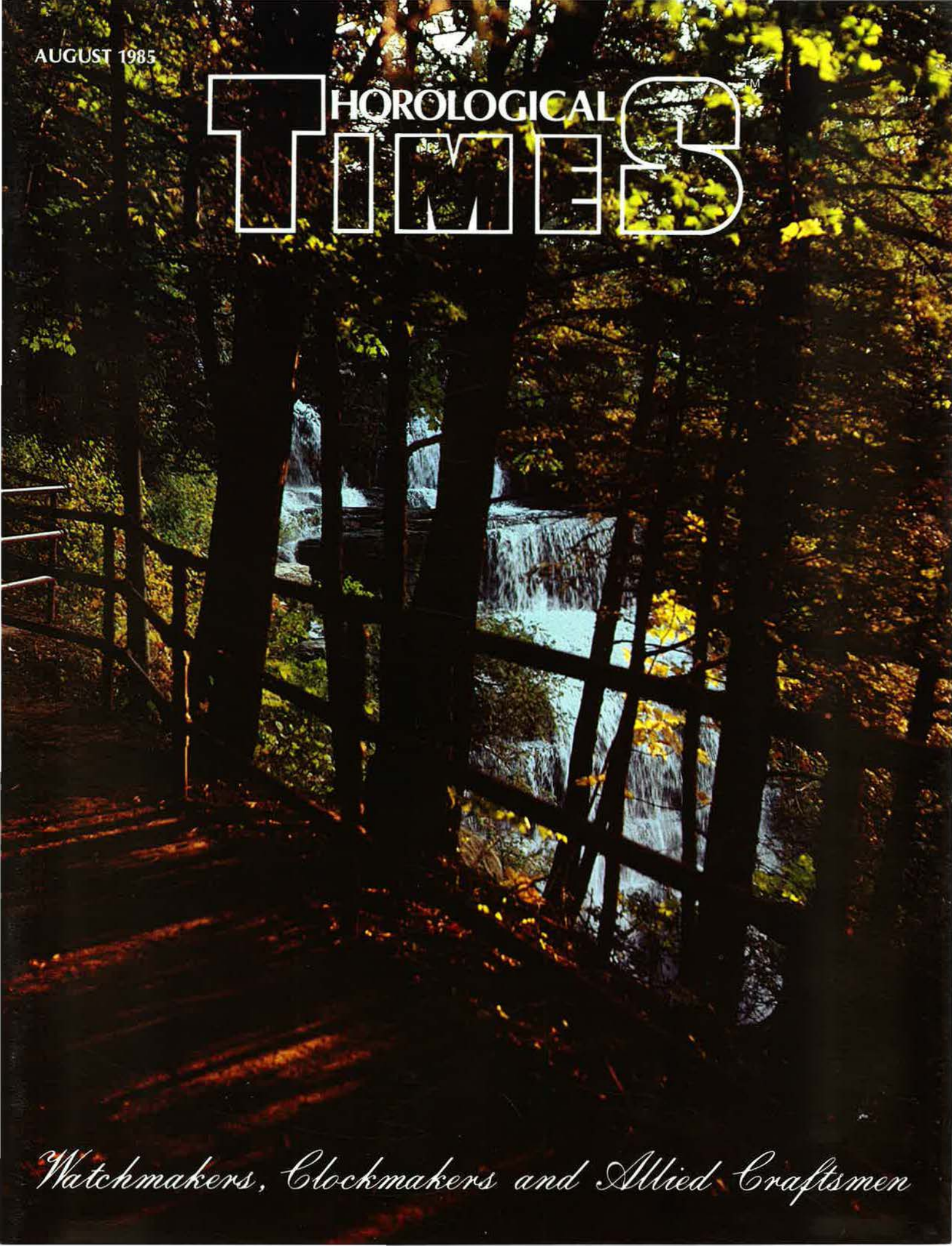
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VOLUME 9, NUMBER 8 AUGUST 1985

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Official Publication of the American Watchmakers Institute

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Editorial

"The title of Fellow in the American Watchmakers Institute (FAWI) may be conferred upon a carefully selected individual whose outstanding and meritorious contribution to the field of horology on a national or international level, has enriched humanity. This title shall be the highest honor awarded by the American Watchmakers Institute." Such is the wording verbatim as it appears in the AWI Constitution.

The title is far more prestigious than one would surmise, for only the sixth "Fellow" has been awarded. Only full and complete credentials will ever permit a candidate to be considered. It has been said that this award is the greatest of its kind.

Mr. George Daniels of Isle of Man, England is the sixth recipient of the title "Fellow, American Watchmakers Institute." He was born into this world considerably less than affluent and at age 5 disassembled his first watch. After World War II, he began to work at his profession in earnest. The quartz explosion directed his efforts to fabrication of mechanical timepieces of utmost quality. Adding to the impeccable quality of his pieces were inventions of his own, especially in the area of the escapement. Quite so, each and every watch he has manufactured has became an item for collection. And what he has done has enriched the profession of horology.

On the Front

A sparkling scene for our August cover . . . the lovely Chittenango Falls near Cazenovia, New York. *Photo by Mark Krueger of Williamsville, New York.*



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PRESIDENT'S MESSAGE...



Fred S. Burckhardt

A Big Thank You

Without a doubt, AWI's 25th Anniversary Celebration was one of the nicest affairs I've ever had the pleasure to attend. I know from the remarks made to me that many others feel the same way. Many thanks to Bill Biederman and his committee, Milton Stevens and Michael Danner along with the office staff, Marvin Whitney for his update on the history of AWI, Thelma Stevens along with Nancy Danner, Betty Danner and Janice Schwarberg for the table decorations, and to all those who did the running around when we needed "Go-fors"! We must not forget all the AWI Past Presidents who attended and Jim Broughton for the past presidents' caps.

As President, it gave me great pleasure to present Affiliate Chapter Charters to the Horological Association of Maryland/Delaware and to the New Zealand Horological Institute who was represented by Mr. W.J. (Bill) Groves, who traveled 11,000 miles to be with us.

To all those who had part in our 25th celebration, I would like to say: "THANKS FOR THE MEMORIES!"

I would also like to take this opportunity to thank all the directors, committee chairmen and committee members, the office staff, *Horological Times* staff, the ELM Trustees, and of course Milton Stevens and Michael Danner. To all, whose help, inspiration and encouragement have made this past year a very pleasant one indeed.

Now that the first twenty-five are over, let's get to work on the next twenty-five!!

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AWI Celebrates 25

More than 250 members, friends and guests joined the AWI officers and staff to celebrate the organization's Silver Anniversary June 24-30, 1985. All events were held at the Drawbridge Inn near the Greater Cincinnati Airport.

The in-service annual meeting for instructor members of the Research and Education Council (REC) schools kicked off the proceedings with a four-day session held Monday through Thursday. The Trustees of the Educational, Library and Museum Trust (ELM) met on Wednesday. Thursday marked the annual meeting of the AWI Affiliate Chapters and culminated in a visit across the Ohio River to AWI Central. A wine and cheese reception provided a relaxed atmosphere in which the crowd could talk with AWI personnel and tour the AWI Museum of timepieces. Orville Hagans, curator, and his wife, Josephine, were on hand to furnish background information on the displays.

A gala program unfolded on Friday, June 28. The key horologists of the world were joined by outstanding achievers in other professions as they commemorated this milestone in AWI's history.



Scott Carpenter was the featured speaker at the Silver Anniversary banquet. He spoke of his experiences as one of the original seven U.S. Astronauts.

It was back to business as usual on Saturday. The AWI Board of Director's meeting plotted the course the organization will follow during the coming fiscal year. The Past President's Reception and an Awards Program occupied the evening activities. The Board of Directors held their traditional breakfast on Sunday morning before closing out the business meeting to end the official program.

The photographs on the following pages portray the people and the events which marked the celebration of AWI's first 25 years of progress. The people and their dedicated support of AWI's goals will determine the association's success in the years to come!



Dr. Gernot Winkler, Director of the Time Service Division of the U.S. Naval Observatory, spoke on "Precision Time and Measurement Distribution."



"The Invention of Standard Time" was explained by Ms. Carlene Stephens. She is the Assistant Curator of the Division of Mechanisms for the National Museum of American History, a part of the Smithsonian Institution complex.



ABOVE:
George Daniels, who is described as "watchmaker extraordinaire", travelled from the Isle of Man, England to address the group. He was honored with a "Fellowship" award by AWI.
RIGHT: Joe Thompson, Editor of the *Modern Jeweler* magazine, analyzed the trends in the world watch industry.





A gala crowd gathered for the Friday night banquet.

Years of PROGRESS



AWI Past Presidents—from left: Orville Hagans, Joe Crooks, Robert Nelson, Marvin Whitney, James Broughton, Leslie Smith, Ewell Hartman, Marshall Richmond, Harold Calvert, Henry Fried, Gerald Jaeger, and Harold Herman.



Warner Bundens, NAWCC



Left: Antonio Marquis from Panama City, Panama. Right: William and Sylvia Groves from Wanganui, New Zealand.





AWI Chapter #102 of the NAWCC.



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AT AWI CENTRAL AND THE MUSEUM



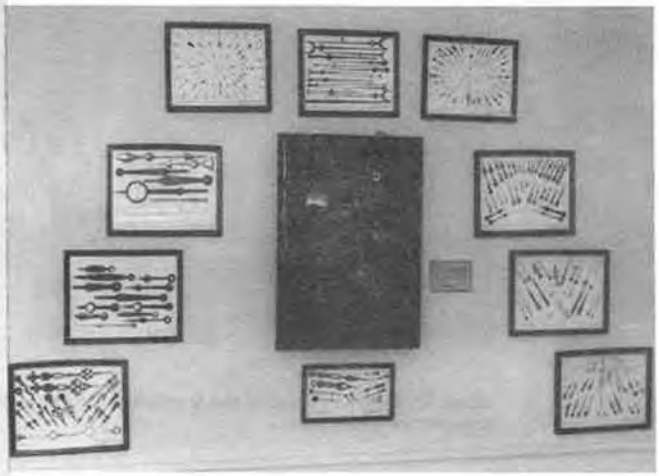
Orville Hagans, curator of museum.



Buddy Carpenter and the Equidistant Escapement.



Gene and Kay Kelton, Citizen Watch Company.



Chronometer detent, surrounded by hands.



Wine and cheese reception at AWI Central.

Members and guests enjoyed a trip to AWI Central and the AWI Museum on Thursday night.











Left to right: George Daniels, Joe Thompson, and Dr. Gernot Winkler gathered at the Speakers Table during the banquet.



Attentive audiences filled the meeting rooms for all the events on the program.

NEWLY ELECTED DIRECTORS AND OFFICERS



Elected directors (left to right): Archie Perkins, Gerald Jaeger, David Fryday, William Biederman, Robert Bishop, Robert Howell, and Fred Burckhardt.



Elected officers (left to right): Fred Burckhardt, president; William Biederman, CMW, first vice-president; David Arnold, CMC, second vice-president; Robert Bishop, secretary; and Robert A. Nelson, CMW, CEWS, treasurer.



Left to right: George Lewis, Secretary; Leon Martin, Vice Chairman; and Bob Howell, Chairman—during installation ceremonies conducted by Gerald Jaeger, REC.



Remy Waechli and Jacques Reymond during seminar on the ETA Swiss Quartz Anadig.

MORE CANDID PHOTOS . . .





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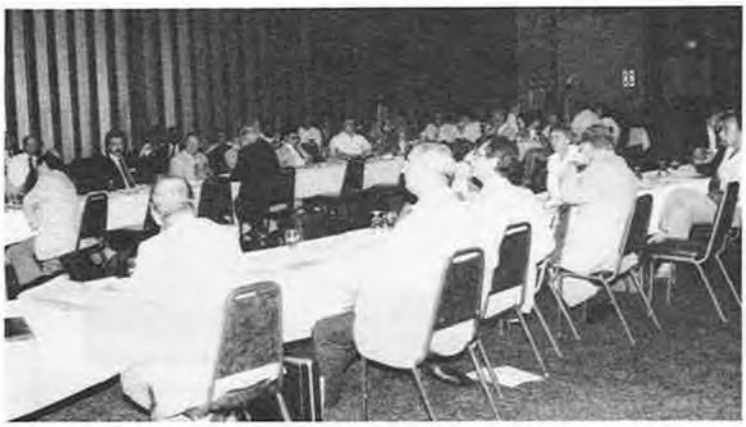


AFFILIATE CHAPTERS





Newly elected Affiliate Chapter Chairman David Fryday is shown at left with Vice-chairman, Thomas White.



Hard-working members plan AWI's future at business meetings.





HONOR AWARDS

Ewell Hartman, Chairman of AWI's Honor Awards Committee, presents the AWI Fellowship Award to George Daniels of Isle of Man, England. Daniels is the sixth person to receive AWI's top honor.



(Continued on page 14)



















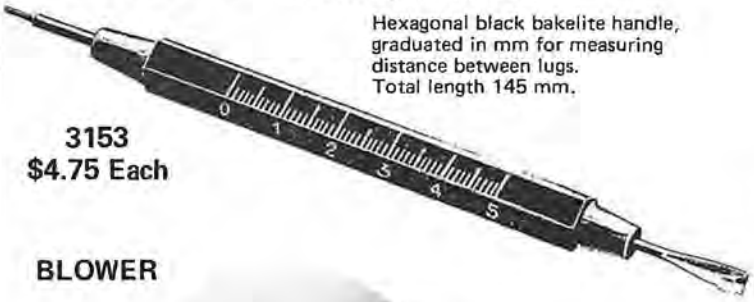


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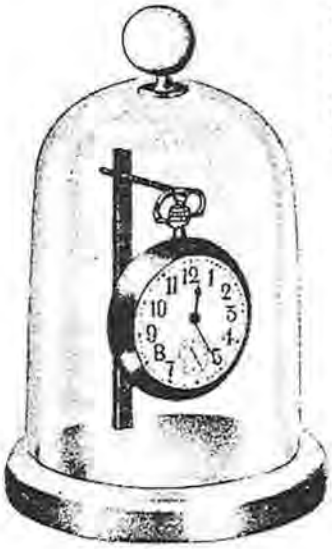
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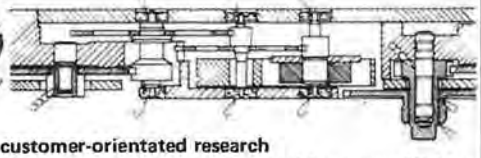
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Battery News

By Ewell Hartman, CMW

All AWI members received a 1985-86 Edition of the Battery Number System along with the July issue of *Horological Times*. This is our third edition and it incorporates literally hundreds of additions and changes that have been made since our 1984 edition.

Everyone who replaces watch batteries in your shop or store should take a few minutes to notice some of the special features of the BNS booklet. Carefully read *all* of the information inside the front cover. The special notes, with regard to low drain and high drain batteries, will be helpful as guidelines for selecting the most suitable battery replacements.

The *Conversion Tables* (Section I) are, in most instances, the greatest timesaver feature of the booklet. All brand numbers are in numerical order and it takes only a few seconds to locate the number of the battery being replaced, along with its AWI number. The AWI number is the same as your cabinet drawer number if you are using this system. The AWI number can also be used in *Specifications and Cross-Reference* (Section II) to find the correct replacement battery number in any brand you choose.

The second section of the booklet also gives the voltage and industry standard-dimensions for every battery listed. This information is invaluable to you when you need to replace an alkaline battery with a silver-oxide, or when you must substitute a high-drain battery for a low-drain. This section will aid you, too, in selecting a battery by measurement only, or in confirming your selection as a replacement for an "off-brand" battery.

This booklet is your most complete source of information needed for watch battery replacement. Its use eliminates the need to refer to more than one chart to obtain the required data. Extra copies may be purchased for $2.00 postpaid by writing to AWI. Special prices will be quoted for large quantities.

"Renata U.S." estimates that during the year 1984, just over 100 million timepieces required a battery replacement—an estimated 20% increase over 1983. Use the AWI system to do a more professional job and to help you get your share of the profits!

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Questions & Answers

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



Letting Down Power in a Fusee Watch

Q I have a couple of questions regarding fusee watches and would appreciate your help. First of all: (1) I've worked myself into a corner and have an English fusee movement–fully wound–and now I need to take it apart again for some adjustments. Is there some way I can let the power down safely? I tried releasing the fusee click but this does nothing. Of course I do not want to spread the plates.

(2) Does the AWI have a source for balance springs suitable for fusee and verge fusee movements?

(3) If the AWI has any information on fusee and verge fusee movements, I would appreciate it. I have your articles on the verge fusee.

Thank you!

William F. Korker
Harrington Park, NJ

A *Letting down the power in a verge fusee watch can be tricky business. The simplest and safest method is to first block the train of wheels. Then remove the balance cock and the balance, marking the hairspring pinning position. Then with the finger acting as a clutch brake against the contrate wheel, remove the train block, controlling the speed at which the train of wheels runs down so as not to "burn" the pivots. Watches with maintaining power and the normal fusee ratchet make let-down rather involved. Some watchmakers attach a tight-fitting key over the take-up ratchet to carefully let down the spring (seen under the dial in some watches).*

Hairsprings for fusee and verge watches are not available. These have fewer coils on light balances. It might be best to use modern springs but skillfully "uncoil" them to assume the large diameter they require, vibrating it to the original balance–most often 14,400 vph. I used to do that and it worked. Just recollet to the old, original collet.

As for information, I believe the articles you mention to be comprehensive on the subject. Also try George Daniels' **Watchmaking**, *which is very, very good.*

Q In a book I recently purchased (*Clock Cleaning & Repairing* by Bernard E. Jones) there is a description and photographs of a long-case movement which I understand is of great accuracy. The feature of the movement is based on the idea suggested by the astronomer F. Hope-Jones and consisted of a most interesting means of giving the pendulum the impulse which was done by gravity and is thus said to be almost a free pendulum.

Now I have searched for a long-case movement which will give a greater accuracy than a quartz movement. Most quartz movements I have tested are no better than about 5 minutes a year, despite their advertised claims.

I have tried to contact the makers and have been advised that they no longer manufacture this movement.

Would you kindly advise me if in your experience this design was in some way a failure? Do you know of the expected accuracy of this "free" pendulum design? The design seemed to offer such great promise of accuracy that I find its discontinuance very disappointing.

I am an old man working to make cases in red cedar and would like to think that my cases and the movements I fit will last for a great number of years. I am too perhaps a "crank" on accuracy . . . thus my appeal to you to locate an accurate movement. Am I chasing the impossible?

