 2C shows the stone set with the prongs bent in place against the stone.) Take the jeweler's saw and saw off any excess length. Then with a fine cut needle file, either a barette or one with a smooth edge, shape the prongs. (Figures 2D, E, and F show a top view of the stone with D showing the stone seated, E with the prongs bent over, and F filed to a shape.)

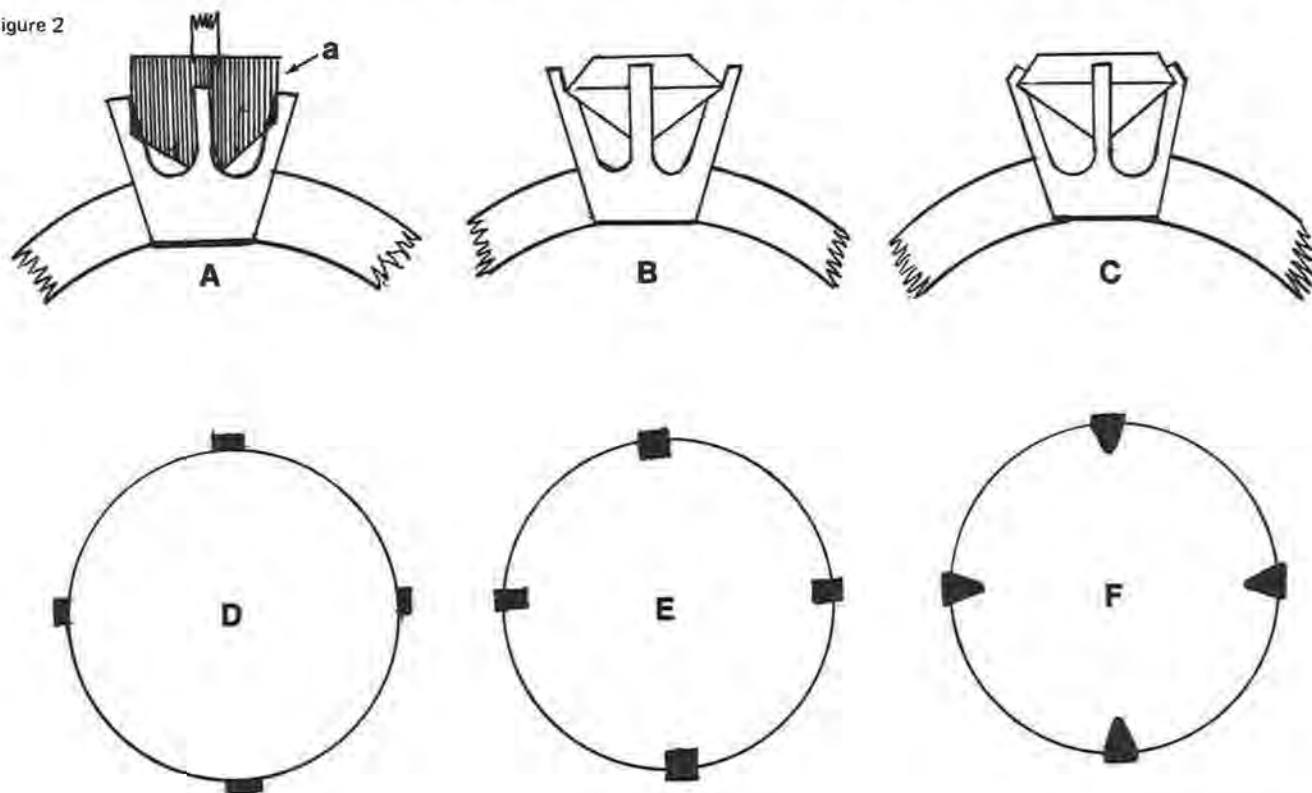
There is more than one way to finish the prong tips, but the one shown makes a neat appearance. One prong shape that I particularly like is a bead appearance that can be put on with a cup bur without even filing. At this point the ring is ready to finish, so with a cotton buff on the polishing motor charged with tripoli the tips can be polished removing all file or bur marks. Then with a cotton buff wheel charged with rouge, the finishing polish can be put on the complete ring.

Inspect it now under magnification and if all file marks or scratches are removed and a fine rouge finish is on the whole ring, it can be washed by putting it through an ultrasonic cleaner or washing it in a solution of soap and ammonia with a washout brush. Rinse and dry; again inspect for correct finger size and any flaws that may have been overlooked. The job is complete.

The four-prong setting is probably the simplest setting used to hold a stone and the easiest to set. The six-prong setting can be used with the same shank and can be set in the same manner as the four-prong. It would be my recommendation that when using any stone 15/100 carat or larger, the six-prong should be used for security reasons. If a prong on a four-prong setting should get broken off or bent away from the stone, it is likely that the stone would come out and chances are be lost. With the six-prong setting if one prong gets bent or broken there are still five to hold the stone. These go more than halfway around the stone so it is unlikely the stone would loosen out before the bent or broken prong is discovered.

Another type of ladies' engagement type mounting that is popular is the square top illusion or miracle type head. This is the most secure head if the stone is set with the top table about level with the edge of the setting, causing the beads holding the stone to be protected from wear (that's because the edge will have to be worn below the height of the beads before they will take wear). Some of these heads or the tops have pin point settings, and they have to be the correct size for the stone to be set. There are only a few points tolerance for larger or smaller stones. Some of these pin points are long enough for the stone to be set above the outer edges, which may show the stone off a little better but it will not take long to cause it to wear off, as well as put the stone in

Figure 2



jeopardy of losing it. When this happens there is usually enough metal left to allow the stone to be set deeper with good beads over the stone. This will put the top table about level with the outside edges of the top table and make for much longer wear.

Another type of these square tops has bars running from the corners to the hole in the center which allow for a good range of size in the stones that can be set. This also makes a secure setting. This head can be put in most any ladies' tapered shank and assembled as was described for a four-prong head.

Remounting rings with melee side diamonds is as much or more in demand than solitaires. There are several ways that side stones are mounted. There are four-prong and even three-prong melee settings available for as small as 1/100 carat melee diamonds. Also in flat side settings are pin point and fishtail side settings. Although it is not impossible to be able to stock all the findings necessary to make up multiple stone rings, it is not really practical, so in doing these remounts it is wise to have a good reliable supplier of mountings. When working with a customer on remounting, before finally agree-

ing on a certain mounting, get on the phone and locate the mounting so you are not agreeing to something that you cannot produce.

Some of the pitfalls that can be encountered in remounting are cracked, chipped, or diamonds with heavy carbon spots or internal feathers. These should be observed while talking with the customer and pointed out with an agreement so you will not later be accused of chipping or breaking a customer's stone. Carbon spots close to the girdle or internal flaws sometimes can cause a diamond to break when setting it because when drawing down a bead with a beading tool a great pressure is put on the girdle. If there is no pre-understanding that a stone is a risk to set, and it is broken in setting, you can be made to replace it. (Knowing some people, if this happens, a low-grade promotional diamond automatically becomes a perfect colorless stone.)

Our next article will be a continuation of ring remounting.

Sterling silver is 92½% fine silver and 7½% copper, and coin silver is 90% fine silver and 10% copper.

We Salute These New Members!