R. Elton
Ballina, Australia

(Please turn to page 43)

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Chime and Strike

Steven G. Conover



*Winterhalder Chime Movement**

This article is actually a continuation of the article "Tubular Bell Chime Movement" from the February issue. You may recall that a Colonial Clock Company grandfather clock movement, made by "Miller Germany" was our subject. Now we have a rod chime version of the same basic movement. Besides the Miller and Colonial markings, the back plate is stamped "Winterhalder Germany."

Shortly after the first article was published in February, Steve DeYoung of Sligh Clocks called me with some background on the tubular bell movement. Although Colonial and Miller were the only names on that movement, he said it was made by Winterhalder. Certainly the present rod chime movement confirms his information, because it is marked Winterhalder in addition to Colonial and Miller. As he understood it, the parts were made in Germany, by Winterhalder, for assembly in the U.S. for Colonial. The "Miller" was Herman Miller, head of Colonial Manufacturing Company, who teamed with Hans Winterhalder to form Miller Movement Company.

The rod chime movement is made just the same as the tubular bell movement in the February article, except of course for the hammer arrangement. Chime and strike levers are identical. The same solid, sturdy construction is featured in this mechanism. No bushings were required during the overhaul. The movement needed cleaning and a few pivots were in need of polishing. The dead-beat escapement was out of adjustment, however. The removable steel pallets were worn, and had been turned end for end. The new surfaces were still perfect, but required further adjustment to eliminate mislocking.

This article, taken along with the February installment, will provide a servicing guide for the Winterhalder/Colonial movement, whether tubular bell or rod chime. We will cover basic movement assembly procedures and specifics of the rod chime version this time. Part numbers listed are all shown in the Figures, which are front and back plate views and details. Refer to the February article as needed, for photos of the movement and additional detail drawings of chime and strike parts.

CLEANING

The basis for any overhaul is a good cleaning. Disassemble the movement and clean it thoroughly. Inspect the chain wheels; the clicks can become sticky, and will fail unless they are cleaned. You can take the chain wheels apart easily by removing the slotted tension spring from the arbor. Refer to Figure 1. Remove the strike warning lever (8), rack hook (7), rack (5), hour wheel (1), minute wheel (3), tension wheel (4), and gathering pallet (6). Pull the center arbor out the front, after you rotate the offset disk which holds it at the back. Remove the hammer assemblies, shown in Figure 3.

You may want to leave the strike unlocking lever (9) and chime warning lever (13) attached to the front plate during ultrasonic cleaning. The chime locking lever (10) and chime correction lever are behind the front plate, attached to the same arbor. There is still plenty of room to get the chime locking wheel (Figure 8, February article) out and back in again. If you decide to remove the parts it is not difficult to put them back, because there are no adjustments. The long lever (with levers 9 and 13) is driven onto the arbor, and the chime locking lever and chime correction lever slip on. They move by gravity, so there is no set-screw adjustment to worry about. At the back end of the arbor there is a brass collar with a set screw. Adjust it to provide comfortable endshake for the two levers.

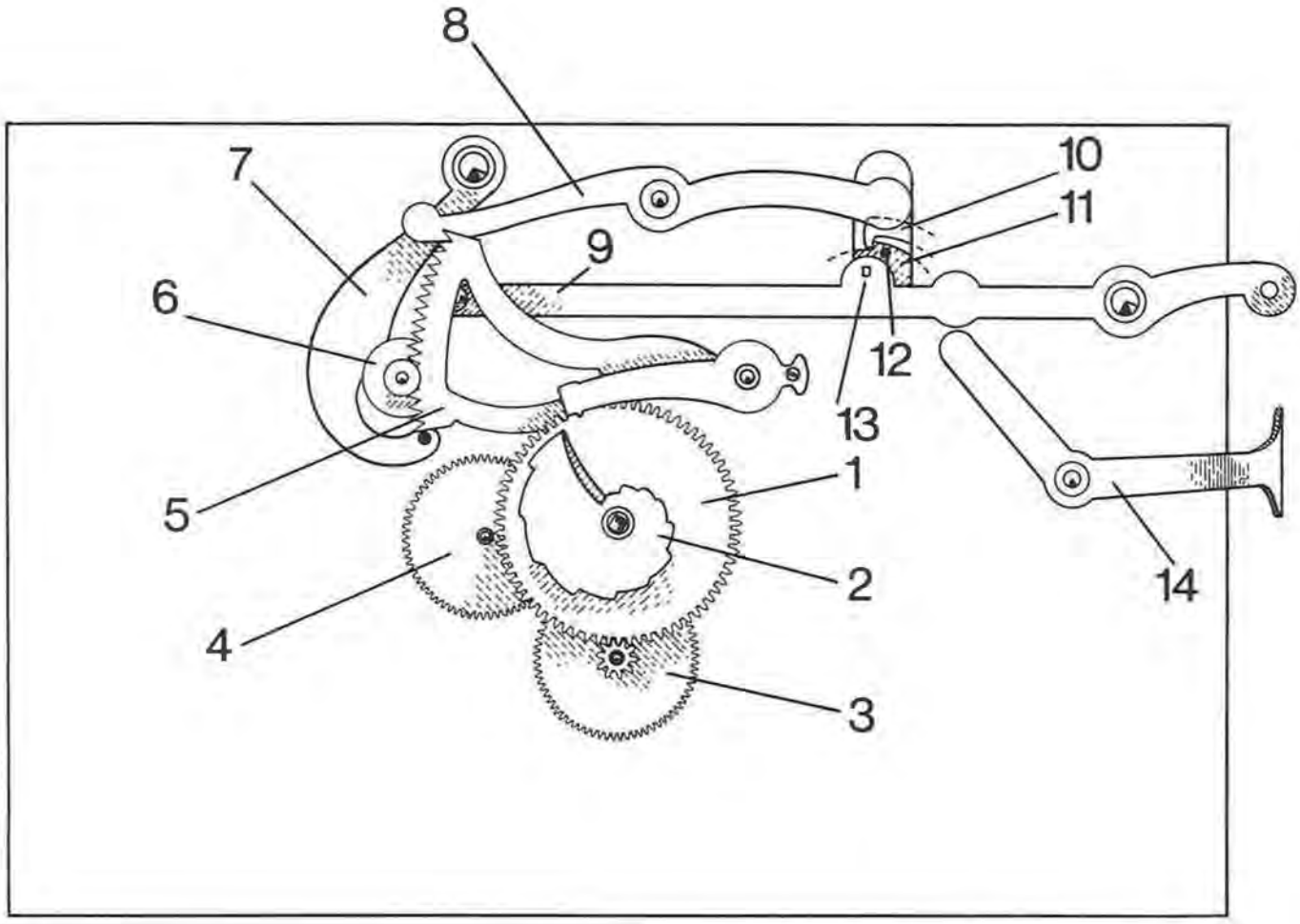
REASSEMBLY AND ADJUSTMENT

To reassemble, place the arbors into the front plate. Then add the back plate, fitting each pivot carefully into place. Make sure you install the chime drive pinion (33). You cannot add it later unless you practically disassemble the movement again. Fasten the pillar nuts finger tight only. Proceed with strike adjustments first.

STRIKE ADJUSTMENTS

Install the rack hook, gathering pallet, and rack now. Note that the gathering pallet goes on only one way. On the rear of the movement, you should also add the strike hammer

* © STEVEN G CONOVER 1985



1	Hour wheel	6	Gathering pallet	11	Chime locking cam
2	Snail	7	Rack hook	12	Chime warning pin
3	Minute wheel	8	Strike warning lever	13	Chime warning lever
4	Hand tension wheel	9	Strike unlocking lever	14	Chime silencer lever
5	Rack	10	Chime locking lever		

Figure 1

assembly shown in Figure 3. Turn the strike train gears by hand as you watch the action.

The relationship of the gathering pallet and the strike locking cam is fixed, because they are on the same arbor. See Figure 6 of the February article for a detail drawing of the parts. You have two main things to check on in the strike area.

First, run the gear train to the locked position and look at the strike hammer tail (26). If it is engaged on the hammer-lifting star, the strike train will have to start up every time under load. Change the mesh of the second wheel and the pinion above it, until you are satisfied with the rest position of the hammer tail. Ease the plates slightly apart to accomplish the adjustment.

Second, check the strike warning pin. When the strike train is locked, the pin should be at a 6 to 8 o'clock position when viewed from the front. This will give about a half revolution of the warning wheel before the strike warning lever (8) stops it. Separate the plates only enough to get the front pivot of the strike warning arbor out of its hole. Carefully adjust and verify the result.

The strike has a hammer adjustment lever (29) below the hammer assembly on the back of the movement. You can make use of it after the movement is back in the case, to make small adjustments to the strike hammers. It applies pressure to the strike buffer spring (27), raising or lowering the four hammers together. Larger adjustments are made by loosening the set screw which holds the four-hammer unit on its arbor, or by bending individual hammer shafts.

Figure 2 shows a front movement detail view. With the hour wheel removed, you can see the rack let-down (15). As an extension of the cannon pinion (18), it provides a smooth alternative to the loud "clunk" some movements make as the rack tail drops onto the snail. In the Winterhalder movement, the rack tail comes to rest first upon the let-down (15), at the warning. Then, as the minute hand moves toward the hour release point, the rack tail slides noiselessly down the edge of the let-down.

You will not need to adjust the position of the hour wheel and snail. The hour hand is keyed to go on one way only, so it will always point to the hour to be struck. You can

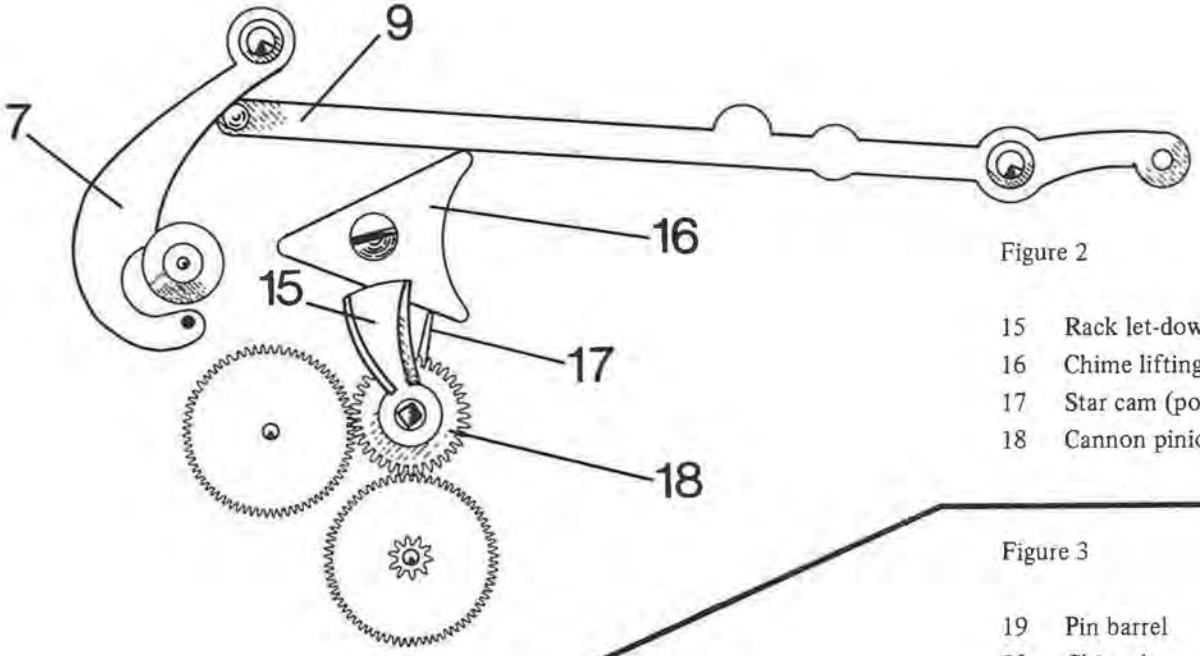
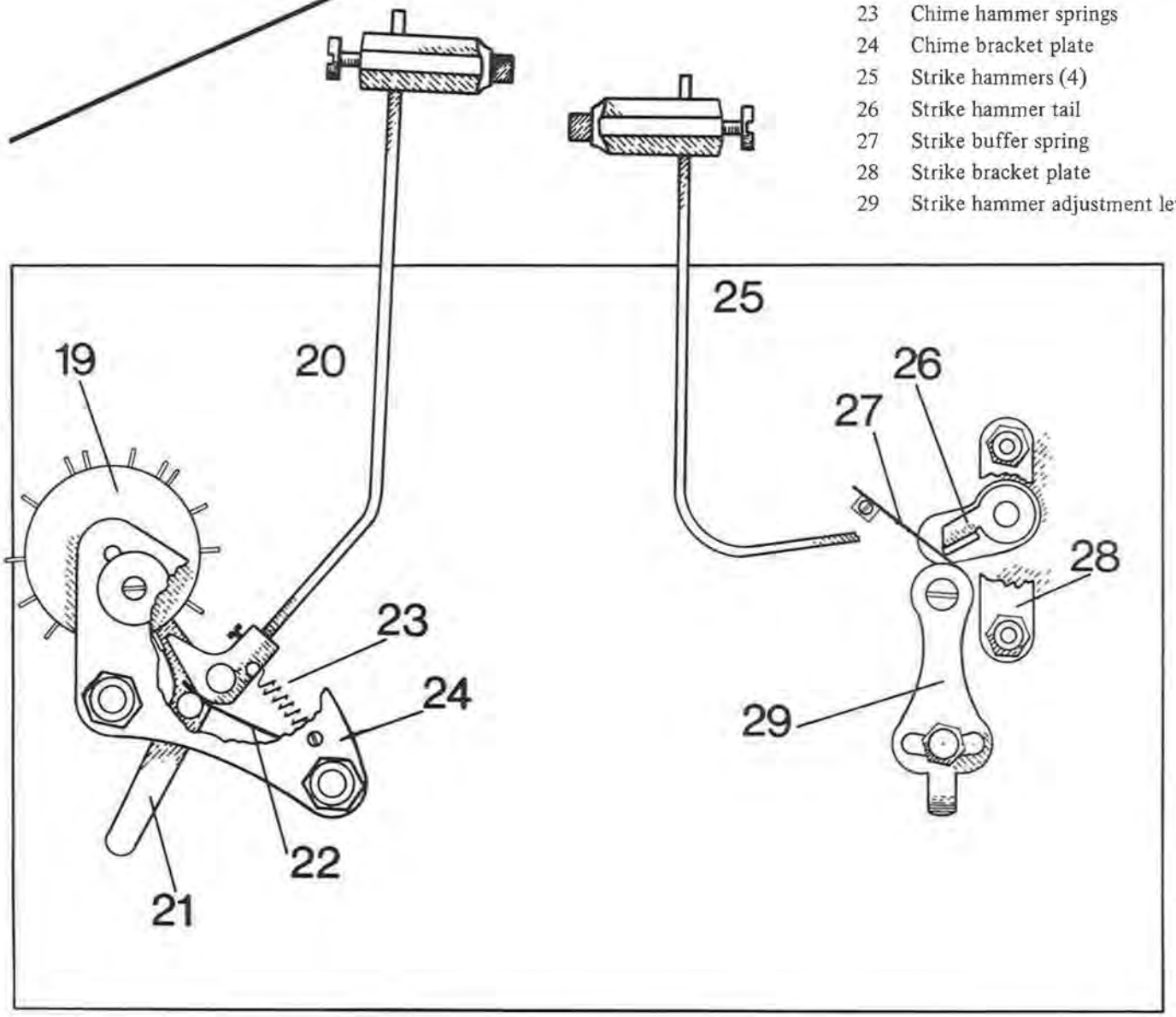


Figure 2

15 Rack let-down
16 Chime lifting lever
17 Star cam (portion)
18 Cannon pinion

Figure 3

19 Pin barrel
20 Chime hammers (4)
21 Chime hammer adjustment lever
22 Chime buffer springs
23 Chime hammer springs
24 Chime bracket plate
25 Strike hammers (4)
26 Strike hammer tail
27 Strike buffer spring
28 Strike bracket plate
29 Strike hammer adjustment lever



move the hour hand and the snail along with it, to change the hour. About the only thing you need to do is to make sure that the hour hand points exactly at a numeral as the clock chimes the hour.

CHIME ADJUSTMENTS

The chime levers are between the plates, where they are difficult to see. However, few adjustments are required anyway. The chime warning run is fixed. The chime warning pin (12) moves only a few degrees to the chime locking lever (10) at warning. There is no need to separate the plates for any chime adjustments. Set screws on the locking plate and the chime locking cam enable you to perform the necessary adjustments. Figure 9 in the February article shows the correct set-up. If the chime locking wheel and the wheel which carries the locking plate are synchronized, there is nothing more to worry about. You do not have to adjust the height of the chime locking or chime correction levers.

Proceed to assemble the chime hammer assembly. Figures 3 and 4 show the relationship of parts. Insert the pin barrel arbor (34) through the hollow arbor which carries the chime drive pinion (33). Now add the rest of the hammer assembly. Note the purpose of the chime hammer adjustment lever (21). Like the arrangement on the strike side, it permits a fine adjustment to be made to all four hammers simultaneously. Using a cam, it applies varying lift to the chime buffer springs (22). This action very slightly raises or lowers the rest position of the four hammers.

(Please turn to page 30)

MOST OUTSTANDING WATCHMAKING STUDENT



Pictured above is Mr. Dale Johnson (right) accepting the permanent classroom trophy from his instructor, Woody Woodward (left). Mr. Johnson started the nine month "Watch, Clock & Jewelry Course," at St. Paul Vocational School last September and graduated in June. Dale was selected as the "Most Outstanding Watchmaking Student" based upon excellence in attitude, ability, achievement and attendance. He has completed training on all mechanical and quartz watches, five types of antique clocks, and jewelry repairing (ring sizing, shanking, pronging, tipping and chain repairs). Dales's future plans are to work for a jewelry store for a few years and eventually own his own business.

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THE PICKLE BARREL

Marshall F. Richmond, CMW



Making Rings from Findings

Finger rings can be assembled from findings at a fraction of the cost of carrying a large inventory of mountings. Basic findings such as heads, shanks, settings, tops and bezels are available (usually for immediate delivery) from most material distributors. Findings specialty houses are located in many parts of the United States and offer more than the basic findings at somewhat lower prices. Keeping a small stock of the basic findings permits us to assemble and finish a ring, including a stone setting, in usually less than an hour. Even when doing general repair work, time can be saved if you don't have to order and wait for parts. Ordering in quantity costs less and the same shipping charge will cover many pieces. If you have three styles of heads and three styles of shanks in stock, you have a selection of nine solitaire rings to offer your customer. And if you carry a small stock of stones, these findings and stones can be shown to the customer as a selling aid. This will also enhance your reputation—the customer will know that you are the craftsman that will be making their ring.