ALEXANDER, Douglas—Cincinnati, OH
ALLEN, Russell E.—Independence, MO
ANDREI, Dennis—Ravenna, OH
BAKER, Steve—N. Little Rock, AR
BARSZCZ, Bob—Cranbury, NJ
BENSON, John C.—San Francisco, CA
BODIN, Igor—Denver, CO
BUHLER, Eugene H.—Harwich, MA
BURROUGHS, Bill—Raleigh, NC
CARLIN, Brian A.—Rutherford, NJ
CHAMBERS, Larry J.—Elmore, AL
CLARK, A.R.—Winter Park, FL
COLON, Wanda I.—Cayey, PR
CONSIDINE, Daniel A.—Green Mountain, NC
CONWAY, William M.—Atlanta, GA
CRAPSE, Neal—Greenwood, SC
CRESPO, Rafael J.—Tucson, AZ
CRONOS, Pete M.—Jacksonville, AR
CRUZAN, Robert—Great Falls, MT
DORMAN, Thomas A.—Tucson, AZ
DUPERRY, Roland L.—Winslow, ME
FEHRMAN, Harold William—Cincinnati, OH
FERET, Walt—Chicago, IL

Sponsor: Robert E. Braun—Elkhorn, WI
FOX, David P.—New York, NY
FREEMAN, Dennis—W. Sacramento, CA
GONSIER, Neil—Culver City, CA

GRAY, Ben L.—Longview, TX
GULL, Gearold E., II—Quincy, IL
HEAZELTINE, William—Lafayette, IN
HELFRICH, John H.—Wellesley Hills, MA
HERMAN, Gerald J.—Farmington Hills, MI
HSU, Ching-Fu—San Jose, CA
JACOBS, Erwin L.—Carmichaels, PA
KELLY, Eugene B.—Sioux City, IA
KESSIE, Milton J.—Livonia, MI
KIM, Nak Heng—Decatur, GA
LEHMAN, Donna—Burbank, CA
LeLACHEUR, Katherine—Sackville, Canada
LEVIN, Keith C.—Frederick, MD
LOYD, Paul L.—Wichita, KS
LOYD, Shelby D., Jr.—Houma, LA
MAGUIRE, D.B.—Newark, DE
MARSHALL, Glenn—San Antonio, TX
McCLURE, Richard—Paris, TX
MEYER, James E.—Westminster, CO
MIHALIK, Bruce—Chicago, IL
MUNDORFF, J.L.—Escondido, CA
PETROSKY, Elaine M.—Lancaster, PA
PIAGGIO, Juan—Montreal, Quebec, Canada
POTTS, Robert T.—Huntsville, AL
QUACKENBUSH, J.M.—Tucson, AZ

Sponsor: David Quackenbush—Tucson, AZ
RASKOW, Thomas R.—Nashua, NH

ROBERSON, Floyd T.—Ooltewah, TN
ROBINSON, H.L.—Enumclaw, WA
RUSSELL, John E.—Riverside, CA
RUST, Henry B.—Manchester, TN
RYMARZ, Leo—Novi, MI
SANOR, Jeffery J.—Kankakee, IL
SARGENT, Charles C., Jr.—Dallas, TX
SEAY, David N.—Walled Lake, MI
SHANTZ, Jeffrey—Tacoma, WA
SMITH, Robert—Brooklyn, NY
STEELE, David—Troup, TX
SULLIVAN, Michael J.—Findlay, OH
SWITZER, Calvin—Erlanger, KY
SYROCZYNSKI, Matthew—Buffalo, NY
TILTON, Wilfred J.—Virginia Beach, VA
TU, Lan Man—Brooklyn, NY
WALDROP, D.D.—Greenville, SC
WHITE, Donovan L.—Idyllwild, CA
WOOSLEY, Sam—Murrieta, CA
WRIGHT, Robert Roy—Port Washington, NY
YARES, Greg—Tucson, AZ

Sponsor: Terry Smith—Tucson, AZ

Novice Watchmaker

James Adams, CMW, CMBHI



OIL and LUBRICATION

PART 3

It was readily apparent in the 1920s and 1930s that oil extracted from natural sources was really not the answer to horological lubrication problems. Natural substances just could not meet the demanding criteria of contributing to the overall run time frame and to the exacting time standards that were being demanded. The answer lay with the formulation of a synthetic substance whose properties could be engineered and controlled over protracted periods of time.

The Elgin National Watch Company of Elgin, Illinois, in collaboration with Elgin's Industrial Fellowship at the Mellon Institute at Pittsburgh, PA, was at the forefront in solving the synthetic watch oil problem. Elgin's goal was to create an oil that exhibited control of spreadability, was noncorrosive in nature, maintained a controlled viscosity, and reduced volatility. This was an awesome task indeed, with trial and error—testing and examining hundreds of compounds, formulating many possible candidates, and then reformulating these candidate oils and field testing the most promising of these. Elgin and Mellon settled on what was to be known as Elgin M-56a® watch oil. Along with the oiliness properties of this synthetic oil, there had to be a predictable shelf life and sameness of product, batch after batch. This also was built into M-56a. Our European cousins were not exactly sitting on their hands either. LaPerle of France and Moebius of Switzerland were also in the forefront of research and development as was the William F. Nye Company of New Bedford, Massachusetts.

In a very broad and general way, there are five distinct areas of stress found in the cased watch: (1) case sealant (2) winding and setting areas, (3) mainspring lubricants, (4) high pressure areas at center and third wheels in mechanical watches and also automatic winding mechanisms, and (5) the more delicate and freedom demanding areas of the fourth wheel through escapements of mechanical watches. The three distinct types of stress in stepping motor quartz watches are: (1) case sealant, (2) hand setting, and (3) the delicate train freedoms.

Working our way into the cased watch, we have case lubricants and sealants. These are, for the most part, silicon greases used to make them slippery and eliminate case gasket galling. It is also used for the same purpose on case crown tubes. On dress cases there is a stable, noncreeping sealant grease which is applied at the case crown opening. This is to reduce the ingress of foreign matter to the movement. Winding, setting, and automatic wind mechanisms require a nonspreading lubricant of high viscosity. Mainspring lubricants are designed to work under maximum load pressures. To

reduce the "stick/slip" problems of tightly coiled springs in barrels and automatic wind barrel movements, it's necessary to coat the inside walls of the barrel with a high pressure grease. Also coat the bottom of the barrel with the same grease so as to prevent undue barrel-to-spring friction. After the mainspring is seated and the barrel arbor greased, it is desirable to wipe some grease across the top of the spring coils to reduce friction between coil edges and barrel caps.

Concerning the "unbreakable" mainspring, these are made of a special alloy, chiefly of cobalt, nickel and chrome. These mainsprings are a self-greasing type because the surface of the spring is coated with a special membrane that acts as a lubricant. So, in this type of spring the slide effect of coil against coil is provided for. Barrel arbors, center wheels and third wheels require a robust, high viscosity lubricant to stay put while under a slow turn, high bearing pressure environment. For escapement usage a more fluid, easy flow, stay-put lubricant is needed. Now wouldn't old Abe (Abraham Louis Breguet) turn green with envy at what we take for granted today?

In the case of the stepping motor quartz movement, there is a new generation of oil formulated for the low torque pressure and delicate mechanical actions taking place. It is of no passing interest as to who uses what in the way of lubricants and what grades of lubricants are used.

In speaking to Gene Kelton, Technical Sales and Service of Citizen Watch Company, Los Angeles, California, this writer learned that Citizen Watch Company has put together an array of oils and lubricants recommended and used by Citizen. Initially this consisted of six types of in-house lubricants. According to Mr. Kelton, this is expanded by one more type. It is public knowledge that Citizen tends to be in the forefront of movement development. Trends and the public desire, coupled with the Citizen flair to produce the elegant in wrist-worn timepieces, has caused Citizen to produce some extremely small and extreme precision timepieces as to cause a need for the extra seventh lubricant. More on this later.

Mr. Kelton, hereafter referred to as Gene, is a common sight at all AWI annual meetings. Gene is easy to talk to and as accessible as can be.