Basic plain ring mountings are available in several styles that have no settings for stones, but settings can be gold soldered in selected places to make dinner or cocktail rings. Full heads, such as a miracle or illusion, can be used for settings. Six or four prongs can also be used or a combination of any of them. The miracle or illusion heads can be used for larger stones as well as six prong settings. The rings and settings are available in 14K white or yellow gold. Heads will usually accommodate stones from 5/100 to 4 carat and settings from 1/100 to 15/100 carat in diamond sizes. If other stones are to be used, a millimeter to carat comparison chart will easily give the millimeter size so you can order the proper one listed in diamond carat size. Various style heads and settings are available in different size ranges, but some won't be available as small as a 5/100 or as large as a 4 carat. A combination of a yellow ring and white heads is sometimes preferred by a customer. Where diamonds are to be used, it is better to use white gold, as yellow settings tend to make a diamond look yellowish. This is considered an undesirable color in diamonds unless the diamond is a true canary color diamond. As previously stated, settings are available in yellow or white but heads are available only in white.

For a step-by-step method of setting up a ring from findings we will use, for example, a quarter carat diamond, miracle head and a plain half-round shank. The shank can be either yellow or white but the head will be white. Choose a head made to accommodate a 1/4 carat diamond with a pin point top, which will make it easy to set the diamond. The next step is to fit the shank to the head. Since the head is tapered, the shank ends should be filed to the proper angle (if they aren't already). Put the head top down on the asbestos pad and flux the two sides that are left solid to attach the shank. In fluxing, I have found that it works better to heat the metal first, apply the flux, and then heat again to make the flux turn a frosty white. This is proof that it is well fluxed at the solder joint.

Using the same procedure, flux the ends of the shank and grasp it at the bottom with heavy duty tweezers and put them in the third hand tool. A perfect alignment can then be made with the shank and head. Lay a small piece of solder on one side where the head and shank are to join and apply heat. Try and make the head and shank come to the melt and flow temperatures of the solder at the same time so the solder will flow to both the head and the shank. If one side gets to this temperature ahead of the other the solder will flow to the side that was hot first. Once the solder has started to flow it can be pulled around the shank end by moving the heat. At this point cool the ring and inspect it for a good solder joint and alignment. If the other end of the shank does not align perfectly, the alignment can be altered by bending the ring shank if it is only out a little. The end not yet soldered aligned and touching the head should be refluxed, solder applied, and then heated until the solder flows. It is not necessary to use the third hand tool for this second joint, but excessive

heat could cause the other joint to melt and the head to get out of alignment. When using a yellow shank and a white head, I use white solder because any extra can be filed from the shank easier than yellow can be removed from the head.

After the head is firmly soldered in place and no more heat is to be applied, the ring can be put on a ring mandrel and rounded with a rawhide mallet and the ring size checked. If using a findings shank, the size will usually come out between a six and a seven. If it is a size or less too small, it can usually be stretched to the exact size by tapping towards the thick end of the mandrel with the rawhide mallet or by using a ring stretcher. A point to remember after the ring has been rounded–if enough heat is applied to the head to melt the solder again, the shank may come loose on one side or the head may come out of alignment due to the stress caused by rounding the ring. Filing away any excess solder or roughness in the ring or head is the next step. The ring should then be polished with Tripoli. A final polish can be applied after the stone is set with rouge. If you buy 14K mountings from a reputable supply house, it is safe to stamp the inside of the shank with a 14K stamp.

Cocktail and dinner rings are always in demand, especially when remounting customers' diamonds. They may have one or many diamonds, usually mounted in old rings which they wish to have consolidated into one ring. These cocktail or dinner ring mountings are available in many styles and are basic rings. All that needs to be added are the settings and then the stones can be set. Some of these mountings are rough castings while others are finished with the sprue marks removed and polished. I prefer using the rough castings and rough finishing them. This can be done before installing the heads and settings. The settings must be gold soldered to the ring in the exact location they are wanted and installed one at a time. This may appear to be very difficult, but one must use ingenuity in setting up the job.

Prong settings are delicate to handle because it is easy to melt one or more of the prongs while applying heat, so it is best to protect them. The method that I use is a soldering block made of strip nonflamable material coiled and in a metal pan. This material is soft enough to push the prongs of the setting into the surface leaving the base of the setting protruding above the surface. The ring mounting can be grasped with heavy duty tweezers at the bottom of the shank, put into the third hand tool base, and aligned with the top of the ring over the setting in the soldering block. The prongs are shielded from the heat, but the material in the soldering block is a nonconductor of heat and will not carry heat away from the concentrated point where the solder must flow between the setting and the ring. The setting must be touching the metal it is to be soldered to or the solder will not flow to both sides. It is not possible to make solder flow across an open space. When the set-up is complete and the setting is properly aligned with the ring, enough heat should be applied to flux with a flux brush. Preheating will cause the flux to adhere to the exact point where it is applied. After the flux is applied, heat again until the flux turns a frosty white. This will assure that the flux is properly applied to the place where it is needed. Solder can then be applied using a small chip with the flux brush or by using a pick. I prefer using the flux brush because the bristles are flimsy and less apt to get the setting out of alignment if contact is made with it. The pick is a solid metal point and if contact is made with the setting it will change the alignment. My preference for heat in making these installations is the little torch using the middle size tip (number 3). The heat can be concentrated in the area where the solder flows and if many settings are to be installed close together, it is necessary to hold the heat to a small enough area that it will not melt the solder around any of the settings previously installed. Where many settings are used, it is safer to pickle and rinse the ring after each setting has been installed. While applying the heat and as the solder flows, make sure that it has flowed completely enough to make a good solder joint before removing the ring from the pad. It can be refluxed, or even more solder added, if the joint is not good. Caution on overheating and boiling the solder must be considered.

The finished appearance of the ring can be no better than the original layout. In making the layout, the stones that are to be used should all be removed from the old rings, measured for size, and settings chosen that the stones will set in. The location of the settings should then be determined. After all the settings are securely soldered to the ring, the ring should be pickled, cleaned with a bronze wire brush on the polishing motor, and then prepolished using Tripoli on bristle brushes, felt wheels and cotton or muslin buff wheels. This should be done before the stones are set since it is difficult to polish around and under them. The stones then can be set and the final shaping and polishing of the beads and settings started.

It is important to get a final finish that is as near perfect as you can. The way I final finish a ring is to start with the inside of the ring. If the inside is very rough, wrap a piece of emery cloth around an inside felt ring buffing finger and emery the inside until all the rough places are smoothed out. Then remove the emery cloth and apply Tripoli to the felt buffing finger and polish the inside of the ring. Polish the outside of the shank in the same manner. Sometimes it is necessary to use small felt knife-edge buff wheels to get into small places around the settings. Bristle brush wheels, charged with Tripoli, are used to polish the settings, prongs, and/or beads that hold the stones secure. Sometimes a bead or prong is still rough and does not shape and smooth with cup burs or beading tools. In this case, I usually dip the ring in borax and alcohol and put a solder tip on the bead or prong. This will give enough soft workable metal to make a perfect bead or prong when finished. Final finishing can be done with jewelers rouge using bristle wheels, felt wheels and soft cotton or muslin buff wheels. When this is complete, the ring should be cleaned in an ultrasonic tank or scrubbed with a soap and ammonia solution, dried and final checked for finger size, rough places in the stone settings, and for general appearance.

Recently I made up a ring of this type using 14 diamonds set in white gold settings attached to a yellow gold mounting. The stones were one 3/8 carat, one 1/5 carat, one 1/8 carat and eleven 5/100 carat diamonds. The three larger stones were set in six prong settings and the smaller ones in four prong settings. Although it was not done all at one time, the total time to make it was about five hours.

There are so many possibilities of different design rings that can be made from findings. There would be no way to cover even a small part of them. However, to design and make rings from findings only takes ingenuity, a desire to accept a challenge and hard work. It is not recommended that a novice to the trade attempt making rings from findings, but they should develop their skills over a period of time by starting with the simpler jobs.

Next month will be a continuation of this with an explanation of some methods of stone settings.

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Archie B. Perkins, CMW, FNAWCC
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Files and Filing © 1985

PART II

In continuing the discussion of files, the American pattern files will be discussed. Unlike the Swiss pattern files just discussed, the coarseness and type of cut of the American pattern file is given a name rather than a number that the Swiss pattern file has. American pattern files are made in both single and double cut styles. Figure 1 shows the single cut file. Single cut files are made in both tapered and blunt shapes.

Single cut files are called MILL files. These are used around saw mills to file saws, although they are for other purposes also. View A, Figure 1 shows the tapered flat file and View B shows a file with a blunt shape which is called a hand file. The single cut file does not remove material as fast as the double cut file, but it gives a smoother finish than the double cut file. View C, Figure 1 shows a chart of cuts for mill files. Row "a" of the chart shows the different coarsenesses of cuts for the MILL BASTARD file. It will be seen that a 4 inch MILL BASTARD file has a finer cut than a 6 inch MILL BASTARD file, and a 6 inch file is finer than an 8 inch file. In other words, the longer the file, the coarser the cut and the shorter the file, the finer the cut. Row "b" of View C shows the cuts for the next finer mill file. This cut is called the MILL SECOND CUT. It will be noted that the cuts in this group are finer than the cuts in group "a". Also, the teeth on a MILL SECOND CUT file are not cut as deeply as the teeth on a MILL BASTARD file. Row "c" of View C shows still another finer cut used on mill files. This cut is called the MILL SMOOTH cut. It will be seen that this cut is finer than the cuts used on both the MILL BASTARD and MILL SECOND CUT files, and it is also graduated in coarse-

Figure 1

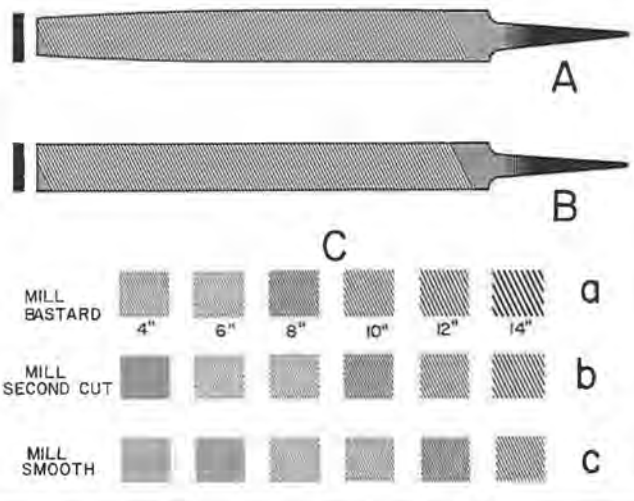
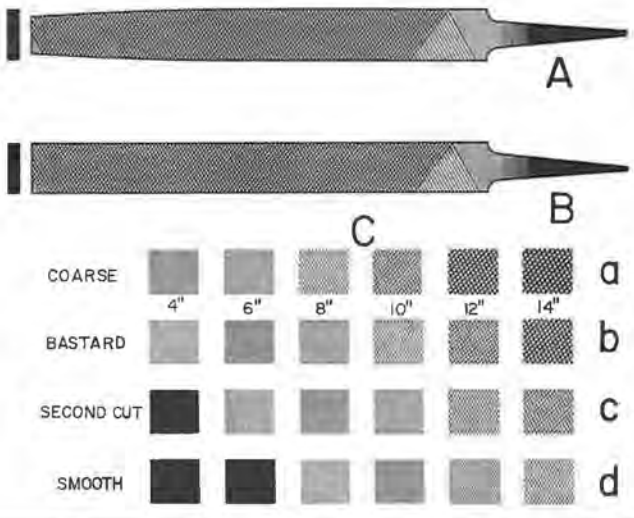


Figure 2



ness for the different lengths of files the same as the MILL BASTARD and the MILL SECOND cut. The MILL BASTARD file is used when doing rough filing, and the MILL SECOND CUTSand MILL SMOOTH files are used when finishing surfaces, or for removing very little material.

Figure 2 shows the double cut file. This file is called the MACHINISTS file and it is made in the tapered flat and blunt hand file styles. View A shows the tapered flat machinists file and View B shows the blunt machinists hand file. These files are used when much material needs to be removed fast; however, they do not leave a smooth surface and are not as good to use for draw filing as the single cut mill file.

View C, Figure 2 shows a chart of the different graduated sizes of cuts for different lengths of machinists files. The row of cuts shown at "a" are used on the COARSE MACHINISTS file. Note how much coarser the cut is on a 14 inch file compared to a 4 inch file. The row of cuts shown at "b", View C is used on the machinists BASTARD file. Note how much finer the cuts are for the BASTARD file than for the COARSE file. Row "c", View C shows the relationship between the cuts for the next finer machinists file. These cuts are for the SECOND CUT file. Row "d" shows the cuts for the SMOOTH MACHINISTS file which is the finest series of cuts for this group of files.

MILL and MACHINISTS files are made in different shapes other than the tapered and blunt shapes already mentioned. Figure 3 shows cross section views of these shapes. View A shows a MILL file with one edge rounded and the other edge square. The rounded edge is for filing the gullets between saw teeth.

View B, Figure 3 shows the FLAT CHAIN SAW file. This file is used for filing plain and raker chain saw teeth.

View C shows the three-cornered file which is used to file hand saw and band saw teeth. These files are made in tapered and blunt shapes in both single and double cuts.

View D shows the CROSSCUT SAW file. This is a single cut file which is used for sharpening cross cut saws.

View E, Figure 3 shows the CANTSAW file. This file is used for filing "M" shaped teeth on both circle saws and crosscut saws. This is a single cut mill file.

View F shows the PITSAW file. This is a straight file which is shaped similar to the half round file. This file is used for sharpening pitsaws.

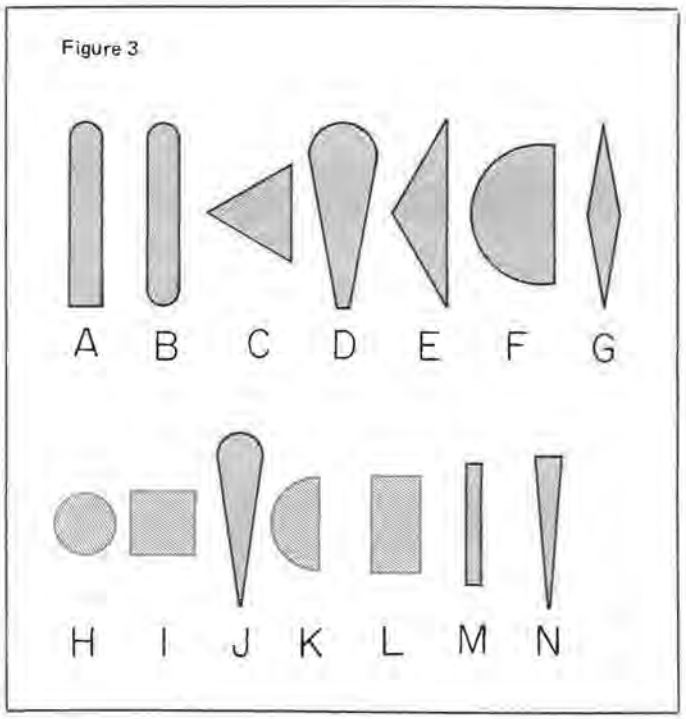
View G shows a WEBSAW file. The shape of this file is similar to a slitting file and it is used to sharpen the teeth of the websaw or pulpwood saws.

View H, Figure 3 shows the ROUND file. These files are made in straight and tapered shapes for filing saw teeth and other filing operations.

View I shows the SQUARE file. This file is made in straight and tapered shapes in single and double cut for filing saw teeth and keyways as well as for other uses.

View J shows the SECTOR file. This file is used for filing the teeth of Bushman type saws.

View K shows the HALF ROUND shaped file. This is made in machinists and special file types and not made in the mill file category. The HALF ROUND file is tapered toward the point in both the width and thickness. The flat side is double cut and the curved side is specially single cut. This type of file is used for both flat and curved surfaces.



View L shows the PILLAR file. This file is similar to the hand file but it is more narrow and thicker with one safety edge. The uses for this file are to file slots and keyways.

View M shows the shape of the cross section of the WARDING file. This file is thinner than the hand file and the width is tapered to a narrow point. The uses for this file are to file notches in keys and locks as well as filing in narrow spaces. This file is double cut.

View N shows the KNIFE file. This file is double cut on the sides, and the back is uncut. The main use for this file is to file acute angles. It is used mainly by tool and die makers.

In addition to mill files and machinists files, there are several special files that are used to file brass, aluminum, stainless steel, castings, lead, plastic, and for filing articles chucked in the lathe. Figure 4 shows some of these files. View A shows a special cut file which is called a GENERAL PURPOSE (G.P.) machinists file. This file is single cut with diagonal serrations which creates coarse teeth for fast stock removal. This file can stand rough usage. The edges of this file also cut.

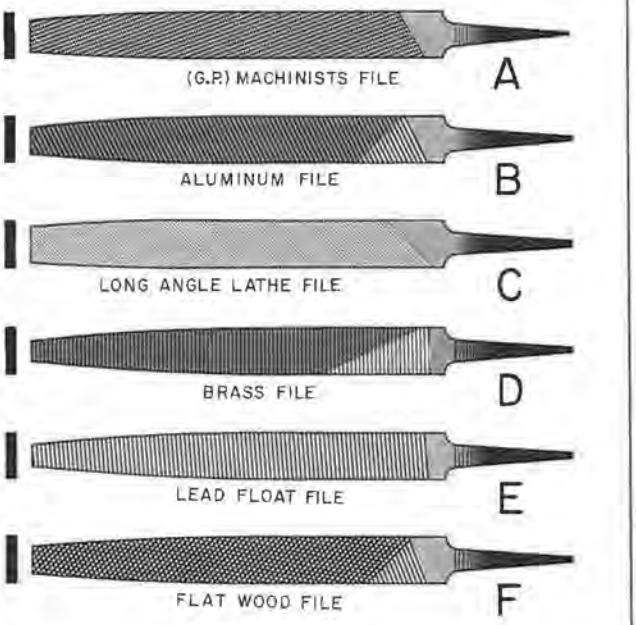
View B, Figure 4 shows a special file for filing aluminum. This file cuts rapidly without clogging. This file comes in only one coarseness regardless of its shape and length. It is made in both tapered flat and half round. This file cuts on its edges also.

View C, Figure 4 shows the LONG ANGLE LATHE file. This file is specially designed for lathe filing. This is a single cut flat file that cuts on sides only. The edges are left smooth.

View D, Figure 4 shows a special file for filing brass, bronze, copper and similar metals. This file should not be used on steel. This file is very sharp and needs very little pressure to make it cut. It leaves a smooth surface although it cuts fast. This file is made in flat and half round shapes.

View E, Figure 4 shows the LEAD FLOAT file. This file is used to file lead, babbitt, and other soft metal. This is a specially designed file with short angle single cut surfaces. It cuts on its edges also.

Figure 4



View F, Figure 4 shows a WOOD file. This is a coarse double cut file specially made for filing wood. This file is made in flat and half round shapes.

References:

1. Nicholson, Paul C., Jr. *File Filosophy*, Providence, Rhode Island: Nicholson File Co., 1956.
2. Oberg, Erik and Jones, F. D. *Machinery's Handbook*, New York: The Industrial Press, Thirteenth Edition, 1946, pp. 1384-1389.
3. Searle, Frederick E. *Shop Theory*, New York: Henry Ford Trade School, McGraw-Hill, 1946, pp. 52-58.

"Files and Filing" will continue next month.

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Our Readers Write

I would like to thank you for your very fine organization. You provide a mountain of information to us folks out in the field. I work for Mason & Sullivan Clock Co. in West Yarmouth, Massachusetts (Cape Cod). My colleagues and I use your services, particularly the AWI Library, extensively. Thanks again for the excellent work you all do.

Gail Eyestone
Osterville, MA

"Shop Talk" by Wes Door is a very interesting article, but I have a word of caution. Please refer to the April 1985 issue of *Horological Times* pages 28-31.

The caution is in regard to the use of the VOM on OHMS as described on page 31. If you present the ohmmeter to many circuits without regard to the voltage and currents as supplied by the device (VOM) to the measured unit you may burn out or damage components. Diodes and transistors do have a limit. Many meters have rather high current in the low ohms ranges, i.e. possibly as high as 1.0 Amp and on the higher ohms ranges some have 30.0 volt batteries. Watch out, you might want to refer to my article on "VOM As Related to Horological Usage", *Horological Times*, October 1978, page 26, about the middle of the article I mention this fact.

Thank you for your "ear".

Roy H. Niegel
Spirit Lake, ID

Membership in your organization is very important to me. I especially enjoy all articles and tidbits from Steven G. Conover and Orville Hagans. All of your topics are timely and helpful for me.

The interest you have taken in providing training courses is inspirational for me, for it provides the furthering of knowledge and awareness to others in the fascinating field of horology.

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Bench Tips



Joe Crooks

Hold On To Your Shock Springs !

This month's Bench Tip is from Darrow Lott, of the Horology Department of Jones County Junior College, Ellisville, MS.

These are shock springs that are not easy to put back in after they have come out or if a new one needs to be installed. I would like to share this foolproof idea.

Figure 1



Figure 2



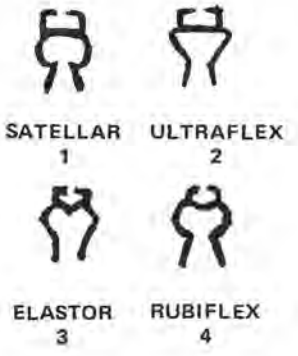
Figure 3



Select a ladies balance wheel with screws in it. Now select a screw on it with the slot turned crossways to the wheel. It will be this screw slot that will hold the shock spring. Cut a piece out of the wheel so the selected screw will be on one end of the piece (Figure 2). You will have to dress down the screw so it will fit down in the place where the balance jewels fit. The cross bar on the shock spring will fit down in the screw slot and can now be handled without losing it.

Mount the piece in something like a balance screw holder (Figure 3). Don't put a screwdriver in the screw slot or the sharp edges that hold the shock spring will be damaged. Of course you will have to select a balance wheel that is small enough to get in between the arms of the spring. The spring is flat material so a screw slot is perfect for holding it. After the spring has been mounted in the screw slot, you may handle the tool in any way you like and the spring will not fall out. Roll the tool over and over and the spring stays in. The balance will have to be out of the watch so as to give plenty of working room for the tool.

There are four different brands of snap-in shock springs that I know of and none of them are shaped the same way.





Satellar and Ultraflex have a straight cross bar and Elastor and Rubiflex use a curved cross bar. The Elastor has a sharp angle cross bar and I don't think it would fit in Darrow's tool because his drawing seems to fit the Rubiflex type shock springs. Also, the ones with a straight cross bar would fall out. But that's all right, since 90% of these shock springs seems to be Rubiflex. (Maybe a little One Touch in the bottom of the timing screw slot?)

I feel more comfortable with a pair of tweezers in my hands, modified to do the job needed. The next drawing shows how I shaped an old pair of 3C tweezers to snap in these shock springs.

First draw the temper in the ends of the tweezers to a dark blue. Then file the tips off to the width of the cross bar on a Rubiflex shock spring. (The tip will now be about 1 mm thick.) File the outsides of the tips of the tweezers back parallel about 3 mm, then use a screw head file and file a shallow slot perpendicular across the end side of one tip of the tweezers 15 mm from the tip. Drill a small hole in the center of the slot, about .10 mm deep, and use the screw head file and round out the outside edges slightly towards the tip of this side of the tweezers.

Next, use a plastic, electric point file and smooth out the burrs. (Sandpaper will do the same thing.) Set a shock spring in the slot and mark the tweezers where the lock tips of the shock spring are inside of the tweezers. Use a ¼ round file and cut out a slot on the outside of the tweezers until they clear the tips of the shock spring. Now dress down the inside of the tweezers until they hold the shock spring firmly when closed. File the bottom half of the tweezers down from a .50 mm tapered to .25 mm at the tip. Smooth off the burrs and polish the tips.

You can now hold any of the four brands of shock springs safely to snap them in without any danger of them flipping. The tweezer and shock spring drawing shows how to shape the tweezers. This sounds like a long, drawn out process, but this tweezer tool can be made in 15 minutes!

BIRTHSTONES

Edgar Cleves, Jr



AUGUST

SARDONYX

The British Museum displays one of the most beautiful single-head cameos. It is a 5 x 3¼ inches sardonyx into which is carved the portrait of Emperor Augustus. This gemstone was formerly in the Strozzi collection at Florence. Recently, I was able to purchase an octagon sardonyx chevee which had been cared in Idar-Oberstein. It is a welcome addition to the several hundred carved gemstones in my collection.



Sardonyx derives its name from a Persian word "ZARD", meaning yellow. When the coloring agent of chalcedony is hematite or red iron oxide, the gemstone is called carnelian. When other iron oxides produce yellowish to brownish-red, it is called sard. Sardonyx is the name applied to stones which have white or black bands alternating with bands of sard or carnelian.

The earliest recording or sardonyx was by Josephus about 90 AD in the "War of Jews", chapter V. According to the book of Revelation, the fifth foundation of the New Jerusalem was made of sardonyx. According to Rabnaus Maurus, Archbishop of Mainz in the ninth century, sardonyx is one of the Apocalyptic gems and represents the humility of the saints in spite of their virtues. Among Christians, the Apostle Philip is represented by Sardonyx. Another source lists sardonyx as a sign of strength in spiritual life.

Although sardonyx is one of the modern birthstones for August, it was used by the Romans for September. Even today it is used by the Russians for July and by the Poles for September. Sardonyx is associated with the right and left wing of Raven 8° of Libra and is supposed to be influenced by the planets Saturn and Mars. According to an old book of dreams, if you dreamed of sardonyx, you have the love of your friends.

Sardonyx is found all over the world. One of the primary sources is in Northern Uruguay, extending over the border into the State of Rio Grande do Sul of Brazil. Other valuable deposits are the Deccan lava deposits of India, which cover an area 200,000 square miles in the Northwest quadrant of the peninsula and are several thousand feet thick. Other major sources are Madagascar, India, Brazil and Egypt.

The chemical composition of sardonyx is Si O_2 (Silicon Dioxide) with some impurities. The staining of onyx has been understood for centuries and the red color can be improved by means of pernitrate of iron. The indices of refraction may vary from 1.533 to 1.539. The specific gravity may vary from 2.58 to 2.64. On the Mohs scale of hardness,

sardonyx is 7. It is more or less porous and readily accepts chemicals to improve the color. Sardonyx shows no cleavage. Fractures are conchoidal and they will display a dull to waxy finish. There is no synthetic sardonyx. There are plastics, but they can easily be identified, because they are much softer and the images are very poor.

HINTS FOR THE BENCHMAN

Reaction To: Setting – Good
Polishing Mounting – Good
Torch Heat – Fair - too much heat may cause color to fade.
Boiling – Fair
Steaming – Fair
Ultrasonic – Good
Pickling & Plating Acids – Fair

PERIDOT

GEM OF THE SUN

Ancient records show that peridot was found about 1500 B.C. on the island of Zebirget which is near the Tropic of Cancer in the Red Sea off the coast of Egypt. Another early recording was mentioned by the Naturalist, Pliny, in his "Natural History" about 70 A.D. The deposits were found on St. John Island, also in the Red Sea. Even to this day, large beautiful bright green crystals are found and there seems to be an unending supply. Very large crystals are found in the Mogok District of Burma. In the United States, fine specimens are found in Arizona and New Mexico, but none are of any significant size. Most of the gems are below 2 carats. Very rarely are any found above 5 carats. Other sources are found in Norway and Tanzania.

Peridot is found as inclusions in volcanic rock in various size grains or granular aggregates. It occurs in yellowish-green, green, greenish-yellow, brownish-green and brown colors. The name peridot is derived from French and was originally assigned to the yellowish-green variety.

According to The Bible, after the destruction of the Temple and its restoration, a second breastplate was made. Peridot is the second stone of the second breastplate. On this stone was engraved the name, Simeon. In the book of Revelation, the great city, the holy Jerusalem had 12 foundations. The seventh foundation was made of peridots. According to Rabanus Maurus, Archbishop of Mainz in the 9th century A.D., peridot was one of the apocalyptic gems and represents true spiritual preaching accompanied by miracles. Peridot symbolizes Bartholomew, since he is known for his divine preaching and his store of virtues. It is also the Zodiacal sign for Libra. The Crusaders, through bartering or looting, returned to Europe with fine specimens of peridot, which found their way into the cathedrals. Some gems, almost two inches long, are in the Treasury of the Three Magi, or at the Cathedral at Cologne.

Fine specimens of green peridot in the Smithsonian Institution include: a 310 ct., a 45.5 ct., an 18.5 ct., and a 10.4 ct. from Egypt; a 287 ct. from Burma; and a 22.9 ct., an 8.9 ct. and an 8.6 ct. from Arizona. The Morgan collection of fine peridots can be seen at the American Museum of Natural History. Also, the Field Museum of Natural History in Chicago contains many fine specimens.

Peridot is one of the gemstones for those born in August. It is also the gemstone for Egypt as well as one of the acrostic stone of Mizpah.

The properties of peridot will vary. It is a magnesium-iron silicate, which usually contains about five times more magnesium than iron. Peridot owes its color to iron. The chemical composition is $(Mg\ Fe)_2\ Si\ O_4$. On the Mohs scale of hardness, peridot will vary from 6½ to 7. The toughness is good. Polish surfaces display vitreous luster, while fractured surfaces are conchoidal and display a bright oily luster. The indices of refraction vary from $\alpha = 1.645$ and $\gamma = 1.683$ to more iron rich specimens of $\alpha = 1.668$ and $\gamma = 1.706$. The birefringence varies from .036 to .038. Even dark specimens of peridot will display very weak pleochroism. The specific gravity varies from 3.32 to 3.35 with occasional higher readings. Under magnification, sometimes "lily pad" inclusions may be observed. Peridot can also have liquid, iron oxide or chromite inclusions. Peridot belongs to the orthorhombic system. The optic sign is biaxial varying from positive in forsterite which is a magnesium silicate ($Mg\ Si\ O_4$) to negative in fayalite which is iron silicate ($Fe\ Si\ O_4$).

For those who have spectroscopes, peridot gives three fairly broad bands in the blue area, centered at about 4960, 4740 and 4530 A. These are caused by ferrous iron.

Other stones with which peridot may be confused are demontoid garnet, emerald, tourmaline, chrysoberyl, zircon, sapphire, synthetic sapphire, synthetic spinel, doublets and glass.

HINTS FOR THE BENCHMAN

Reaction To: Setting – Poor - edges chip easily
Polishing – Poor
Torch Heat – Very Poor
Boiling – Poor - avoid extreme temperatures
Steam Cleaning – Poor
Ultrasonic – Fair
Pickling & Plating Acids – Fair

Peridot will be damaged under temperature changes or stress.

CHIME & STRIKE

(Continued from page 21)

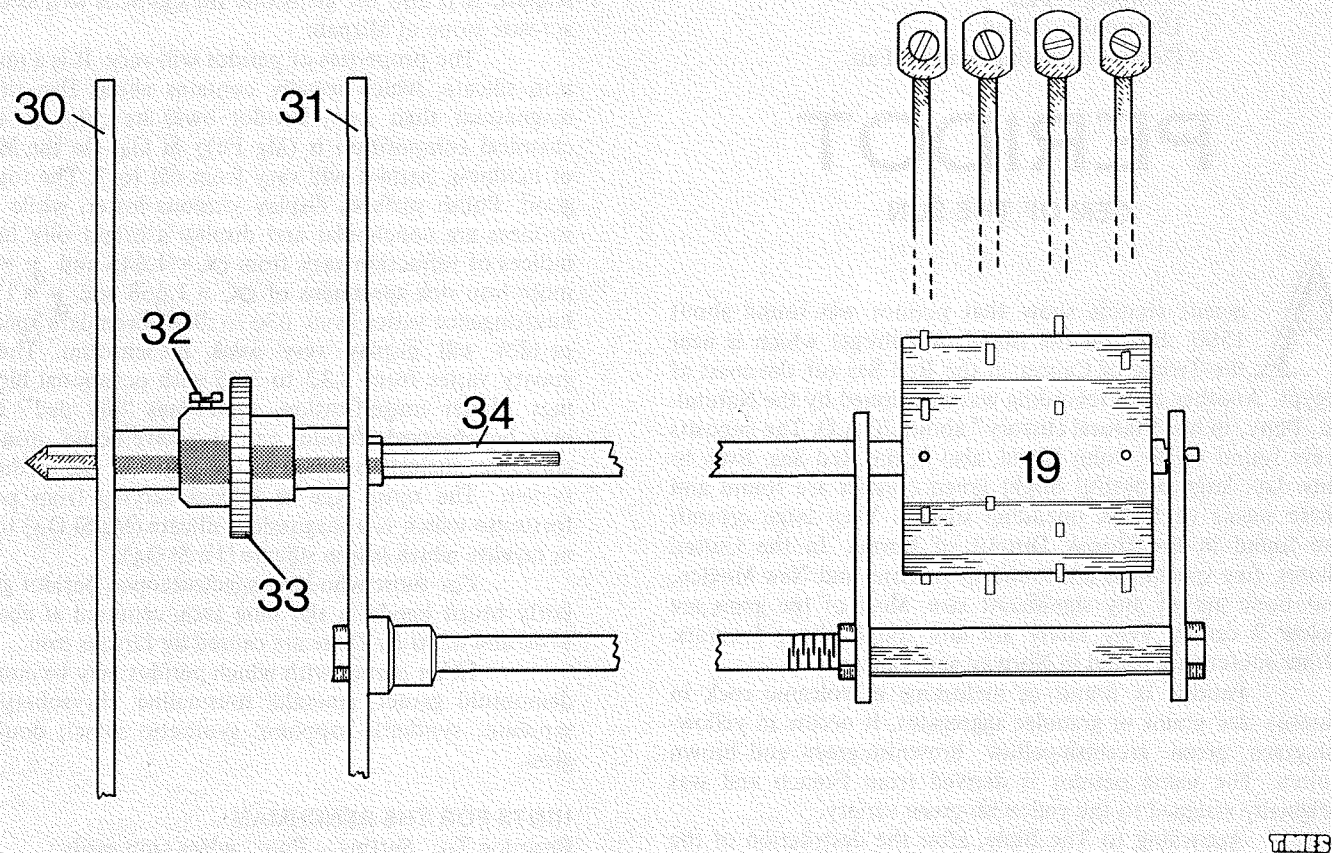
Don't forget to install the chime silent lever (14) on the front of the movement. It operates by lifting the chime and strike levers to the warning position and leaving them there. Chime and strike are silenced together.

You don't need to adjust the chime hammer sequences until the movement is running on the test stand. The minute hand is keyed to go on only one way, and the chime train will automatically adjust itself to run the hour chime when the minute hand points upward. The operation of the chime correction mechanism is covered in the February article. All that remains is to adjust the pin barrel to lift the hammers in the correct sequence.

Chime the movement through the hour, and then through the first quarter. Loosen the set screw (32) on the chime drive pinion (33), and move the pinion forward to disengage it from the third wheel. Turn the pin barrel (19) until you see the four hammers rise and fall in order from front to back. Then engage the pinion and tighten the set screw. Readjust if necessary. That's all there is to it. Chime and strike are ready for the test run.

Figure 4

30 Front movement plate
31 Rear movement plate
32 Set screw
33 Chime drive pinion
34 Pin barrel arbor



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Book Review

PENDULERIE, by J.C. Nicolet, published by Technicmedia.

This book is written entirely in French and as such has basic appeal to those who are capable of translating the French and this is, of course, a distinct disadvantage in the U.S.

It is written by J.C. Nicolet a master horologist and professor at the Technicum (college) de-la-Chaux-de-Fonds. He is well known to many specialists in a wide area.

The book contains the observations of his many years of research and experimentation in the field of horology. It contains hundreds of drawings and many problems which are presented and solutions offered. The book has 200 pages and five chapters: 1. Motor Force (weights and springs); 2. Trains; 3. Escapements; 4. Pendulums; and 5. Striking.

This book has pulled together a mass of technical details that have had to be culled from several sources. It is for students of repairing and one basic part of the course of study is for restorers.

L'ESCHAPPEMENT A CYLINDRE, by Henry L. Belmont, published by Technicmedia.

This book is written in French, but don't let that stop you from reading the review.