To paraphrase Gene on what Citizen uses, "We use a combination of the finest types of lubricants our research department can find. We use several of the Moebius products, namely Synt-A-Lube 9010®, Synta-V-Lube 9020® and a special Synt-F-Lube®. Because of our new, extremely small quartz movements, we use an extremely thin Moebius oil
(Please turn to next page)

(designated as "F") only in the rotors of the new breed of minutely small movements. Other lubricants are too heavy for these areas."

Along with the above lubricants, Citizen has developed very special and heavier lubricants designated CH-1, CA-1 and CA-2.

CH-1 is a black mixture of special grease and special solid lubricant and is used on hand wind mainsprings to stabilize mainspring torque.

CA-1 is an olive green grease designed to stabilize the slip torque in automatic wind barrels. This also has a solid lubricant in its makeup. The CA-1 is used also on part of the train wheels.

CA-2 is a pale yellow grease developed for use in Citizen automatic watches which have increased torque pressures. This is quite different from CA-1, as it excels in stability with no oil flows and is suited for heavy loads.

For O-ring lubrication, Citizen has developed its silicon oil and lubricant to promote and enhance their water resistant properties.

It is a delightful experience to have Citizen Watch Company respond so rapidly and freely to my inquiries. Even the world giant in horology that Citizen is, they are warm enough to share with us, AWI, what is of interest to us. Thank you Gene Kelton, Mr. Citizen Watch Company.

On examining the technical guides issued from Switzerland and Japan, two types or grades of lubricants are used in quartz watches. A fine grade is used in train wheels, a heavier grade in hand setting mechanisms, and a combination of light and heavy lubricants in calendar mechanisms.

Mechanical movements use three grades of lubricants. The equivalents of Moebius 9010® are used for trains and Moebius 8302® grease with molybdenum disulphide for automatic mainspring barrels. The molybdenum corrects minute imperfections on metal surfaces while adding its lubrication properties. Seiko watch grease, S-6 grade, is used for heavy friction and stem areas.

In watch cases (water resistant and dress cases) where gaskets are used, some grade of silicon sealant is necessary. A heavier bodied sealant is needed for those dress case openings not protected with gaskets.

What types of lubricants are used by highly successful repair centers?

Scott Chou, General Manager of COSERV, states: "Basically we assign the Moebius oil to be used in our watches, except for the following two oils: Seiko Silicon Grease TSF-451 which is specially used for gasket application and Seiko Watch Grease S-6 which is applied to heavy friction and stem mechanism areas."

In reply to the same question, Ray Vance, owner and chief watchmaker of Lawrence Watch Repair (trade shop), replied: "I use Moebius Synt-A-Lube 9010/2® for all trains, etc. on quartz, Accutron and mechanical; Nye PML grease for all stem, winding, clutch, and detent parts; and HR Silicon water resistant watch case sealer for all case, crown, pushes, gaskets, etc. Moebius 9010® is especially good on the new generation of plastics as used in quartz watches."

To answer my own question I use Moebius 9010® on quartz and Accutron tuning fork trains. On mechanical watches I use Moebius 9010® from the fourth wheel on through the escapements. I use Seiko S-6 on barrel arbors, centerwheels, and third wheels; Seiko S-6 and Moebius 9010® on automatic wind parts, cannon pinions, and watch calendars; Seiko S-3 inside mainspring barrels; KT-22 on winding and setting parts of all watches; ETIC sealing silicon on gaskets; and heavier HR case sealant for crown openings.

The most exciting development in horological oil and lubrication has to be in the field of rinse solution lubrication, popularly (but incorrectly) called plastic lube. The L&R Company of Kearny, New Jersey has been, and continues to be, on the forefront of rinse solution lubrication development, hereafter described, albeit incorrectly, as "plastic lube."

Phil Simon, chief chemist of the L&R Company, most graciously explained the nuances of this remarkable substance most candidly with me. Mr. Simon came across as a most knowledgeable, honest, and straightforward person.

Plastic lube is a combination of natural mineral oil materials and select synthetic materials. I imagine the mineral oil material to be the coupled carrier of the synthetic material and in unison become a very effective lubricant. I also suspect that the insertion of plastic lube in the rinse solution of the ultrasonic cleaning system is a fortunate wedding of convenience. To go back a moment and paraphrase Mr. Simon, "This material is not a true plastic. It's really the best of two worlds, the organic and man-made, carefully and chemically joined to produce an incredible lubricating system. Really, it's the greatest lubricant devised." L&R Company produces two types of plastic lube—Solo Lube® and Duo Lube®.

Duo Lube® is that system which uses two rinse cycles to complete its job. The first rinse container has, what is described by Phil (now we are on a first-name basis), the conditioner step. The second rinse container of Duo Lube® is the actual lubrication process. In the Solo Lube® system, both conditioner and lube are combined. Which is superior? According to Phil, "That's up to the watchmaker, it's a personal preference thing. Again, what really made plastic lube is its use in the ultrasonic cleaning systems. The ability of ultrasound to penetrate the most minute cavities of a watch movement and to carry the lube impregnated rinse solution into these areas is phenomenal." Phil also mentioned, "When Solo or Duo Lube® is used, one must be careful and recognize those areas that might act as trapped air pockets and those areas of blind holes. Blind holes are those areas that are not readily apparent as bearing holes. It is possible to trap air bubbles in movements and create non-lubed dry spots in critical areas. It's best if your ultrasound system does not agitate the movement container, and for the watchmaker to do this agitation manually to break up any trapped air bubbles in immersed movements."

Questions put to Phil (PS) by this writer (JA):

JA: Can Solo and Duo Lube® really do a good job on assembled movements?

PS: Yes indeed. But remember to make certain there is no trapped air in the movement. For instance, air can be trapped in cap/hole jewel combinations not designed with drain holes. Air can also be trapped in mainspring barrels. Balance wheel springs do not benefit by a coating of Solo or Duo Lube®. Balance springs (hairsprings) and air traps are to be avoided.

JA: Are Solo and Duo Lube® more effective in assembled units such as train wheel assemblies?

PS: No, not really. Assembled or disassembled, there is no lubrication advantage. Again, this is a personal preference thing of the watchmaker.

JA: Are Solo and Duo Lube® really effective in high stress areas, such as barrel arbors, center wheels, etc.?

PS: That is a good question. In the time L&R has produced Solo and Duo®, we have never run into a problem where, when properly used, Solo or Duo® has not provided proper lubrication. These two are formulated to provide ample lubrication protection. This is not a problem.

JA: Does ultrasound cavitation destroy or break down Solo and Duo®?

PS: Not that we are aware of. Faulty results from Solo or Duo® lie in user abuse. For instance, a watch movement is placed in the cleaning solution, ultrasonically cleaned, spun to remove the excess cleaning solution, and then placed in the rinse solution charged with Solo or Duo®. The problem is excessive cleaning solution induced into the rinse solution. The more cleaning solution induced into the rinse, the less effective the Solo or Duo® becomes. Some watchmakers mistakenly feel they can fill the rinse cycles with Solo or Duo® once, and then merely add solution as needed. In my mind, for this system to work most effectively, the watchmaker should change the rinse solutions as often as he changes the cleaning solution. Some watchmakers do this after 20 movements, some after 50 movements. This, again, is a personal thing. Don't do as some do and return spent rinse solution back into the storage gallon of unused rinse thinking the spent solution is somehow rejuvenated. It is not.

JA: What is the storage shelf life of Solo and Duo®?

PS: I wondered when you were going to get to that. Really a mixed gallon of lubricant solution has a shelf life of at least three to five years. You would surely use a gallon up in that time frame.

JA: What questions have I missed?