This book is one of the most definitive books ever written on a particular subject—the cylinder escapement.

It contains 328 pages and hundreds of photographs of specialized tools and drawings explaining many of the operations performed when the photographs don't make the function self-explanatory.

The eight chapters cover:

1. A brief history of the escapement—its origins, its life, its disappearance.
2. Evolution of the theory and techniques published by the English and French from 1731 to 1869.
3. The manufacturing manuals of the horologists back to 1840, the production and tooling beginning in the 19th century.
4. Production by parcelling out operations in the region of Maiche, Charquemont, Le Russey; wheels, cylinder shells, collets and balances.
5. The artisans-tool makers of the cylinder during the period of developing industrialization.
6. Industrial production during 1920.
7. Tools used by repairers of cylinder watches, methods of effective repairs.
8. Additional notes and conclusions; biographies and genealogies of makers, bibliography, and the glossary (in French).

This book has some interesting quirks. The short biographies of George Graham (the English horologist) is written in English as is that of Thomas Mudge.

The manufacture of the escape wheel is broken down into 32 operations, 27 for the wheel and 5 for the pinion. Each operation is described, the tool illustrated, and in many cases the production figures are given, for example, Operation No. 16 — Checking and rectifying the thickness of the teeth on the escape wheel is 12-15 minutes per gross. The balance wheel is made in five operations which are described in detail along with pictures of the tools. On page 261 an escape wheel with 12 teeth with a diameter of 2.3 mm is shown. It is almost mind boggling—12 teeth on tiny, tiny stalks.

This book is for every serious craftsman and collector, with the assistance of a French dictionary and a copy of: *Dictionnaire Professionnel Illustre deL'Horologerie* by G.A. Gerner, little difficulty should be had in interpreting the main gist of the French text.

Otto Benesh

(Please turn to page 39)

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The James Ward Packard Collection

Patek, Philippe Watch #12

Its Restoration – Part III



Joseph G. Baier, Ph.D.
CMW, CMC

The previous two articles on the restoration of Patek, Philippe Watch, #12, of the AWI Packard Collection, included a description of the watch, the various functions it could perform, problems found responsible for its earlier failure, and the beginning of its disassembly. The third, and last part of the series, will describe the final disassembly, repairs made, assembly, lubrication, and final adjustments of the watch. The several photographs which accompany the text will illustrate the significant stages of disassembly, with suggestions on procedures to follow in that process, and finally, a photograph of the fully restored watch.

Figure 10 is a photograph of the various wheels, pinions, levers, springs and bridges found attached to the intermediate half-plate (between the pillar plate and the false dial), as well as those attached to the dial side of the pillar plate itself. Figures 7 and 8 of Part II showed many of these parts located in their respective positions. These parts are concerned with the up-down mechanism, indicating the amount of time still available for the running of the watch, parts of the repeating mechanism, and several control levers functioning with the chronograph portion of the watch, all related to each other only in being located in the same region, and which must be dissembled at the same time.

With Figures 7 and 8 of Part II before us, it might be of value at this time to describe one of three repairs made to broken parts of the watch. Referring to Figure 8, Part II, note the small wheel at the left of that photograph with one tooth missing. A duplicate of that wheel was made by Archie Perkins of Denver, Colorado, whose renown as a craftsman-horologist is known to us all. Incidently, that wheel has 32 teeth, an overall diameter of 3.10 mm, and an estimated module of 0.09 mm. The writer extends his appreciation to

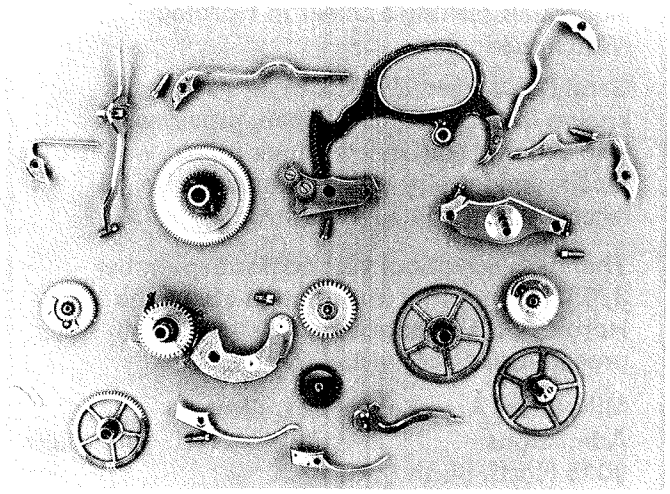


Figure 10. Intermediate plate and pillar plate mounted parts. See Figures 7 and 8, Part II, for their location.

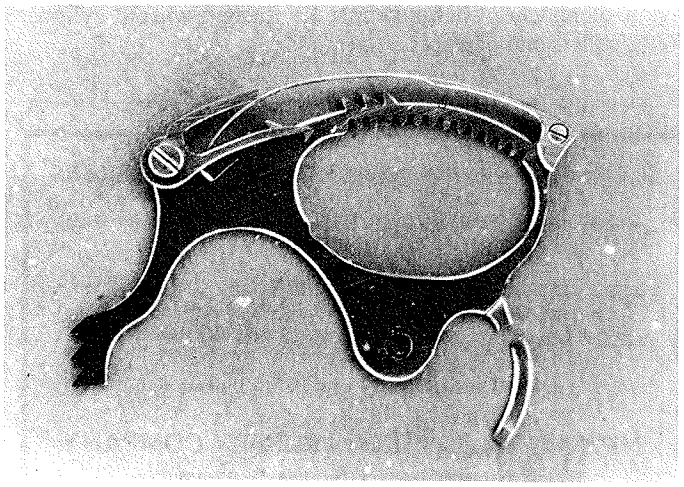


Figure 11. Damaged quarter rack, with tail detached.

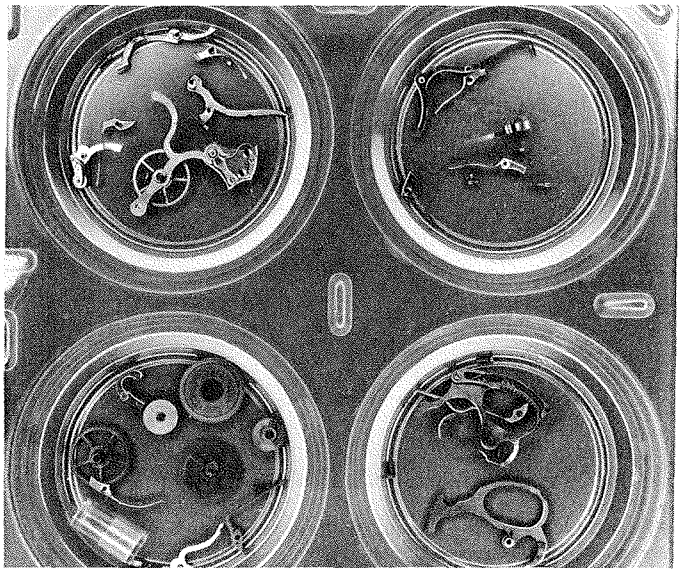


Figure 12. Tray compartments holding 'regional' parts.

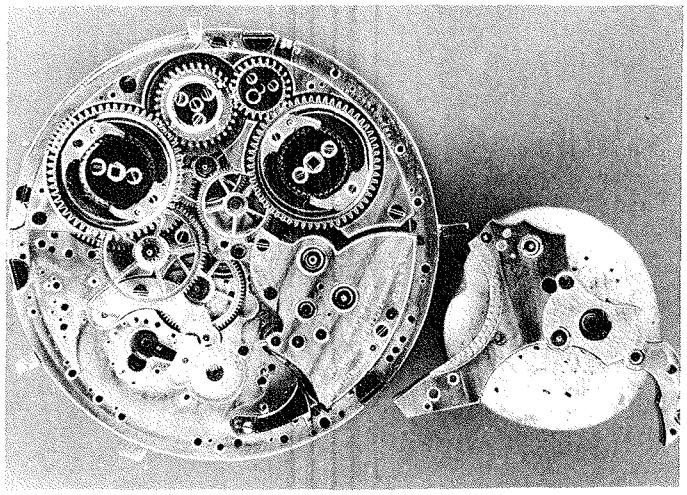


Figure 13. Upper 'plate', partially disassembled, showing winding, intermediate and idler wheels.

Archie for volunteering this contribution in the restoration process.

Another repair involved the quarter rack. Figure 11 shows that rack with its tail broken off. This was the 'boomerang-like' structure found loose within the watch early in disassembly. It was easy to determine its position on the rack; it was more difficult to silver solder it back on retaining its original curvature and length. Thomas Bulfer, of Avondale, Arizona, with his combined capabilities of being an excellent watchmaker and jeweler, volunteered to perform this task. Needless to say, after sufficient study of all the problems which could have arisen, the tail was reattached on the first attempt. It had to be of the same length, and be located on the same circle it originally circumscribed. Also, it had to be at the proper level to fall properly onto the quarter step of the snail. Again, many thanks, this time to Thomas Bulfer.

The third repair involved the minute rack. The missing tail of the minute rack had to be made without benefit of a broken piece. It had to be of the proper length to be able to call for a strike of one minute, up to 14 minutes; it had to be formed with the proper curvature to swing an arc so that the step of the snail upon which it fell would correspond to the position of the minute hand on the dial, and, it had to have its end shaped so that it would cover both the steps of the snail as well as the surprise piece, activated by the flirt, to assure that no minute strike will occur at the hour. This piece was made by the writer. The only other major task involved refitting the small heart-shaped piece to the split second arbor, which somehow unknowingly had become separated from that arbor. This was done during assembly.

At this time, the movement was removed from the watch case and the balance assembly carefully put aside. Then, position by position, groups of physically related parts not involved directly in the power trains were removed and placed in disassembly order within the compartments of the plastic trays referred to earlier, and illustrated in Figure 12, selected at random from the many compartments. Any further disassembly required that mainspring power be let-down. But, because there are three mainsprings, each with a different function and train, and found on two arbors, with the arbors wound by a single crown and stem, in alternate fashion, the approach to the let-down process is different than with a single train watch, or one in which the repeater train has its own mainspring, but is wound during the process of moving the initiating slide forward.

Unfortunately no photographs are available of the dismantling of the watch to include let-down of the mainsprings. However, Figures 13 and 14, taken during reassembly, will show some of the parts involved. Figure 13 shows the two larger winding wheels (the one on the left for the repeater train; the one on the right for the time and chronograph trains) engaged with the smaller single intermediate wheel (directly, on the left, through an idler to its right), with each of the two wheels having its own double ratchet, so that one

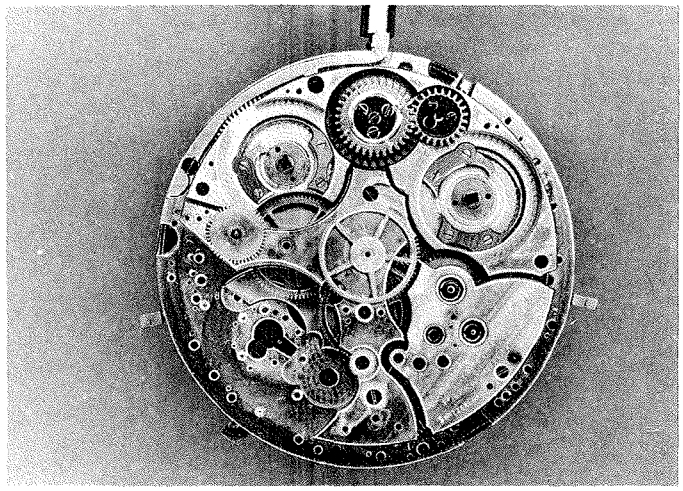


Figure 14. Upper 'plate', with winding and 'holding' ratchet wheels removed. Note winding squares.

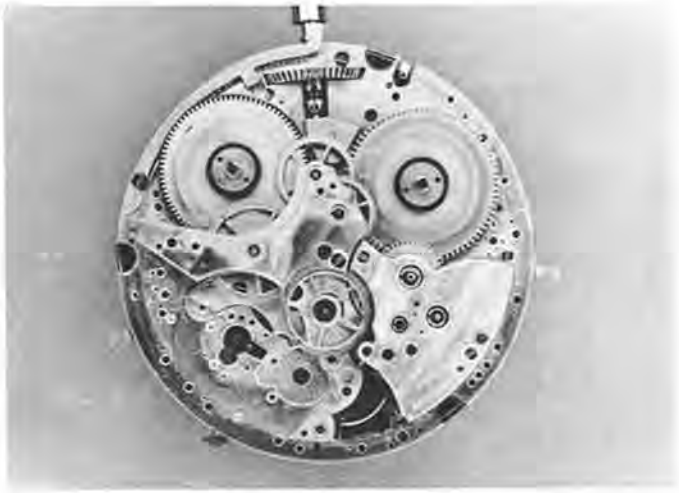


Figure 15. Upper 'plate' with barrel bridge removed.

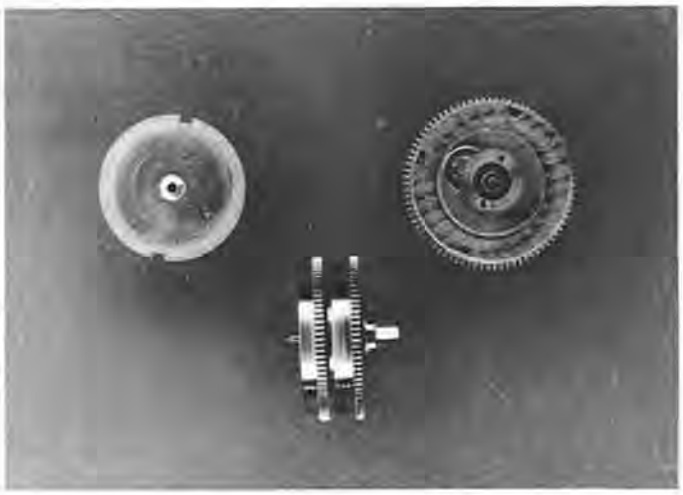


Figure 17. Mainspring barrels. Note tandem arrangement for the time and chronograph barrels.

mainspring arbor can be wound while the stem is turned in one direction, the other mainspring arbor wound when the stem is turned in the opposite direction. Note that these ratchets are arranged to permit the mainspring arbors to be turned in the direction of winding, but during the reverse direction, the ratchets slip over the teeth of their respective wheels. This action is controlled by the presence of another ratchet wheel below each of the two winding wheels, and mounted to their respective arbors. The two winding wheels seen in this Figure can be removed without mainspring let-down because they are not 'holding' wheels. Figure 14 shows both winding wheels removed, and while the two smaller and lower ratchet wheels, referred to above, are not yet in place, it is obvious that these wheels and their single ratchets are the only holding wheels for the wound mainsprings. Now, to let-down the mainsprings.

Remove the winding wheels with their ratchets. To let down the mainsprings, one arbor at a time, a small pin vise, with four jaws, is fastened to one of the winding arbor squares. By increasing spring tension, the click on that arbor can be held away from its ratchet wheel. Then slowly let down the mainspring in the usual fashion. Repeat the process with the other mainspring arbor. Before both mainspring arbors can be removed from the watch movement, the barrel bridge must be lifted off, see Figure 15, and the train bridge, see Figure 16. Further, to remove the combined time-chronograph arbor mainspring assembly the repeater bridge and its associated wheels must be lifted off, because this mainspring assembly is overly large. This brings to mind an observation made in Part I of this series, namely, that the wheel jewels of the repeater train have convex surfaces, so that reassembly can be a very tedious task; apparently all arbors with their pivots are of the same length, so that they must all be in proper position before the bridge can be replaced. Anticipate a longer than usual reassembly period! Figure 16 illustrates the watch movement almost completely disassembled. In the end all parts have been removed from the plates.



Figure 16. Further disassembly. Striking barrel, on the left, can now be removed. Remaining bridges must yet be removed to lift out the time and chronograph mainspring barrel assembly.

The mainsprings within their respective barrels, showing the tandem relationship of the time and chronograph barrels, are shown in Figure 17, while Figure 18 shows the disassembled mainspring barrels, arbors and springs. Note that the chronograph mainspring is square cut at its free end, with a slight curvature to the outside. This spring does not have its end annealed. Further, the chronograph barrel does not have the usual anchor, but instead there are four equally spaced half-cylinders cut out of its inner wall, serving as friction devices in the same way that the bridle does in automatic watches. This becomes a necessity for those mainsprings wound by the same arbor, yet where one mainspring may be wound down to a variable degree, or not wound down at all, as may be the case with the chronograph if not used very often during any one day. Note the small wheel fastened to the barrel arbor. This wheel serves as the initiator of the up-down train leading to the dial. A similar wheel is fastened to the other mainspring arbor. Geneva stops are also present, so that the daily run of the watch is obtained from the center portion of the winding, from fully wound to fully unwound.

At this time, after complete disassembly, including the time, strike and chronograph trains, the parts were run through the cleaner, group by group where desirable. All parts in any one area were kept together to assure greater ease in reassembly, particularly for the many screws of varying size and the many small springs, some of which have a similar appearance yet are not identical in strength or length. Each part then was carefully examined: pivots, jewels, wheels teeth, pinions, leaves, springs, among others. Hole jewels were pegged

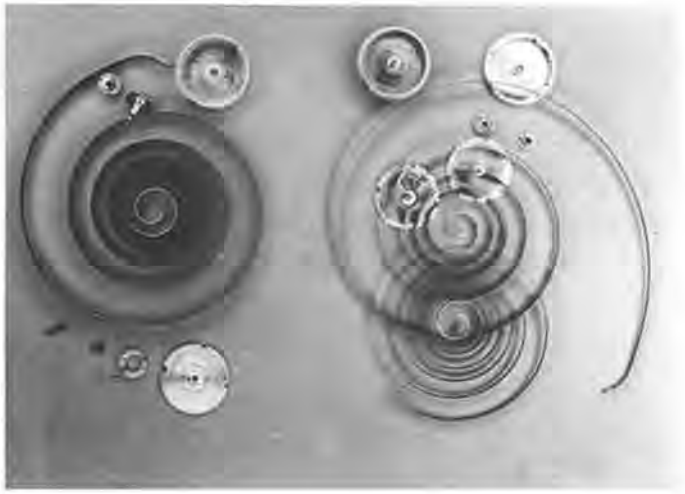


Figure 18. Mainspring barrels disassembled. Note square-cut end of chronograph mainspring (lower right).

out, cap jewels cleaned. The repairs to be made have already been described.

At this time the watch was completely assembled, section by section, assuring that each piece, as it was installed, was individually functional, because the total operation of the watch, train by train, could be checked only after complete assembly. Any failure of a part along the way might call for a partial or complete disassembly.

The special committee appointed to examine the entire Packard Collection had originally recommended that as museum pieces some of the problems seeming to plague the watches over the many years of non-use might be avoided if they were not lubricated. However, it did not take long for that view to be changed. It was found that even with the great care taken in their manufacture, with polished pivots, highly jeweled movements, polished levers, among other refinements, and with careful cleaning, the watches performed their functions only with great difficulty. Levers would not slide upon each other with little friction, striking actions would fail, set levers for the perpetual calendar and chronograph functions, among others would fail. Therefore, the earlier recommendation was altered, and the watches were fully lubricated. As appropriate, several grades of oils were applied, according to recommended practice, and the watch was cased and given its final adjustments.

This completes the story on the restoration of Watch



Figure 19. The restored watch, Patek, Philippe, #12.

#12, of the AWI Packard Collection. To be sure, this story has been abbreviated, but hopefully it will help in the encouragement of watchmakers to undertake those challenges which exist in the world of complicated, unusual, rare, and valuable timepieces with their various addenda. Figure 19 is included lest the reader forget that there was a whole watch both before and after this restoration was undertaken. It can be one of the most memorable and rewarding experiences of horological life.

Next month – the restoration of watch #11 of the AWI Packard Collection, also made by Patek, Philippe & Company.

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ANGLES



Elizabeth Brehmer

Facts About Flames

Fire is one of the greatest discoveries of mankind. When tamed it becomes an invaluable source of heat and energy. The flame body is composed of gas vapor created by the act of combustion. The gas combines with the oxygen or compressed air.

There are two basic flame types. The diffusion flame and the premix flame. The diffusion flame is composed of solid fuels such as the wax in a candle flame or liquid oil in an oil lamp. The solid fuel combines with the atmosphere and burns. There are three cones or rings which compose a candle flame. The outer most ring has the glow of burning gases. The central cone is invisible gas and the innermost ring is composed of mostly vapor. Early goldsmiths used a blowpipe to increase the intesity of the diffusion flame, thus converting it into a premix flame to burn hotter.

Premix flames are considerably more complex in heat intensity. Their color and quality depend on the type of gas used. A premix flame blows compressed air or oxygen and gas together to create combustion. The mixture takes place when the gas and oxygen first leave the very tip of the torch. Some torches are designed to mix the gas and oxygen together in a chamber within the torch body. A good example of this is in acetylene welding torches.

The way to judge a good premix flame is by the color zone areas within the flame and the size of the flame body. These factors will vary in characteristics depending upon the gas type used. It is important to adjust the flame of the torch properly. Efficient burning of oxygen and gas is necessary in order to achieve a good solder. A poor mixture of gas and oxygen causes the carbon in the oxygen to not burn off properly and a build-up of carbon dirt to form on your work pieces. A good clean flame mixture will burn as a blue or very slight yellowish-blue flame. Color depends on the gas used. Yellow in the flame's inner cone shows that the ratio of gas to oxygen is not correct and that there is unburned carbon present in the flame.

A torch tip which sparks or shows sparks within the flame may need the tip cleaned. To clean a torch tip, shut off the oxygen and gas nozzles and take the tip off of the torch. Dirt or carbon build-up may be clogging the opening. Hardware stores sell sets of tip cleaners, which look like small threaded wires in varying diameters. Choose the one which will fit the tip opening and work it around the sides of the opening and remove. The tip is then ready to reattach and use. When removing a torch tip or reattaching one, always use a jewelers wrench for the job. The tips are usually made out of brass and regular pliers can ruin the outside shape and make it difficult to remove in the future.

To light your torch, turn on the gas first and use a sparker to light it. **DO NOT** use a butane lighter. A lighter can explode around anything hot. They also tend to build up gas fumes which can easily ignite. Once the gas is lit, add the oxygen until all the yellow in the flame is gone. A yellow-blue color flame is correct. Flames with a strong yellow color will be too gentle and soft for concentrated soldering. Remember that oxygen alone is noncombustible. It must be mixed with a fuel in order to burn. A torch which has too much oxygen will hiss loudly and have a sharp pointed cone flame. This type of flame will cause the solder and metal to oxidize and prevent the solder from properly flowing.

There are three specific types of flames to recognize: an oxidizing flame, a reducing flame, and a neutral flame. An oxidizing flame should have a bright blue inner cone and a larger light blue outer cone. The inner cone is the hot spot in the flame. This cone should not be directly applied to a piece of work. It will quickly melt jewelry. Use the cone of the flame approximately one inch back from the jewelry piece.

When adjusting the torch for a reducing flame, watch the overall appearance of the inner cone. It is brushy and light blue in color. An oxidizing flame is sharp and pointed. The outer area is also brushy in appearance and is soft yellowish-blue color. This flame is good for annealing large pieces of metal or sweat soldering joints (a technique to be described in a later article). The flame is clean burning and causes little or no surface oxidation on metal. This flame should have enough oxygen present so that the flame loses almost all of its yellow color. Use the flame on jewelry work so that the area just within the tip of the innermost light blue cone almost touches the metal surface.

A neutral flame is balanced between the texture of an oxidizing flame and a reducing flame. The oxygen and gas are evenly adjusted so neither oxidation nor reduction takes place. The cone appearance is a blue inner cone, a medium blue middle cone, and a clean neat yellow-blue outer cone. This type of flame is the most commonly used torch flame.

Jewelers use a neutral flame for all types of general fabrication and repair work.

One of the secrets of soldering is to learn about heat transfer and distribution in metal. Heat distribution directly affects the solders flow and direction. Set your jewelry up on a flame retardant pad. Asbestos is available, however it is also dangerous to your health. A nonasbestos pad is a beter choice. Charcoal blocks work well for heating and are clean burning because of their carbon composition. They are quite messy to have around though, since they leave charcoal dust everywhere they are placed. Make sure to bind your block with binding wire around the outside (three or four rounds of heavy wire will do). When a charcoal block is heated in a particular area, that area will expand while the rest of the block does not. This will cause the block to break into several pieces, but binding wire will hold the shape together.

Charcoal blocks are great for soldering. They are soft and a high carbon product which makes them burn cleanly. The surface, when heated, is clean and will bounce heat back upward as well as absorbing some of the heat. Findings can be pushed down into the charcoal block's soft surface. Heads can be arranged in a pattern and pressed into the surface. The charcoal will help protect the tin prongs from direct heat and hold everything in place securely. Chains can be soldered by laying them on the block and applying the heat of the torch just in front of them. The heat will transfer through the charcoal block and it will melt the solder on the chain.

Ceramic blocks are also available, but they tend to absorb a great amount of your torch heat. Ceramic blocks work well in a kiln because the heat is constant and controlled. Ceramic is brittle and can easily be broken into pieces when used to support objects. Ceramic blocks can be used as a bench soldering pad, however, they tend to be quite porous.

Hard nonasbestos pads work well as protector pads on the top of a bench. They are also good for general soldering and heating purposes. As these pads get older they tend to break down and become dusty on the surface. Whenever this occurs it's a good time to replace them.

In cases where a large flat plate of metal is being soldered to smaller pieces, it is a good idea to set the plate up on some small blocks (i.e.: small pieces of charcoal block)

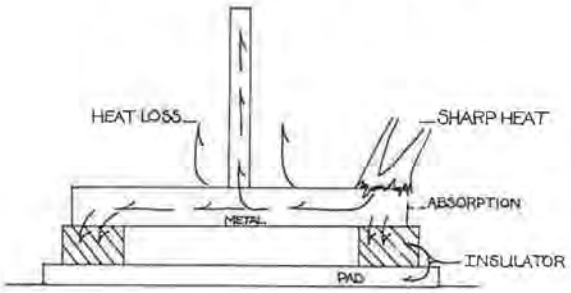
FIGURE 1
ANATOMY OF A TORCH FLAME



to allow for an efficient heat flow and a reduction in the amount of total heat absorption (Figure 1). Setting the heavier plate up on blocks and heating one end allows the heat to quickly transfer down to the smaller plate. If solder were to be applied to this particular joint, it would be set on the opposite side of the wall away from the heat because of the theory of heat control transfer. The solder would melt and be pulled through the joint toward the hottest part of the plate. Solder which is drawn through a joint by heat is a technique known as draw brazing or draw soldering.

In order for heat conduction/transfer to work properly the heat must be placed in the proper area of the piece being soldered (Figure 2). The heat input (adjustment of heat from torch) must be greater than the heat loss. Heat loss is determined by the atmospheric condition surrounding it and the tightness of the joint being soldered, but most importantly the amount of surface area being heated. The size of the torch tip should be directly related to the size of the job that you expect to do.

FIGURE 2
HEAT TRANSFER/CONDUCTION

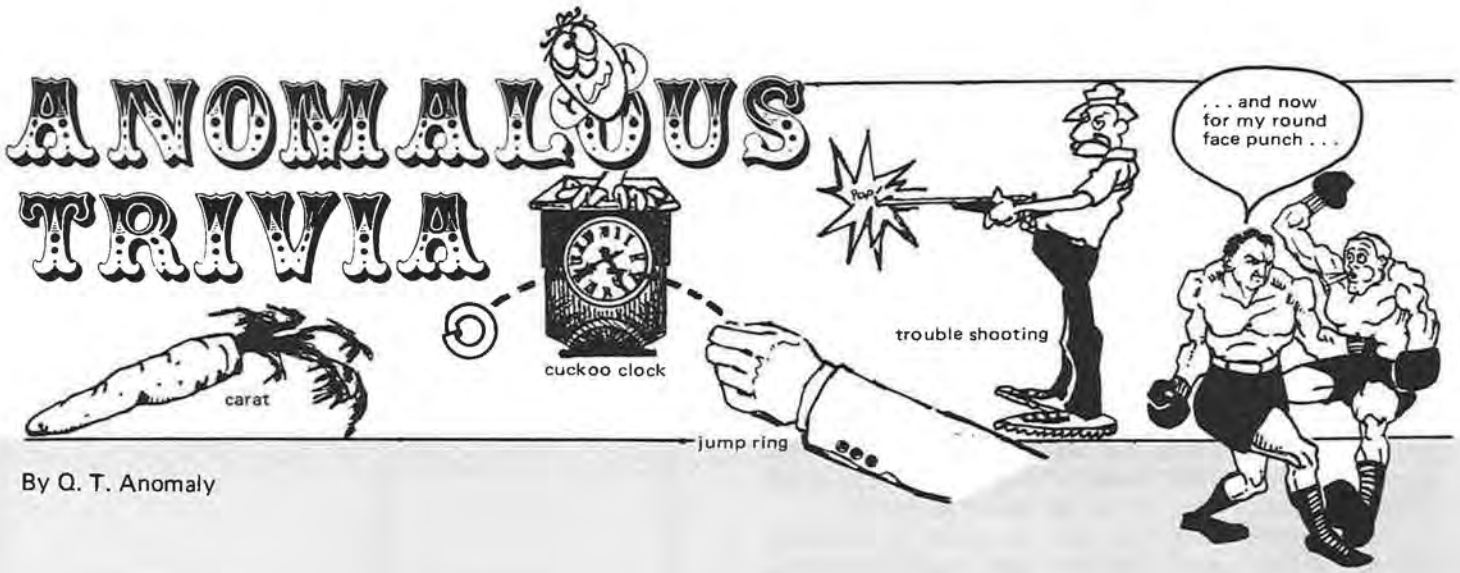


Torch tips are available in a variety of shapes and sizes, and are usually sold in conjunction with a particular name brand torch. The torch manufacturers break the tips down into flame size needs. For example one company classifies their tips as: Large Brush, for melting and annealing; Small Size, for general all purpose soldering and annealing; Pencil, for small delicate work; and Pin Point, for small chain repair and filigree work. Along with the general descriptions a number system is also stamped on the tip for recognition of the opening diameter.

A new set of torch tips is now available to jewelers. They have hypodermic style tips in a variety (six sizes) of very fine diameters. The kit is available with an adaptor which fits on your torch and the hypo tips fit within it. When purchasing any torch tips make sure that the tips advertised are applicable to your torch system. This includes your torch and gas source. The threading system can be different enough that the tip won't properly fit the torch. Torch tips regulate the flame size, and so does the source of fuel being used. Also, the volume of heat which is delivered depends on the size of the flame and the burning temperature of the gas source. Any of the gases, be it natural gas, propane, acetylene or butane—mixed with oxygen—will increase the burning temperature produced by approximately 1000° F over the atmospheric air.

Time and experience will train your eye to recognize the different types of flame sizes. Basic characteristics need to be remembered when adjusting your torch for use. Always turn the gas knob on first and light the gas with a spark lighter. **DO NOT** use a butane lighter at the bench. They are very dangerous. Once the gas is lit, then add the oxygen (or compressed air) until the flame is adjusted to the color necessary for the work that you are soldering.

Also, remember to analyze the size of the job and choose a tip which will perform efficiently. Good preparation of the metal is still extremely necessary for a gold solder, but having your equipment set up properly will help you cut down on valuable time.



By Q. T. Anomaly

Potpourri From the Bench

I just returned from the store where I purchased six cases of beer and one ten-cent bag of potato chips. The only reason I'm telling you this is because they recently installed these new machines at the check-out counters. All the clerk has to do is 'wipe' the article across the glass looking window and the price, description of the article, and the type of package appears on the screen. This is made possible due to the coding system, which consists of a bunch of stripes marked on the package.

Now what I'm getting at is, why doesn't one of you electrical geniuses out there invent something like that for our business? Imagine the amount of time and money that would be saved without having to buy or write tags for everything. Each piece would be scratched with the proper code, then the sales person would 'wipe' it across the screen to produce, as an example–Ladies 14K yellow gold solitaire ring, containing one 1.35 cts. brilliant cut diamond VS2-G color, set in a six prong white gold setting $5975.00.

Think of how it would revolutionize watch repair. A series of lines would tell the date, what was done, who did it, etc. We wouldn't have to use the case marks anymore, as one small line would take care of all that information. When the customer comes in, everything would appear on the screen. There wouldn't be a lot of time wasted trying to decipher hieroglyphic writing. This of course, would result in additional coffee break time.

Watch material would be a breeze. No packaging or anything, all the information listed on the part itself. 'Wipe' a balance staff and it could be coded with all the measurements, what models it is made for, what would have to be done in altering it for use in additional models, plus the numbers of the staking set punches needed to install the staff properly. Best of all, the listing of numbers used for this particular item, cross referenced with all the material systems that are used in the world. Just think, we could probably get away stocking maybe six staffs, four stems and a dozen mainsprings, if this system was put into use.

This gadget would also be great for watch cases. Sizes of crowns, crystals or other case information could be had with one 'wipe'. No more wasting time finding the case numbers. The supply houses never have a listing anyway. Sometimes I think there are vice-presidents in charge of thinking up numbers to put in cases. If he/she does a good job at the numbers game, a promotion to the next desk is in order. This is the one where the vice-president in charge of obsolescence sits. When he/she receives a new case number, they mark it in a book and stamp it 'obsolete'. We must give them credit though. They get this information into our hands as quickly as possible. This way, we can tell the customer who's buying a watch not to bring it in for repair because it's already obsolete.

BOOK REVIEW
(Continued from page 31)

THE MUSICAL BOX HANDBOOK, Volume No. 1, Number 1, Cylinder Boxes, by Graham Webb, colored soft covers, 243 pages, 8½ x 5½", 43 photos, over 50 drawings. Published by the Vestal Press Ltd., New York, 13850-0097, 1984 at $14.95.

Musical boxes are appealing nostalgic reminders of days before radio and are closely related to clockmakers. The musical boxes of old were most often created by clockmakers. Names familiar to jewelers, clock and watch collectors are equally known by collectors of music boxes–Cahpuis, Henri Capt, Dimier, Froissard, Golay, Le Coultre, Huegenin, Janvier, Jacot, Meylan, Raingo, Vacheron, Constantin, Mailzel and a host of other horologists were those who also made complicated musical mechanisms.

This new book is by Graham Webb, an internationally known dealer and restorer of musical boxes whose shop is in London's Portobello Road. He has authored other books on musical boxes.

The latest edition has a number of sections which should make this not only an appealing exposition, but one that is equally informative and instructive in the art of restoring these attractive pleasant-sounding devices.

Mr. Webb covers the development of the pinned cylinder musical mechanism, dating these close to the beginning of the nineteenth century, correctly placing this in the center of horological Switzerland. Antoine Favre, a familiar name in watchmaking, is credited with the introduction of the pinned-barrel musical mechanism. The pins on the rotating barrel plucked a series of prongs of a steel comb-like structure, each tooth tuned precisely to a note of the musical scale. This system was more compact than the earlier method of striking nests of bell and the new method allowed these to be used in watches as well.

Succeeding chapters continue with a recounting of the development of these devices with new technical sophistications and improvements in sound, quality, length of melody and choice of many melodies on one pinned barrel.

The book also contains a chapter on how to choose a musical box, examination, determining condition and desirability, maker's reputation, cases, and mechanism condition.

There are chapters on the cleaning and repair of musical box mechanisms, their cases, their inlay, veneer, and marquity. These chapters are most valuable as they show how professional restoration and repairs should be approached. All these skills are within the comprehending range and manipulations of competent clockmakers.

The instructions are clear, well illustrated and easily understood, making it one of the better essays on musical box repairs.

A useful chapter lists forty pages of makers and agents, details of their history, places and dates in which they worked. This lists many American names, inventors of improvements, makers who represented them and whose names appear on the boxes.

The book has a fine index. In all, it is to be recommended to jewelers, watchmakers and especially clockmakers who in the course of their work will be called upon to service either music boxes or clocks with musical sections.

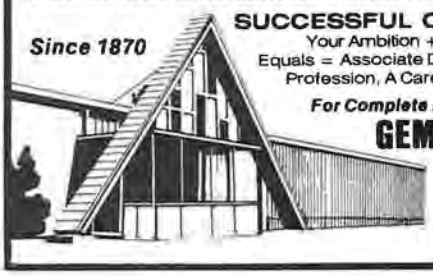
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WATCHES *INSIDE and OUT !*

"Watches Inside and Out" welcomes a new writer this month. Calvin E. Sustachek will share the knowledge gained in thirty-five years as a bench watchmaker in future issues of H.T.

Cal was an associate project engineer for fifteen years with Delco Electronic Division of General Motors. He was involved in building the Apollo Guidance Systems for the U.S. space program.