PS: Well, if movements are not cleaned well enough, that is enough ultrasound time used or excessively dirty solutions, then Solo or Duo® will not be as effective as they should. It's not the fault of the material but rather a user error. This is especially critical in the very small movements where internal space is at a premium, so to speak. Also, do not spin off for as long as to cause the cleaning solution to literally dry on the plates and wheels. Also, Solo and Duo® are friendly to plastic parts. But in this area it would be wise to test very thin plastic parts to be sure there is no adverse reaction to the parts in the solution. Excessive heat is not good for plastic parts. Excessive heat may be at fault rather than the fault of the solution. Use common sense in using Solo and Duo® or anything for that matter. We honestly have not received any complaints that could be traced to the products. This excessive spin-off of cleaning solution just makes the rinse portion of the cleaning cycle work that much harder.

I wish to thank the people at L&R Company for putting Mr. Simon at my disposal. Mr. Simon answered every question put to him with extreme candor. He is a decided asset to the L&R Company.

A sales representative of a major and respected watch company in the New York City area reported, tested, and found Solo and Duo Lube® very satisfactory. But as a matter of company policy, they dismantle, clean, and inspect their import movements and lubricate them in the conventional manner.

So it appears, that used properly, Solo and Duo Lube® are an effective "space age" tool for the bench watchmaker.

At a meeting of the Indianapolis Horological Guild, the question of what type of oil the guild members used in servicing watches was asked. Now, novice, this was a room full of practicing professionals and one brand new watchmaker attending his first guild meeting. A series of 12 categories was listed on a printed form. The answers were handwritten in their own words with no names fixed to the forms. As this was a watch oil project, the clockmakers present were only observers. For this I was personally very sorry.

The categories and broad answers (in some cases combinations of lubricants are used within categories):

MECHANICAL WATCH TRAINS

L&R Solo
L&R Duo
Elgin Oil
Moebius 9010
Hamilton PML
KT-22
Pocket watches, no plastic used
Synt-A-Lube
Moebius Oil

MECHANICAL SETTING PARTS

KT-22
Moebius clock oil
Moebius
Molybdenum disulphide
Hamilton PML
Nye stem grease

MECHANICAL CALENDAR

Molybdenum disulphide
Plastic w/KT-22
Moebius 9010
Zenith
Nye

QUARTZ WATCH TRAIN

Moebius
Moebius 9010
Plastic
Synt-A-Lube

QUARTZ WATCH SETTING

Moebius 9010
Moebius clock oil
Silicone
KT-22
Hamilton PML
Nye stem grease

QUARTZ WATCH CALENDAR

Hamilton PML
Plastic w/KT-22
Moebius 9010
Nothing used

MECHANICAL MAINSPRING BARRELS

Moebius mainspring oil
Moebius clock oil
Moebius
Elgin
Moebius grease
Molybdenum disulphide
10w40

AUTOMATIC MAINSPRING BARRELS

Silicone
Moebius clock oil
Moebius grease
Graphite mainspring grease
Zenith

WATERPROOF CASE GASKET

Silicone
KT-22
Nothing used

WATERPROOF CASE TUBE

Silicone
KT-22
Zenith sealant
Nothing used

DRESS CASE CROWN

Silicone
Zenith sealant
Nothing used

DRESS CASE BACK

Silicone
Nothing used

These queried watchmakers are an independent breed. The answers given by category are listed only once, although many watchmakers answering do use several. The answers to lubricant usage listed in this article are answers from specific watchmaker sources and are not meant as a universal "carved in granite" fiat. Understand that.

Affiliate Chapter Column

Thomas H. White



DEDICATION

Our grandson tried out for the Phoenix Boys Choir four years ago when he was eight years old. At this time we knew he had a good voice because his other Grandpap is gifted with a good Irish tenor voice, although he has no professional training. Early in John's life his mother started to teach him to read music and to "carry a tune." She also is very talented, as music was her major in college. Without the encouragement and financial support of his mother and father, he could not be in the choir at all. I would like to tell you just what it cost John to participate.

The first year or so he would have practice on Tuesday nights and then on Saturday mornings. During the week he would memorize all of the songs. This didn't interfere too much with his school work, sports, and other activities that a child loves to do. The following year John was promoted to the touring choir. This meant he would spend an additional two weeks in the summertime in music camp. Then, as soon as school started he would be practicing a couple of nights a week plus all Saturday morning. Often, he would perform several times a week, getting out of school for the performances and then having to make up the work he missed. Sometimes he is busy five nights a week plus Saturday morning. One year he traveled with the choir for three weeks on the East Coast, while the next year he traveled to Europe. This year, the choir is travelling to the Orient. This takes tremendous *dedication* on his part, but he will cherish his experiences the rest of his life. This is a boy who has set goals for high grades in school as well as preparing for his career.

We also have men who are dedicated to their profession. They fill the offices on the national level to help their

profession's growth, as well as spending many hours performing various new tasks, all for the love they feel for the profession.

The Affiliate Chapters would like to see strong guilds throughout our nation. We have a lot of presidents and officers in our local guilds who spend time and money to see that we have good programs for our nightly meetings. It has been a number of years since I went through the chairs in our local guild. I'm pleased to see the continued work everyone is accomplishing in order to fill the offices of president, vice president, secretary, and treasurer. These offices, along with the local guild's governing board, spend many hours carrying on the work of these offices. It is easy to understand their dedication and hard work because others have traveled down the same road.

Some of us in the trade belong to the national organization AWI, while others belong to just our local guilds. Membership in both is the ideal way that it should be. The most important thing we should be doing is backing up our guilds by attending the meetings. A program on any given night might not necessarily meet the needs of everyone. However, in the long run, most of them will benefit someone every night. "Rubbing elbows" with a fellow journeyman is also important. Socializing after the meeting might be your "bag of bones" to allow you to pick up "helpful hints" for your work. I would like to see everyone attend our local meetings. Be involved in a program, and insight will become your middle name! Give up TV for one night a month and be *dedicated* to your guilds!

THW

NEWS ...from all around the ASSOCIATION...

NEW YORK



At a recent meeting of the Horological Society of New York, Mr. Martin J. Foster, of Australia, was the guest speaker. His presentation was on his invention of an electronic timer for mechanical clocks. Pictured above, left to right, are: Martin J. Foster; James J. Lazarus, President of L&R, distributors of the timer; and Henry B. Fried who introduced the speaker.

ARIZONA

The January 17th meeting of the Arizona Clockmakers and Watchmakers Guild was held in Phoenix, AZ. The meeting was attended by approximately 20 members.

Thomas White and Dr. Joseph G. Baier enhanced the program presentation of the cassette tape on Testing and Repairing Quartz Watches. Mr. White and Dr. Baier created slides to illustrate the use of testing equipment used for quartz watches. The cassette was awarded to the Guild for their collection and contribution of batteries to the ELM Trust.

It was decided by the members to adopt a new logo since the name of the Guild has been changed.

Tom Bulfer is conducting a survey on the type and quality of lubricants used on clocks and watches. The members have been asked to respond by expressing their preferences. Also, each member has been encouraged to write a one or two paragraph story on horology for inclusion in the Guild's monthly newsletter.

UPCOMING CONVENTIONS

Wisconsin Horological Society

Annual Convention

April 28-30, 1989

Midway Motor Lodge - La Crosse, WI

Watchmakers Association of Pennsylvania

Annual Convention

May 5-7, 1989

Holiday Inn East - Lancaster, PA

Texas Watchmakers Convention

May 5-7, 1989

Radisson Airport Hotel - San Antonio, TX

Arizona Horological Association

Eleventh Annual Convention

May 20-21, 1989

The Embassy Suites - Tucson, AZ

Watchmakers Association of Ohio

Annual Convention

July 28-30, 1989

Parke University Hotel - Columbus, OH

Iowa Jewelers and Watchmakers Association

Convention and Trade Show

September 9-10, 1989

Airport Hilton Inn - Des Moines, IA

INTEREST-FREE LOANS AVAILABLE TO SERIOUS CLOCK STUDENTS

The Student Loan Program of the Educational, Library and Museum Charitable Trust has funds available for loan to students needing financial assistance to obtain training in Clock Repair.

This fund was established by Orville R. Hagans in memory of J.E. Coleman, many of his friends and benefactors making contributions. Mr. Coleman, who died in 1975, was one of the

most knowledgeable clockmakers in the country and was always ready to assist anyone with his advice and counsel. He was a firm believer in the necessity of thorough training for all clock repair persons and was disturbed by those who believed they could repair clocks without much training.

For applications, write to: **J.E. Coleman Memorial Fund, AWI-ELM Trust, P.O. Box 11011, Cincinnati, OH 45211.** Applications must be completed and returned to AWI before June 1, 1989 in order to be considered this year.

BOOK REVIEW

THE ARTISTRY OF THE ENGLISH WATCH by Cedric Jagger. Hard covers and jacket. 9"x11½", 160 pages, 93 b&w plates, 16 color plates. Pub. 1988 by Chas. E. Tuttle @ \$31.50.

Cedric Jagger is "Keeper of the Clockmaker's Company Collection" and author of two books, *The World's Great Clocks and Watches* and *Royal Clocks*. In this volume he treats the English watch as a work of art. His perspective is well-founded and advanced in this first book to concentrate on parts of the watch which had little if anything to do with improving the performance of these timepieces.

For example, when one examines and compares late 17th and 18th century watch movements made on the European continent with those made in England, the difference is dramatic in the manner and indulgence with which the English lavished on the decoration of these movements and its parts. Those movements of French and German or Swiss origin are rather plain, and most are unsigned, although their working parts are finished rather well to enhance their performance and endurance. The watch cases of these continental watches, though, often show the artist's contribution to their appearance.

Cedric Jagger points out that lavish decoration of the English watch existed early and he quotes from the inventory of Elizabeth I as an example in which its "case decorated with diamonds, rubies, emeralds and pearls was a gift to the Queen in 1572."

Giving credit to the 16th century German, French, and Flemish engravers' pattern books used by casemakers, Jagger points out the artistic origins of continental watchmakers and how these influenced the English by these early examples.

The author then turns to the artwork inside the watch as compared to the plainer movements from across the channel. Designs for the chasing and embellishments of the case were those of French and German artists, some of whom emigrated to England.

By the early 17th century, the English watch was an attractive, artful product, at first resembling contemporary French watches with underpainted horn outer cases and highly decorated metal cases. Other watches were in book form; fruit and seashell shapes also appeared.

While a technology remains on a plateau of development in any era, the tendency is to embellish its outer appearance, and horology is not an exception. Thus these pre-hairspring watches had calendric and alarm services and elaborate enamelwork outer cases with fine repousse while their timekeeping qualities remained static. The art of enameling found some truly artistic examples with subject matter reflecting popular contemporary works of art. Other artform watch cases employed various materials and techniques. The book pictures many examples, some in color. There is a 41-page chapter on "Materials and Techniques" which contains some of the most useful references in this book. In it, Mr. Jagger lists the materials used to decorate and improve the artistic and aesthetic appearance of the English watch. He also goes into fine detail of the techniques of these applications with explanations of how these were applied, often quoting

verbatim from various sources such as Britten, Rees' *Cyclopaedia*, Dr. J. Lewis, an early 19th century authority, or from Martin's "Circle of the Mechanical Arts" (1813).

Among the various subjects covered and quoted are: *Treatise on Japanning and Varnishing* by Stalker and Parker (1688); for enamelwork his reference and quotes are from the 1826 book *The Little Book of Knowledge* by Charlotte Matilda Hunt. This section uses seven pages, some details on techniques and materials, and includes some instruction from Arthur Aiken's *1807 Chemical Dictionary* in which is detailed Monsieur Clouet's *Annales de Chemie*, for Niello, hardstone, and lapidary techniques.

Still other sections explain the staining of a wood surface for green, ivory horn, or bone. Also included are details of gold, silver, hallmarking, treatment of brass and copper, steel, simulating gold by heat or chemicals, and reversal of such treatments. Some other techniques include silvering, lacquering, burnishing, piercing, chasing, and chiseling.

In a section on engine-turning the author refers to Charles Holtzapffel's *Turning and Mechanical Manipulations*. Filagree, Jagger explains, is a rather rare technique if the true definition of this artform is recognized. In the description of the treatment of horn and tortoiseshell, Daniel Brewster's 1816 *Edinburgh Encyclopedia* is his quoting source and he combines this reference with one of rather recent date (1981) by Paula Hardwick.

Abraham Rees' *Cyclopaedia* (1805-18) states as quoted by Jagger that the hawksbill turtle shell, "unless the animal itself be about the weight of 150 pounds, the shell is not worth much."

Another technique explained is *Inlaying and Pinwork* (pique) securing shellwork or leather to watch cases. Shagreen, fishkin are included in this process. Bloodstone, glass, ivory, porcelain, and Puddingstone (almond-sized rounded flint with black or yellowish-brown spotting polished) methodology can also be found in Mr. Jagger's accounting.

A 20-page section on watch balance cocks is arranged in 33 sections or categories of types by subject matter of design and piercing. To list a few: agriculture, animals, mythological, horticultural, birds, grotesque faces, heraldry, monograms, musical, and military souvenirs.

As most collectors are aware, the beauty and artistry of the visible parts of these older watches were responsible for the destruction of some of the rarest watch movements. Jagger cites the well-known example of the erstwhile fine Waltham collection of old watches whose movements were virtually denuded of their balance cocks. These movements at one time were so plentiful that some watchmakers in this reviewer's earlier days would buy such a movement for pennies just to use the diamond endstone for a cutting tool or crushed to bort to polish a jewel or some steelwork's surface.

Throughout this book are excellent photographs, close to their referring text, some in color to highlight the enamelwork/multi-gold surfaces or to accentuate the gems employed to improve their appearance. The book is a virtual encyclopedia of most of the techniques of watch case decoration, giving most of the basic instruction but also serving as a reference source for more serious study of any of the methods

explained since the author gives his sources from which he quotes. As such, it is surprisingly informative and at its retail price it beckons to become a worthy addition to any watchmaker's, collector's, or restorer's library.

Henry B. Fried

ENGLISH DIAL CLOCKS by Ronald E. Rose. 9"x11", 255 pages, 253 b&w illustrations, 42 color, 385 line drawings. Pub. 1988 by Antique Collectors, Ltd. @ \$59.50.

This is a revised and greatly expanded 1988 edition, first published in 1978 with 60 pages, 200 line drawings, and 35 color plates less. This new edition contains additional chapters on Unusual Dial Clocks, The Later Years, and throughout the text are shown numerous clocks not seen in the first edition.

Dial clocks are those whose dial area is greatest or its style of prominence makes it so. Dials had bold roman numerals with outer minute markings in five-minute increments with arabic numerals. Author Ronald Rose was a former long-term employee and apprentice with Thwaites and Reed. They were prominent makers of these clocks since 1740 and supplied finished movements to most other "makers." Their records are reproduced in this book and make for authentic reference.

The tavern clock is often referred to as an "Act of Parliament Clock," although it had this status for but one year. According to Rose, dial clocks are the most numerous in existence and thus deserve their place as a volume in the literature of horology. Rose as an apprentice with Thwaites and Reed brings authenticity to this volume as well.