After graduating from Elgin Watch College, he earned the titles of Certified Master Watchmaker from AWI and Certified Accutron Technician from the Bulova Watch Company. He is a former field service instructor for Bulova. He has conducted many workshops on Accutron quartz watches throughout the western United States. He is presently teaching courses on watch testing equipment for AWI. He has, also, conducted classes on quartz watch repair at the Milwaukee Area Technical College.

Cal is an active member of the Wisconsin Horological Society and has served as president and technical director of that organization. Sustachek and his son Bill, a graduate GIA gemologist, own and operate a jewelry store in Racine, Wisconsin.



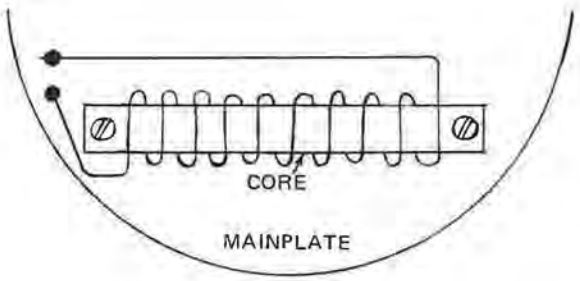
By Cal Sustachek

GROUNDED COILS

When quartz analog watches came onto the market several years ago, servicing them became a frequent topic of conversation among watchmakers. Questions like: How long will the quartz last? How shock resistant are they? How much will it drift? How good is the integrated circuit? How long will it last? Will the motor hold up? Will the rotors lose magnetism? Can the motor become weak? How sturdy are the coils? And last but not least, what about lubrication? At first it was thought that lubrication of pivots of the train wasn't necessary. Today we find that it is. Unless flooded, heavy lubrication is not harmful. Tests have been made which indicate that more lubrication provides better "low voltage runs" than lighter lubrication.

One problem that developed which wasn't apparent in the early quartz watches was the grounded coil. It is difficult to determine what causes this problem or why, because it is not something we can look for and see. It has no outward sign. In the early model watches, the movements were large and coils were made with heavier wire (probably with more insulation). With the demand for smaller, thinner watches, coils were made smaller using finer wire and thinner insulation. A watch with a grounded coil can operate very erratically. One day it may run fine, the next day it may run slow. It can be a very frustrating problem for a repairman. Temperature, humidity and the wearer's habits can affect it. A grounded coil cannot normally be discovered with traditional quartz watch testing methods. However, a quick simple test can be made at the time the coil testing is done.

Figure 1



WHAT A COIL IS AND WHAT IT DOES

It is nothing more than one long piece of insulated wire wrapped around a soft steel bar of metal (See Figure 1). The coil produces the electromagnetic field of the motor. When the electrical current flows through the wire, it creates the magnetic field to cause the rotor to turn. When the current flow is reversed, the magnetic field changes polarity and the rotor again turns. This action can take place every 1, 5, 10, 12, 30 or 60 seconds, depending on the design of the integrated circuit. The strength of the magnetic field of the motor is determined by a number of factors: the number of turns of the wire, the material of the core, and the distance between the rotor and the motor field. In the early years of quartz watch motors, the distance between the rotor and the field was small. Later designs have provided larger space due to a change in design of the fields and rotor. This is a welcome change because there is less chance of blockage of the rotor by foreign materials.

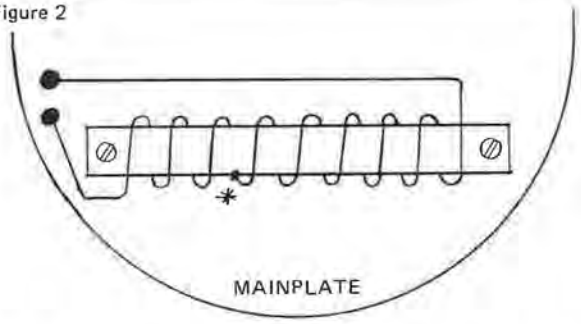
WHAT IS A GROUNDED COIL?

A grounded coil is one that has a break in the insulation on the wire and the wire is touching either the bar that it is wound around or touching the mainplate of the watch. A ground is not a broken wire in the coil, it could be in one or several points along the wire.

In nearly every quartz watch, the positive side of the battery is grounded to the mainplate. The metal core of the

coil is fastened to the mainplate. If the coil is grounded, the current flow through the coil wire will not follow the electrical path that it should from one connection of the electronic circuit through the coil wire and back to the other. Instead, it will flow back to the electronic circuit through the ground to the core (See Figure 2). This creates a limited magnetic field in the motor because it bypasses some turns of wire. In some cases it may be strong enough to index the rotor and in others it may not. A watch may run until the power demand on the motor is greater, during the date change, and then it could stop.

Figure 2



* A place where insulation is off the wire and bare wire touches the core.

Grounds of coils can take many different forms. They may come and go. The ground could be at the very end of the coil so that it acts like a short circuit and the watch will not run at all. It could be near the center and the coil would have a smaller magnetic field because only half the wraps of the wire are being used.

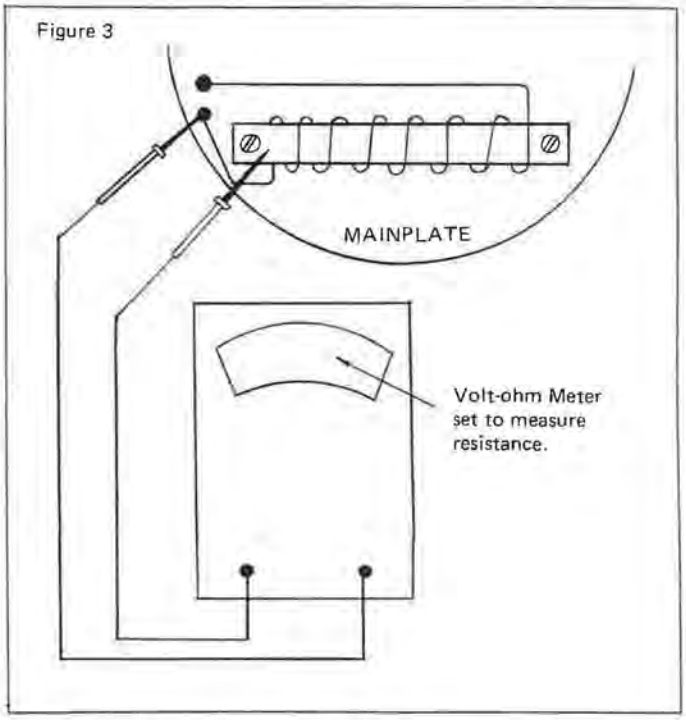
WHAT CAUSES A GROUNDED COIL?

A grounded coil can be caused by a number of things: (1) Too little insulation of the wire; (2) A warping of the coil bar due to improper fastening to the mainplate, or a bar that is not straight enough to lay flat; (3) "Cold flow" of the insulation, if the insulated wire is pressed tightly against a metal surface, the constant pressure against the insulation can cause it to "flow" away from the pressure point exposing the bare wire and allowing it to come in contact with the metal; (4) Moisture and resulting corrosion can cause a breakdown of the insulation on the coil permitting the bare wire to contact the metal. Moisture and corrosion conditions can be the most frustrating because they can change with the humidity and temperature.

HOW CAN A GROUNDED COIL BE DETERMINED?

When taking a current consumption check on a watch, the current pulses should be of equal magnitude. In a watch with a grounded coil, these current pulses can be of unequal magnitude. This is one indication of the coil problem. If the pulses are a great deal different; i.e., a larger pulse one time and a very small one the next, this could indicate that the ground is very near one end of the coil.

Figure 3



HOW CAN A GROUNDED COIL BE TESTED?

With the coil disconnected from the electronic assembly, the resistance of the coil can be measured from one terminal to the other with an ohm meter. The resistance of most coils will fall in the 1,000 to 4,000 ohm range. To check for ground, touch one probe to one lead and the other to the metal bar that the coil is wound on (See Figure 3). A grounded coil will show a resistance reading. A good coil will show none at all. This test can be made with the coil apart from the movement. However, it should also be done when the coil is fastened to the mainplate because the grounded condition could be caused by : (1) improper fastening of the coil to the plate; (2) warping of the coil because of improper fit; or (3) moisture or corrosion between the coil and the plate causing a current flow from the wire to the ground. This third condition can be the most perplexing because it can be intermittent depending on heat or humidity. It is a condition that can exist when a watch has been subjected to moisture and clears up when it is dried out; or it can remain as a result of chemical deposits or corrosion left behind by the water.

WHAT CAN BE DONE TO CORRECT A GROUNDED COIL?

The only solution to a failure due to a grounded coil is to replace it with a new one. On a coil with broken wire, the break is on the surface where it can be seen and it can be corrected. In most instances, the ground of the coil is deep under the coils of wire against the core of the coil and no repair can be achieved.

Modern watch test equipment is designed to permit testing motor coils for grounds even when the coil is connected to the electronic assembly. This equipment will be reviewed in future articles.

In the Spotlight © 1985
by Orville R. Hagans



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The Ball Escapement of Verite

Description of Escapement

An eccentric disc *a* is fastened upon the arbor of the last wheel. The lever *c c'* is also mounted upon this arbor. A lever *d d'* carries upon its center of motion a fork *b*, the prongs of which embrace the eccentric disc. Projection *e* is another arm of the lever *d d'*. It still possesses an elongation not visible in the figure, covered by the end of the lever *c c'*. A second part, similar to this, is seen on the lever *c c'*. The detent of the train is affected by the contact of these two parts, and activity is regulated in such a manner that the pressure of the lever *c c'* against the prolongation *e* occurs at right angles to a line imagined as drawn from the point of contact toward the center of motion of the lever *d d'*, which is in perfect equipoise.

Two balls are suspended from the lever *d d'* which impart the impulse to the pendulum. At each side of the lever *d d'* two parts, *m* and *n'*, movable around an axis, are arranged. Their lower ends are provided with two small detent planes upon which the ends of the lever *d d'* lay themselves alternately.

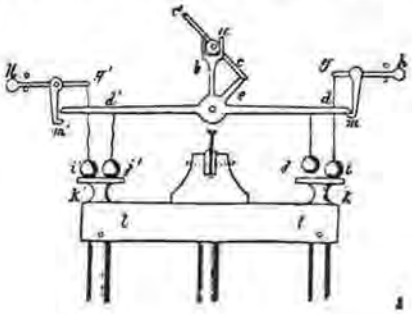
Two balls *i i'* are suspended on the arms *g g'* of the levers *g h* and *g' h'*, and fastened on the same arbors as the detents *m* and *m'*, and their arms *h h'*, which are heavier than the arms *g g'* pertaining to them, move between two pins.

The upper end of the pendulum is provided with a cross piece *l l*, which carries at the two ends level planes *k k'*, upon which rest alternately the balls imparting the impulse.

Action of Escapement

The accompaning sketch represents the end of an impulse from right to left, which was first commenced by the ball *j* and is still continued by the ball *i*; the balls *j'* and *i'* on the opposite side are already lifted by the level plane *k'* of the cross piece.

When the pendulum continues its oscillation from right to left, a part of the weight *i* will cease to exert its pressure, whereby the ball *i* will draw after it the lever arm *g*. The descent of the lever arm *g* forces the detent *m*, fastened with it upon the same arbor, to liberate the point of the lever arm *d* to which the ball *j* is fastened. The weight of this ball then draws the lever arm down, and in this



manner unlocks the connection of the projection *e* with the lever arm *c*. The train, which is now no longer in detent, turns the eccentric disc *a*, which again draws into sympathy the fork *b* and with it the lever arm *d d'*. The lever arm *d'*, in its motion, assumes precisely at the moment detent upon repose *m'*, when the arm *c'*, after it has accomplished one-half a revolution, strikes again at the place of the projection *e*, and thus again stops the activity of the train. This return of the detent of the lever *d d'*, determines the falling height of the ball *j'* in the now occurring impulse from left to right, and at the same time lifts the ball *j* in order to hold it ready for the next occurring impulse from right to left.

It will be seen from the drawing that the eccentric disc *a* does not entirely fill the space between the prongs of the fork *b*. This is for the purpose of permitting the ball *j* to make the slight descending motion which is caused by the unlocking of the train. It is not so large, however, that the ball is able to reach the pendulum.

When the pendulum has accomplished its oscillation from right to left, the motion of from left to right begins under the influence of the proper weight of the pendulum and the weight of the two balls *i'* and *j'*. When the motion has progressed as far as a certain point, the ball *j'* ceases to exert its pressure upon the pendulum so that the latter then receives its impulse only from the ball *i'*, which finally also leaves the level plane of the pendulum and remains suspended upon the arm *g'*, where, by its weight, it draws back the repose *m'* upon which, until now, laid the point of the lever arm *d'*. The ball *j'* which is now no longer retained by the resistance of this repose, compels the lever *d d'* to make a small motion, through which again the position of rest of the parts *e* and *c* is destroyed. The train, with its eccentric disc *a*, commence to move, whereby the lever *d d'* is again brought into the position shown in the drawing, and in this manner the falling height of the ball *j* is established for the next impulse. The next succeeding impulse is prepared by the simultaneous lifting of the ball *j'*. So as not to overcrowd the drawing, a small fly situated upon the arbor of the eccentric disc, is left off.

QUESTION AND ANSWERS
(Continued from page 16)

A I have read your request with great interest. I hope that I interpret your needs correctly. Long cased clock movements with pendulums that will be at least as accurate as a really fine quartz clock is what you are seeking.

I do not think that is available. The clocks with pendulums and quartz crystal resonators are those that are sold by suppliers to people who like to see a pendulum swing yet be as accurate as a quartz clock. In those instances, the pendulum serves no purpose except to please the eye. A friend, like yourself, now retired but a former physicist for RCA and holder of 80 patents, made a clock using a schoolhouse Seth Thomas weight driven pendulum clock with a quartz regulated resonator–and got that to keep the kind of time you seek. He published this in **Scientific American** *a few years ago but that was a tour de force effort and impractical for all other purposes.*

If you want a clock movement to keep accurate time within those four seconds, I might suggest obtaining a movement and invar pendulum that is now available from clock dealers in England. These are surplus Hope-Jones gravity clocks with "free pendulums." These are now considered surplus since observatory quality quartz clocks became available. With proper stability, barometric sealing of the cases and other controls, you might do better than four seconds. These can be obtained by advertising for one in the **British Horological Journal**. *Occasionally I do see an ad for these in both the* **Mart** *of the NAWCC and in the classified ad section of the* **British Horological Journal.**

The free pendulum of Hope-Jones clock as already mentioned was not a failure; it merely has been technologically eclipsed by the modern quartz technology. Quartz clocks that can be used as astronomical clocks by the observatories are a different breed of cat than the stuff available from clock dealers. These are quartz in the megacycle range and with sophisticated temperature controls, preaging, stress polish and cut according to certain rules to obtain the required results. If these are what you want, inquire from the local observatory where they've bought theirs. But these certainly aren't outfits to use in a handmade wooden case as they aren't cosmetically suited at all.

Henry B. Fried

I'd like to submit some information on an unusual clock I once saw mentioned in one of your articles.

Known as the "Angelus" Clock, they were used to count out the three times during the day when the faithful would recite a prayer called *The Angelus*. This prayer is still recited by many Catholics each day at sunrise, noon, and sunset; hence, the 6 AM, 12 PM, and 6 PM strikes. The prayers are made up of three phrases in three parts.

Here is the prayer which will show how the bell strikes accompany the prayer. In many monasteries, the monks chant the prayer along with the tower bells. One such place I've visited is Genesse Abbey in upstate New York.

The steeple bells would peel the notes so that all on the countryside could, in theory, be saying this prayer at the same time. Since the prayer is basically the words of the Blessed Mother, it is considered Mary's prayer; her words with "the angel," or *The Angelus.*

Rev. Dennis D. Donovan
Goshen, NY

BELL STRIKE	PRAYER (Leader and Congregation or Choir 1 and Choir 2)
X	The angel of the Lord declared unto Mary.
X	And she conceived of the Holy Spirit.
X	Hail Mary, full of grace, the Lord is with Thee, Blessed art thou among women, and blessed is the fruit of thy womb, Jesus. Holy Mary, Mother of God, Pray for us sinners, now and at the hour of our death. Amen.
X	Behold the handmaid of the Lord.
X	Be it done unto me according to your word.
X	Hail Mary . . . (same as above, repeated)
X	And the Word was made flesh.
X	And dwelt among us.
X	Hail Mary . . . (repeated as above)
	Pray for us, O holy Mother of God. That we may be made worthy of the promises of Christ.
X (9 times)	Let us pray. Pour forth, we beseech you, O Lord, your grace into our hearts; that as we have known the incarnation of Christ, your Son, by the message of an angel, so by his passion and cross we may be brought to the glory of his resurrection. Through Christ, our Lord. Amen.

(Through the courtesy of Rev. Dennis D. Donovan, S.D.B., Goshen, NY)



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SHOP TALK

Wes Door, CMW



Quartz Analog Quick Tester

Since my son, Jim, has made some super equipment testers for various quartz repairs, I have asked him to write this month's article and describe one of them.

The tester described in this article is one that I have used for several years to help troubleshoot quartz analog watches. It helps to isolate whether the circuit or the coil and train are at fault. In many cases it can be used without disassembling the watch.

This month we will describe how to build the tester and what it does. Next month we will explain how to use it.

Its principle is very simple. To test a circuit, we connect its output to the coil in a good movement. If the good watch runs, the circuit is okay. To test the coil and the train we connect the coil inputs to a good circuit. If the faulty watch runs, the coil and train are okay. If not, then more work will be needed to isolate the problem. One nice part of this testing method is that since the circuit outputs and the coil inputs are in the same place, we only have to probe one location on the watch to make both tests.

The tester utilizes the ESA 961.101 movement. This is the version with a second hand. I chose it because it pulses once per second, the circuit paths are easy to work with, and it has a reasonable cost. A parts list is included at the end of the article.

If you have had experience soldering on circuit boards, you shouldn't have any trouble making this tester. If you haven't, it may be wise to ask a friend who has to help with that part of the project.

First locate the circuit output paths. They are the two longest ones and are usually marked "Five 5 Jewels Swiss" and "Unadjusted". Refer to Figure 1 and cut the circuit paths between the dotted lines as indicated by the arrows. You now have four paths which we have marked A, B, C and D.