These clocks date from 1720 and proliferated until 1910. An important inclusion in this edition are the wheel counts of the train and pendulum lengths for almost all these included in this book. An appendix includes a facsimile reproduction of that famous "Act of Parliament."

Photos of movements, clocks, and many pages of hand and moulding styles show gradual changes and establish the dating of such timepieces. Japanning was a popular style of ornamentation for a certain period, discussed in these pages. Even weight shapes are shown and relate to certain periods.

Earlier models show verge escapements with short pendulums. Their plain but sturdy workable fusee movements are still in working order after so many years of service. Later these had drop panels to accommodate longer pendulums. Their "A" frame movements appear to have influenced Boston-made American clock design.

The book is well organized and the photos and text are top grade and easily understood.

Henry B. Fried

THE PIN-PALLET ESCAPEMENT by Robert Porter, CMW. 8 3/4"x11", 43 pages, 31 figures, spiral binding. Pub. by Robert Porter, 1987, @ \$8.00.

The title of this 43-page manual would at first give the impression that the text refers to the upright pin pallets found in very cheap watches. This book, however, is about D-shaped and other forms of upright pallets found in various clocks, the most popular of which are those known by its young inventor, Achilles Brocot, who introduced this about 150 years ago.

This manual covers the Brocot escapement with its D-shaped perpendicular pallets as used in French and Ansonia clocks, the triangular-shaped pins found on W.L. Gilbert clocks, and the diamond-shaped pallets in the A-200 series of Seth Thomas clocks. Also, a short, two-page review of the Roskopf pin-pallet escapement used in cheap wristwatches is included.

The instruction is accomplished with good, clear drawings, some in isometric views and with to-the-point text which explores the basic principles of the action in a properly set up escapement. Here the requirements of proper lock, drop (clearance), and beat are illustrated with the text. How these adjustments can be achieved is explained with the illustrations.

Adjusting center distances, making and fitting new D-shaped pallets, making a pendulum suspension spring wire which the author terms a "verge," perpetuates an archaic and inexact term for this piece of wire from which the lenticular bob is hung.

In all, it is an instructive, short exposition which should help those called upon to repair clocks with such "visible" or "exposed" escapements.

Henry B. Fried

THE

The AWI Movement Bank

* CONSERVING THE PRESENT *
* PROVIDING FOR THE FUTURE *

The AWI Movement Bank is established for the purpose of providing a reservoir of discontinued parts for use by present and future generation watchmakers. In time the Bank will expand to include clock movements as well.

If desired, a tax credit can be taken for your contribution. If you plan to claim tax credit, indicate the value you place on your donation at the time you sent it; the ELM Trust will acknowledge receipt, and it will be your responsibility to justify that value to the IRS in the event they question you about it.

Your contribution at this time will hasten the day we can begin to service requests for withdrawal from the Bank. Although "Phase I" of the project deals only with watches, donations of watches, clocks, and loose material will be welcome at this time.

Movement Bank Contributors

James Adams
Arthur L. Brown
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Milton C. Stevens
O.S. Whitten
Harry & Sue Wysong

Send your donation to: AWI/ELM MOVEMENT BANK,
AWI CENTRAL, 3700 HARRISON AVE., CINCINNATI,
OH 45211.

New Products and Literature / News in the Trade

SEIKO'S NEW ADVENTURE SERIES

Seiko's Adventure Series combines superior craftsmanship with rugged styling. Crafted for durability, this watch has clean fashion lines coupled with rugged appeal and easy-to-read luminous Arabic numerals. Pictured below is one of the six men's and ladies' timepieces in the collection. This men's watch sports a dramatic two-tone khaki and black dial, covered by a curved crystal, has a tachymeter, and is water resistant. It is complemented by an engraved gun metal gray case and khaki padded leather strap. The watch also conceals a state-of-the-art quartz movement that allows the two hands to display alarm time, stopwatch time, count-down-time or real-time at the user's command, continuing regardless of which function is being displayed.

The new Adventure Series is available through Seiko's nationwide sales force.



Seiko

BOREL'S NEW CASE NUMBER TO CRYSTAL NUMBER REFERENCE GUIDE AVAILABLE

The third edition of the Jules Borel Case Number to Crystal Number Reference Guide is ready for distribution. Covering the major watch brands of Seiko, Pulsar, Phasar, Lorus, Citizen, Rolex, and Casio, this handy 88-page guide lists about 29,000 case numbers and the corresponding crystal numbers.

Knowing both the case and the crystal number, a crystal can be ordered by proper number. A stock of popular numbers can be maintained, and watch-

makers can utilize the crystals they have in stock. Call for prices and additional information: Jules Borel & Co., Kansas City, (800) 333-4646; Otto Frei-Jules Borel, Oakland, (800) 772-3456; Borel & Frei, Los Angeles, (800) 654-9591.



Borel

CASIO'S WRISTWATCH FOR THE OUTDOORMAN

Called "the watch for the Great Outdoors," Casio's electronic Sensor technology has been incorporated into the ultimate wrist instrument for the outdoor enthusiast. The ARW320AT is a three-hand analog with digital readout. Its sensor capabilities include an altimeter with readings to 14,000 feet, depth gauge to 100 meters, and a barometer which indicates changes in barometric pressure. Also, it is 100 meters water-resistant and has a daily alarm. This watch was designed for those who enjoy backpacking, boating, hang gliding, snorkeling, scuba diving, or flying (non-pressurized cabin). Its suggested retail is \$99.95.

Contact Casio, Inc., 570 Mt. Pleasant Ave., P.O. Box 7000, Dover, NJ 07801; (201) 361-5400.

Casio



UNIVERSAL GENEVE'S "COLLECTION 66"

When Universal Geneve introduced its "Calibre 66" in 1966, it was the thinnest self-winding movement made—barely 2.50 mm. Its secret was an off-centered mini rotor moving on four ball-bearings. Today it is back, in Universal Geneve's "Collection 66" line, lodged in a water-resistant 18K gold case with beaded decor, engine-turned middle, and clear sapphire caseback through which to admire the movement's ceaseless rhythm. The model is fitted with a circular calendar and a moon-phase indicator.

For more information, contact Universal Geneve Watch Co., 501 Madison Ave., NY, NY 10022; (212) 752-4848.



WORLD'S MOST COMPLICATED PORTABLE TIMEPIECE UNVEILED IN GENEVA

Swiss watchmaking firm Patek Philippe recently unveiled the world's most complicated portable timepiece at the company's Geneva headquarters.

The timepiece known as Calibre '89, has taken more than eight years to design and assemble, and is part of Patek Philippe's yearlong 150th anniversary celebration. With proper care, the watch is expected to accurately mark the advent of the 25th century.

As no such timepiece has ever been produced, the potential purchase price can only be estimated. Philippe Stern, Patek Philippe's managing director, says that it's difficult to project the sum Calibre '89 might command.

Made of 18 carat yellow gold, Calibre '89 is the first portable timepiece to incorporate a secular perpetual calendar and to

calculate the date of Easter. It performs 33 horological functions—31 of them considered "complications"—thereby surpassing previous records.

Containing a total of 1,728 parts, Calibre '89 weighs 1,100 grams, has a diameter of 88.2 mm, and is 41.07 mm thick. Along with the Easter date function and the secular perpetual calendar with retrograde indicator, the timepiece's other complications include solar and sidereal time, a thermometer, a split second chronograph, a second time zone indicator, 12-hour and 30-minute elapsed time indicators, and a moon-phase display. Calibre '89 has been crafted to show the position of the stars, and the times of sunrise and sunset in Geneva. These features can be adjusted for other locations. A tourbillon regulator ensures the precise function of all complications.

Calibre '89 runs according to the Gregorian calendar, introduced in 1582 by Pope Gregory and used by virtually every society today. Yet, to compensate for discrepancies between "Gregorian" time and actual time (as measured by a complete passage of the earth around the sun), the perpetual secular calendar will automatically make two adjustments: every four years it will display February 29th, and three out of every four century years the calendar will skip the leap year day. Consequently, the years 2000 and 2400 will be leap years, but the years 2100, 2200, and 2300 will not.

Calibre '89 will embark on a worldwide tour before being auctioned by Habsburg, Feldman in Geneva on April 9, 1989. In the United States, Calibre '89 will be on display at Tiffany & Co. in New York March 6-10, and in Beverly Hills, CA March 13-15. The sale of Calibre '89 will be accompanied by the auction of some 300 Patek Philippe watches which demonstrate the firm's craftsmanship over 150 years. This collection of watches will be part of the Calibre '89 exhibition tour.

The auction will take place at 2:00 P.M. on Sunday, April 9, at the Hotel des Bergues in Geneva, Switzerland. For more information, contact: Patek Philippe SA, 41 Rue du Rhone, 1211 Geneva 3, Switzerland, Tel. 022/20-03-66. Auctioneers' address: Habsburg/Feldman, P.O. Box 125, 202 route du Grand-Lancy, 1213 Onex/Geneva, Switzerland, Tel. 022/57-25-30.



LEFT: The front dial of Calibre '89. Features shown above include the secular perpetual calendar, the 12-hour and 30-minute elapsed time indicators, and moon-phase and temperature displays. Created by Patek Philippe in honor of its 150th anniversary, Calibre '89 will be auctioned by Habsburg, Feldman in Geneva on April 9, 1989. RIGHT: The back dial. Features shown above include the celestial chart, date of Easter indicator, time of sunrise and sunset, and sidereal time.

RAYMOND WEIL'S "ADAGIO" COLLECTION

Stylish, softly rounded, this jewelry watch features a case water resistant to 30 m, whose curved pattern continues on the integrated 18K gold-plated bracelet. It has a quartz movement with date calendar and sapphire crystal. Available in men's and women's sizes, it comes with raised Roman numerals or twin rows of bright stones.

For more information, contact **Raymond Weil, 587 Fifth Ave., NY, NY 10017; (212) 355-3350.**

"Adagio"



GESSWEIN'S NEW RING SIZE CUTTER

This ring size cutter from Gesswein saves time by neatly shearing a controlled amount of ring shank material. The sides remain perfectly parallel so soldering jobs are neat and fast. Because the metal removed is in one piece, more metal is saved, and there are no tiny sawed particles to lose. It comes complete with seven different blade sizes: $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, and 2. (These sizes correspond to the change in ring size.) Blades can be changed in five seconds without any other tools needed. Made in USA from quality steels with proper heat treatment for long life.

Contact **Gesswein, P.O. Box 3998, 255 Hancock Ave., Bridgeport, CT 06605; (203) 366-5400.**

Gesswein



SPORTS TIME FROM BULOVA

Caravelle® by Bulova premieres a dynamic, bold look in a man's sport watch for 1989. The handsomely styled, black brass case has a gold-tone bezel ring framing the black and applied gilt marker dial. Its two-tone effect continues onto the gilt-accented stainless steel bracelet, creating an integrated fashion look. Additional features include a quartz movement, water resistance to 150 feet, stainless steel screw back, day/date window, and a scratch-resistant Dura-Crystal®. The model illustrated is 40C15, with a suggested retail price of \$99.95.

Contact the **Bulova Corp., Caravelle Division, One Bulova Avenue, Woodside, NY 11377; (718) 204-3300.**

Bulova



KASSOY 1989 CATALOG NOW AVAILABLE

Kassoy has announced the publication of its full-color 1989 catalog, which contains 60 separate categories of tools, scales, loupes, microscopes, testing equipment, cleaning equipment, tagging and bar coding systems, display items, video cassettes, etc. Fifty-six new items are featured, including a pocket-sized electronic gold scale and a jewelers microscope.

Recently, Kassoy moved its office and distribution center to Hicksville, NY, a large, modern facility. The company has retained its store on 47th Street to service walk-in trade.

Catalogs can be obtained by contacting **Kassoy, 16 Midland Ave., Hicksville, NY 11801; or call toll free (800) 4-KASSOY; in NY State (516) 942-6560.**



Kassoy

SILVER CLEANERS INTRODUCES THE 'QUICKSILVER REVOLUTION'

Silver Cleaners USA recently demonstrated how Quicksilver—the new company's flagship product—has revolutionized the way silver and other precious metals are cleaned at the National Housewares Manufacturers' Association (NHMA) show held in Chicago. Visitors to their booth watched tarnish disappear from silver and other precious metals due to Quicksilver's electrolytic cleaning process.

The process has been used in England for over 60 years. It has been perfected and is now available in the United States in the easy-to-use Quicksilver kit. The set consists of a reusable metal alloy Electrolytic Plate,

small enough to fit in a kitchen sink or bowl, and 16 packets of specially formulated Activator Powder. When the Quicksilver Plate is immersed in tap water mixed with Activator, a low-density magnetic field is created that safely draws the soft, sulphur ions of tarnish off silver, silver plate, gold, bronze, copper, and most brass that comes in contact with the Plate. It is safe, doesn't damage or strip metal, and works in seconds.

Silver Cleaners USA acquired exclusive distribution for this product. It is now sold in Bloomingdale's, Macy's, B. Altman, J.C. Penney, Marshall Fields, Carson Pirie Scott, Bullocks, Robinsons, Broadway and Strawbridge & Clothier.

For more information, contact Silver Cleaners USA, P.O. Box 2975, Beverly Hills, CA 90213; (213) 204-2024.

SHARP'S NEW DELUXE MOON/DAY QUARTZ MODELS

Sharp Watches, a manufacturer of fashionable watches, introduces its new deluxe moon/day quartz models, retailing from \$49.95. Available for men and women, these watches feature pearlized enamel dials with Roman numerals. Other highlights include a distinctive triple accent yellow case complemented with hunt leather saddle-stitched leather straps. The ladies' model also features a cabochon crown. All Sharp watches carry an exclusive five-year warranty. The models shown are 283899 and 383898.

For more information, contact Sharp Watches, 484 Sunrise Highway, Rockville Centre, NY 11570; (516) 536-1600.



Sharp

GROBET INTRODUCES JEWELRY STEAM CLEANER

Grobet File Co. of America, Carlstadt, NJ has introduced a jewelry steam cleaner designed especially for retail jewelers. Manufactured exclusively for Grobet by Steamaster, the unit weighs less than 70 lbs.

Packaged in an eight-sided baked enamel 12"x9"x16" cabinet, the steam cleaner has a large two-gallon water capacity, is UL listed, and may be operated from any 120 volt, 15 amp outlet. Its high steam pressure (70/80 lbs.) provides an efficient method of cutting grease and grime quickly and easily. Display jewelry may be cleaned in their trays without removing identification tags. The steam cleaner is built to ASME specifications, and is available with a solenoid foot pedal or manual pull chain steam release control. It is easy to service with all components accessible for repair.

Contact Grobet File Co. of America, 750 Washington Ave., Carlstadt, NJ 07072 (company contact: Andrew Serenyi).



Grobet

ROTO BENCH FROM RIO GRANDE

Rio Grande Albuquerque is introducing the rotating jeweler's work station. Roto Bench is a high quality four-way work station that rotates 360° to put the tool you need in front of you instantly. You'll keep a soldering station, vise, ring clamp, and accessory work station set up and ready to go. Each separate work area can be moved into place in a few seconds as you change from task to task. Variable height lets the craftsman adjust the work surface precisely for maxi-

mum comfort and work efficiency.

The Roto Bench is made from cold-rolled steel and anodized aluminum. Its design keeps everything you need close at hand. It turns in 90° increments, with preset stops so that work stations can be changed quickly and easily. The Roto Bench system includes a flexible arm soldering tweezer, a rotating bench vise, a mandrel/accessory clamp, a bench

pin and bench pin mounting plate, bur life and mounting plates, and a Brookhart true cut jig. Additional accessories are also available to further customize the Roto Bench.

This bench will appear in the new 1989 Tools Catalog for Rio Grande Albuquerque. For additional information, contact Rio Grande Albuquerque, 6901 Washington, NE, Albuquerque, NM 87109; (800) 545-6566.



PREPARATIONS NEAR COMPLETION FOR UPCOMING HONG KONG JEWELRY SHOW

Record crowds are expected in Hong Kong for the Hong Kong Jewelry Show set for March 18-21, 1989 at the new Convention and Exhibition Centre. Because of the increased facilities that the new Centre offers, exhibitors will almost double this year to 247 from the 135 that participated in the 1988 show.

The organizers for this year's show will be the Hong Kong Trade Development Council with the Hong Kong Jewelers and Goldsmiths Association Ltd., the Hong Kong Jade and Stone Manufacturers Ltd., and the Diamond Importers Association acting as co-sponsors. The show will be open to all manufacturers, distributors, exporters, traders and trade associations dealing in diamond jewelry, gem-set jewelry, semi-precious stones, machinery and equipment, and a host of

other merchandise.

Contact the Hong Kong Trade Development Council, 673 Fifth Ave., NY, NY 10022; (212) 838-8688.

STAR STRUCK'S NEW LOCATION

Star Struck, Inc. has announced that they have relocated their offices and distribution center from Norwalk, CT to a brand new facility in Bethel, CT.

Keith Sessler, Star Struck's vice president, explains, "The new building is designed to provide the trade with the service and expeditious delivery that is expected." Star Struck is a distributor providing watch batteries, jewelry findings, and quartz movements to the jewelry trade.

Star Struck's new address: 10-B F.J. Clarke Circle, Bethel, CT 06801; (800) 243-6144; in CT (203) 778-4925.

Classified Ads

REGULATIONS AND RATES

Ads are payable in advance \$.50 per word, \$.60 per word in **bold type**. 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 \$4.00 additional for postage and handling. The first of the month is issue date. Copy must be received 30 days in advance. (e.g. August issue closed for copy on July 1st.)

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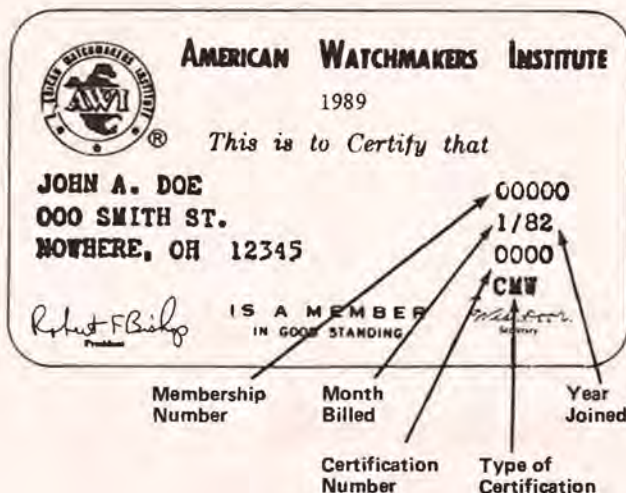
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MARCH 1989

5—Florida State Watchmakers Association, Inc. All Day Seminar and Lunch; Comfort Suites Airport Hotel, 1808 Australian Avenue S., West Palm Beach, FL. Phone (407) 689-6888. For more information write: FSWA, 589 Pine Street NW, Port Charlotte, FL 33952.

8-12—Jewelry Industry Distributors Association (JIDA)/American Jewelry Marketing Association (AJDA) Co-Conventions; Saddlebrook Golf & Tennis Resort; Tampa Bay, FL.

12—Sixth Annual Spring Open House of the Gemological Institute of America (GIA); Santa Monica, CA; 12 noon-5 p.m. Open to the public. For more information, call GIA at (800) 421-7250, ext. 220; or (213) 829-2991, ext. 220.

APRIL 1989

12-19—17th European Watch, Clock and Jewellery Fair (Basel '89); Basel, Switzerland.

28-30—Wisconsin Horological Society Annual Convention; Midway Motor Lodge; La Crosse, WI.

MAY 1989

5-7—Watchmakers Association of Pennsylvania Annual Convention; Holiday Inn East; Lancaster, PA.

5-7—Texas Watchmakers Convention; Radisson Airport Hotel; San Antonio, TX. For more information contact Curtis Anderson, (512) 822-9200 or Dwight Tubb, (214) 784-9361.

13-June 3—AWI Tour to Russia; Henry B. Fried, tour guide. See page 14 of this issue for more information.

20-21—Arizona Horological Association 11th Annual Convention; The Embassy Suites; 7051 South Tucson Blvd.; Tucson, AZ.

JUNE 1989

20-22—Research and Education Council Annual Meeting; Radisson Inn, located at Greater Cincinnati Airport. Contact AWI for information.

23—AWI Annual Affiliate Chapter Meeting; Radisson Inn; Greater Cincinnati Airport. Contact AWI for information.

24-25—AWI Annual Board of Directors Meeting; Radisson Inn; Greater Cincinnati Airport. Contact AWI for information.

JULY 1989

15-16—8th Annual Indiana Jewelry and Watch Trade Show; 500 Ballroom of the Downtown Indianapolis Convention Center & Hoosier Dome and New Westin Hotel. Information: Normagene Murray, (317) 631-8124; 251 N. Capitol, Ste. 1792, P.O. Box 2104, Indianapolis, IN 46204

28-30—Watchmakers Association of Ohio Annual Convention; Perke University Hotel; Columbus, OH.

SEPTEMBER 1989

9-10—Iowa Jewelers and Watchmakers Association Convention and Trade Show; Airport Hilton Inn; Des Moines, IA.

Ad Index

American Perfit	21
Borel	7
Cas-Ker	inside back cover
Charles Cleves	17
Eagle Dial Refinishing	4
Esslinger	inside front cover
Gem City College	13
Hovig's	8
Jewelmont Corp.	27
S. La Rose	22
Livesay's	15
Maxell	3
Panasonic	9
Ray Gaber Co	23
Toledo Jewelers	13
Tumi Watch Company	27
Twin City Supply	19
Vibrograf USA Corp	center insert
Zantech	5

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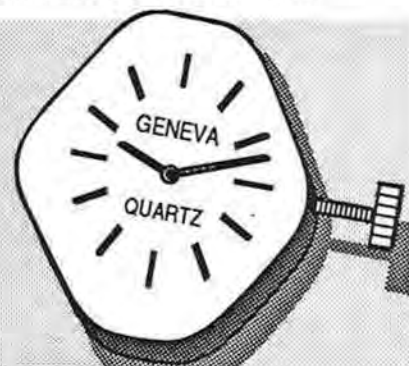
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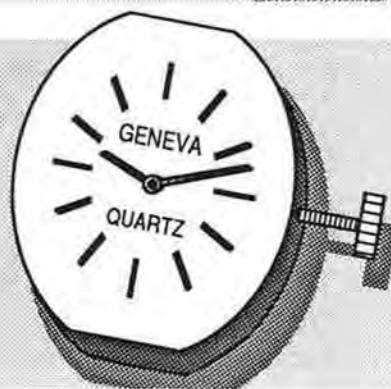
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