I advise removing the battery from the watch while soldering. Solder two black wires to paths A and B; then solder two red wires to paths C and D. If solder flowed between any of the paths, remove it or you may have a short. You now should have a movement with four wires hanging off of it.

Figure 2 shows what your tester might look like when it is mounted in a box. Almost any type of box will work, as long as the top is thin enough for the cannon pinion to go through it and have room for a second hand. Even a large watch tin will work.

Figure 1

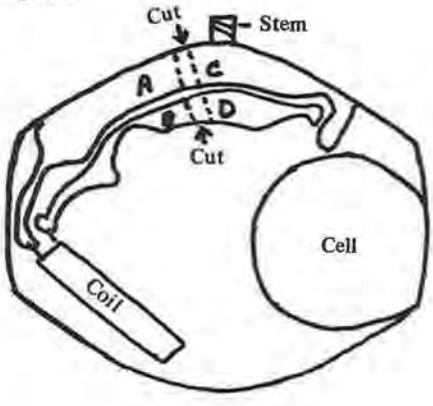
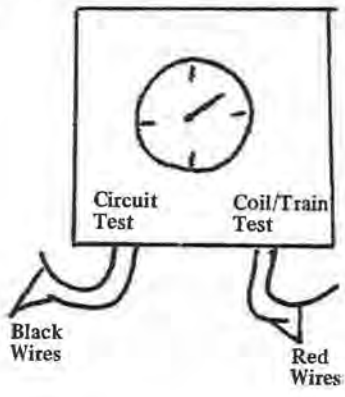


Figure 2



To mount the movement, make a hole for the cannon pinion to go through and two holes for the two sets of wires to go through. The movement can be held to the top of the box with double face tape. Use a medium weight tape that can be found in hardware stores. Place a little on the dial side. Make sure it doesn't touch the cannon pinion or the setting parts. Line up the pinion with the hole you drilled and press in place.

Before running the wires through their holes, tie a loose knot in each set of wires. These knots should rest against the inside wall of the box. The knots will help prevent you from pulling the wires too far and causing them to pull off of the circuit.

Before closing the box, be sure there is a fresh battery in the movement and the stem is in the running position. A piece of foam under the movement will help to hold it in place.

Either place a dial over the cannon pinion or make some marks on the box as reference points. Put a second hand on the movement. Attach a watch crystal over the hand to protect it from damage. Double face tape can be used to attach the dial and the crystal.

Adjust the length of the wires to suit your needs and attach probes to the ends. The probes should have very fine points. Straight pins will work if they are soldered to the wire ends.

Now you are ready to test the unit. Hold the ends of the black wires against the red wires. The second hand should begin to move. If it doesn't, check all connections, make sure the battery is fresh and there are no shorts, and that the stem is in the in position.

Next month we will describe how to use the tester.

Parts List:

ESA 961.101 movement with second hand
Wire - small gauge, stranded - 4 pieces at least 8 inches long, 2 black and 2 red
Box - with fairly thin top, large watch tin will work
Double face tape - medium weight preferred
Probes - 4 with fine points, straight pins will work
Watch crystal - to protect second hand
Solder - fine rosin core, for circuit board soldering.

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ESA 588.001	5½ x 6¾	ESA 977.001 - Ronda 3572 -	12.95	14.95	15.95
FE 6320	6¾ x 8	FF 60 - ST 69 - ESA 961.001	8.50	9.50	10.50
FE 6820	5½ x 6¾	INT 301.001 AS 1977 - Seiko 11A	8.50	9.50	10.50
Bulova 2500	5½ x 6¾	Popular Bulova Model	15.00	16.00	16.50
Bulova 2801.10	11½ Ligne	SMQ - 7 Jewels Sweep Sec.	12.95		
Bulova 2802.10	11½ Ligne	SMQ - 7 Jewels Date	12.95		
Bulova 2210	7½ x 8½	Conversion Kit Complete Using 2500 Movt	19.95		
Bulova 218-2 Bulova 224-2	12 Ligne	Conversion Kit Complete Using 2783 Movt	30.00		
Pulsar Seiko 480	6¾ x 8	Discontinued - Use Either 481 - 482			
Pulsar Seiko 481	6¾ x 8	Sweep Replace For 480 - Change Hands	8.95	9.95	10.95
Pulsar Seiko 482	6¾ x 8	Non Sweep Replace For 480 - Change Hands	8.95	9.95	10.95
Pulsar Seiko 588	5½ x 6¾	Replacement for 590 - 5420 A	9.95	10.95	11.95
Pulsar Seiko 590	5½ x 6¾	Use 588 - Same Dial - Hands	9.95	10.95	11.95
Pulsar Seiko V230	5½	Thinner Version of 235	10.95	11.95	12.95
Pulsar Seiko V235	5½	Use 230 - Slightly Thinner			
Pulsar Seiko V242	6¾ x 8	Sweep Second Date - Lorus 242	10.95	11.95	12.95
Pulsar Seiko V243	6¾ x 8	Sweep Second Day - Date Lorus 243	11.95	12.95	13.95
Miyota Citizen 3220	5½ x 6¾	Non Sweep - 3N20 - 3228 Y590	12.00	13.00	14.00
Miyota Citizen 2950	5½ x 6¾	Sweep Second - 2Y50	12.00	13.00	14.00
Miyota Citizen 2030	6¾ x 8	Sweep Second - 2035 - 2038	11.00	12.00	13.00
Miyota Citizen 2020	6¾ x 8	Non Sweep 2028	11.00	12.00	12.00
Harley Ronda 3572	5½ x 6¾	Thin - 2.7mm - 5AH Bul Re-Position Dial Ft.	13.50	14.00	14.50

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Affiliate Chapter Column



David H. Fryday

LOOKING FORWARD TO THE FUTURE

IMPORTANT DEADLINE INFORMATION

The editors of H.T. are anxious to print as many different items as space will permit in the *Association News* columns. However, deadlines must be met if your chapter news material is to be used.

News copy must be received at AWI Central five weeks prior to the month of issue to be considered for use (i.e., the deadline for the March issue is January 25).

Most sincere thanks are owed to Walter Riegler for providing me with invaluable experience in helping to operate the Affiliate Chapter organization. The individual chapters have expressed their appreciation for his fine articles and his genuine concern for chapter interests. We appreciate his responsiveness to the delegates and his years of service to the American Watchmakers Institute.

Likewise, I will listen to the membership and do my utmost to promote and support the affiliate chapters. The Affiliate Chapter organization is a link between the AWI national organization and the individual state organizations. If the delegates of these affiliated chapters work together all year long, more can be accomplished at the annual meeting in June.

Tom White of Arizona will serve as our new Vice-chairman. We will work together this year to be productive and further the goals of the Affiliate Chapters. Paul Wadsworth, delegate from New York has expressed an interest in clarifying the process by which the Affiliate Chapters make proposals/recommendations to the Board of Directors of the AWI by writing a booklet for the chapters. Carl Lewis, delegate from the state of Washington, will develop a handbook to be distributed to new delegates at the annual meeting explaining their responsibilities and their rights.

Reflecting on the 1985 annual meeting, it is clear to me that the single most important issue for the Affiliate Chapter is how to maintain or increase membership in our local, state, and national organizations. Next month, this column will focus on the topic of membership.

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

ONTARIO

The Ontario Watchmakers Association held their 48th Annual Members Meeting at Loews Westbury Hotel in Toronto, Ontario. At the business session the 1984 officers were voted a 2nd term of office by acclamation for 1985. They are: President James Hill, 1st Vice-president Michael Cosby, 2nd Vice-president David Azoulay, 3rd Vice-president Stewart Gold, Treasurer David Murakami, and Secretary Robert Phillip.

A special committee was set up to plan a celebration for the OWA's 50th anniversary in 1987. The Committee Chairman Michael Cosby, and Co-chairman David Azoulay look forward to suggestions from the membership on what type of program to have in celebrating the special occasion.

Benjamin Matz, CMW (AWI) NYCWS was the guest speaker at the meeting's afternoon Technical Program. Mr. Matz is a past president and director of the New York City Watchmakers Society. At the Annual Members Meeting of AWI in 1984 he gave a report to those present regarding a survey of the future of watch repair prospects for the Jewelry Industry in the United States. Ben checked his figures in regard to the Canadian Market and found that they have the prospect of more mechanical watches for repair in the next 30 years than in the United States.



David Barthau, past president of OWA, member of AWI and chairman of the Quarter Century Club, presents Willis Paisley of Sault Ste. Marie a Certificate, thereby making him a member. Willis is a member of OWA and AWI. Executive Secretary Robert Phillip is in the background.

MASSACHUSETTS

June was a very productive and successful month for the Massachusetts Watchmakers Association. They held an important dinner meeting in Cambridge, MA. The new slate of officers elected are: President Robert Cohen, Charles Clavin, Vice-president, Treasurer Alvin Cohen, Financial Secretary Ed McKeon, and Recording Secretary Joan Curran. The new directors are: Harvey Plouffe, Robert Glaser, and Gerald Bieber. Other directors with current terms are Norman Rubin, John Alden, Giacomo Cappabianca, and John Urban.

Al Carruci will be taking the place of the Past President Jose Piatti as Chairman of the Board.

The next meeting will be held on September 17, 1985 at the Howard Johnson Motel in Cambridge, MA.

NEW YORK

The Horological Society of New York met recently at the Loew's Hotel Summit in New York. Mr. Irving Albert presented a talk on retrofitting that was filled with ingenious techniques for converting mechanical watches into quartz watches.

Mr. Albert is a technical writer, lecturer, manager of the Technical Information Department for the Bulova Watch Company and a past president of the Horological Society of New York. He also recently had published an important series of articles on unusual stem and battery installations in quartz watches. Not resting on his laurels, he now has turned his attention to providing information on retrofitting.

In his illustrated talk he pointed out that the main problems facing the watchmaker in the conversion process are: the dial feet, hour and cannon pinion heights, movement thickness and stem hole position, among other problems. Of equal importance is the fitting of hands of the lightest weight to compensate for the low torque of some quartz movements.

At the Bulova School of Watchmaking, Jacques Reymond conducted a bench course on quartz watches for the members of the Horological Society of New York recently.

In the all-day session, three movements representing different types of mechanisms were covered. Of special importance were two points that Mr. Reymond brought to the attention of the members: (1) a warning on test meters; and (2) a short-cut to determine whether a movement is running in a non-sweep watch.

Specifically, Mr. Reymond cautioned the repairers to use only test meters designed for watch movements because many other meters contain 9 Volt batteries. Consequently, in checking coils which are permanently attached to the P.C. board, the board can be damaged.

Regarding the short-cut, he stated that when a non-sweep movement was in order, he could see the accelerated motion of the train wheels by contacting the proper points on the circuit (T points).





LEFT: Jacques Reymond, Technical Director of ETA Industries, Inc., conducted a bench course on quartz watches recently for the Horological Society of New York. RIGHT: Irving H. Albert, Manager of Technical Information Services, Bulova Watch Company, addressed the Society about retrofitting.



Watchmakers Association of New Jersey has honored Past President Walter Riegler with its Fellowship Award in recognition of his years of leadership and continuing service to the organization. A charter member of AWI, Walter Riegler has served many years as WANJ liaison and is immediate past chairman of AWI Affiliate Chapters. He is also a past president of the Central Jersey Watchmakers Guild and has been AWI area representative. Mr. Riegler is pictured at right receiving the award from Anthony Montefusco, awards chairman.

SCHOLASTICALLY SPEAKING



Alice Carpenter, CMW, CEWS

REC Meeting - 1985

By Alice Carpenter and Robert Howell
WEDNESDAY, JUNE 26 – TIME: 12 NOON

As I write this, we are finishing up our in-service and annual meeting for instructor members of the Research and Education Council (REC) member schools. It has been a good meeting.

On Tuesday, Marshall Richmond gave a program for us on jewelry repair for the watchmaker. He covered the simple repairs most watchmakers need to know in today's stores. We all found Marshall to be interesting and informative.

Come to think of it, I have never attended a seminar that I didn't learn something. In fact, several years ago there was one seminar that I somehow attended twice. I learned something from both of them.

As you may know, AWI has started a bench course on jewelry repair. The course is currently being taught by Marshall Richmond, Max Hoover and Charles Callahan, and I highly recommend it.

Speaking of AWI courses, Fred Burckhardt's course on "Gemology for the Watchmaker" is also excellent. Fred spoke to us on Wednesday morning. Michael Plourde and his son, Robert, from Quebec will speak to us on Wednesday afternoon on how they make video tapes of the watchmaking program in their school. This is a very timely program for those schools who have not yet begun to video-tape their programs. Most of the schools represented here this year fit into that category.

On Monday, Gerry Hough spoke to us and explained how Parkland College has met the challenge of falling enrollment by implementing a program called "Micro Precision Technology", and Jerry Jaeger reviewed the new certification examinations with the REC instructors.

Tonight, we are squeezing in Ewell Hartman, who will preview his new "mail order" seminar. (Sorry about that, Ewell. That's my label, and not Ewell's.) His seminar was designed to be given to small groups without necessitating the presence of an AWI instructor.

Last on our schedule is Remy Wallechi. We are looking forward to the bench course he is going to present on Thursday.

I feel that a word of explanation is in order here to the watchmakers in the field who are not members of REC. First, the only persons who can attend the REC meetings are the watchmaking instructors who represent schools who hold membership in REC. This membership costs the schools a membership fee. Second, it would not be possible to let all the watchmakers attend who wanted to. Therefore, there is a rule, born of necessity, that no one other than these instructors be allowed to attend.

At our business meeting, it was announced that George Lewis and Leon Martin were elected to the Board of Directors of REC. The following were elected to serve as officers for the coming year: George Lewis, secretary; Leon Martin, vice-chairman; and Robert Howell, chairman.

Congratulations to each of you.

And now – the next person you will hear from in this column will be ––

Robert Howell, Chairman of REC

The Research and Education Council (REC) had 13 schools represented this year by 16 instructors. Those present were as follows: Alice Carpenter, Goldsboro, NC; Pat Williams, Dallas, TX; George Lewis, Seattle, WA; Gerald Jaeger, Milwaukee, WI; Milton Stevens, AWI Central; James Burdette, Great Falls, MT; Howard Woodward, St. Paul, MN; Frank Torre, Boston, MA; Robert Plourde, Quebec, Canada; Bill Clary, Champaign, IL; Leon Martin, Orangeburg, SC; Wes Van Every, Denver, CO; Michael Plourde, Quebec, Canada; Gerry Hough, Champaign, IL; Jim Lubic, Cincinnati, OH; and Robert L. Howell, Paris, TX.

I would like to express my admiration and respect for the previous Chairman of the REC, Alice Carpenter, for an outstanding job. I, as the newly elected Chairman, already feel the pressure of the challenges as I anticipate trying to fill her boots.

I look back over the accomplishments, and the efforts not accomplished, over the past two years and I am overwhelmed. That is the exact reason I wish to ask each and every school to join the REC at this time and for each and every member school to participate in the functions of this branch of the AWI for the coming year. These are **your** organizations–the REC and AWI. AWI needs your participation for added strength and the REC needs your ideas and efforts in strengthening the functions of the AWI.

"Scholastically speaking," the most important advice I can give any graduate from any school, is to become acquainted with your competitor down the street–he can help you. There are many things you have not yet encountered–he can help you. There are new technologies surfacing every day–he can help you.

The AWI has just observed its first 25 years of positive, successful operation. Could this have happened without the cooperation of one individual with the competitor down the street or across the country?

"Scholastically speaking," the most important advice I can give any educator from any school, is to read the advice I gave the students above. Would this not apply to you? We need you, not only for my first year as Chairman of the REC, but let's shoot for another 25 years of AWI's successful operation.

BENCH COURSES

	PROGRAMS	INSTRUCTORS
A	Meter Microamps and Modules	Gerald G. Jaeger, CMW, CEWS
B	AWI Certified Citizen Quartz Watch Technician	Buddy Carpenter, CEWS
C	Pulsar Quartz Analog Y590 and Y112	James H. Broughton, CEWS
D	Seiko Quartz Combos	Leslie L. Smith, CMW, CEWS
E	Quartz Watch Test Equipment	Calvin E. Sustachek, CMW
F	Common Sense Quartz Watch Repair	Robert F. Bishop
G	ESA Digital/Analog 900.911 and ETA Analog 961.101	William Biederman, CMW
H	ESA Analog Quartz Repair	James Adams, CMW
I	Using the Watchmakers Lathe	Archie B. Perkins, CMW
L	Introduction to Striking Clocks	Joseph G. Baier, Ph.D., CMC, CMW
M	Striking Clocks—Advanced Seminar	Joseph G. Baier, Ph.D., CMC, CMW
N	Introduction to Clock Repair	David G. Arnold, CMC
R	Introduction to Jewelry Skills	Marshall F. Richmond, CMW Max Hoover, CMC Charles Callahan

AUGUST 1985

10-11	F	St. Louis, MO	BISHOP
11	H	Milwaukee, WI	ADAMS
11-13	R	Des Moines, IA	HOOVER
18	G	Columbia, SC	BIEDERMAN
21-23	R	Denver, CO	RICHMOND
26-28	R	Salt Lake City, UT	RICHMOND

SEPTEMBER

4-6	R	Phoenix, AZ	RICHMOND
7	A	State College, PA	JAEGER
13	E	Salt Lake City, UT	SUSTACHEK
13	B	Manden, ND	CARPENTER
14-15	L	Dallas, TX	BAIER
15-17	R	Milwaukee, WI	CALLAHAN
17	E	Sacramento, CA	SUSTACHEK
19	E	Fresno, CA	SUSTACHEK
19-21	R	Cleveland, OH	CALLAHAN
20-23	I	San Francisco, CA	PERKINS
22	C	Richmond, VA	BROUGHTON
22	D	Denver, CO	SMITH
24	E	Los Angeles, CA	SUSTACHEK
26	E	San Diego, CA	SUSTACHEK
30-Oct2	R	West Virginia	CALLAHAN

OCTOBER

6	B	St. Paul, MN	CARPENTER
12-13	F	Hartford, CT	BISHOP
13-15	R	Bismark, ND	HOOVER
17-19	R	Pierre, SD	HOOVER
20	H	Shreveport, LA	ADAMS

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3. THE BEST OF J.E. COLEMAN - CLOCKMAKER—Orville R. Hagans. An aid to solving everyday problems in clock repairing $30.00
4. ESSENCE OF CLOCK REPAIR—Sean C. (Pat) Monk. A practicing clockmaker reveals repairing secrets. $19.95
5. QUESTIONS & ANSWERS FOR THE CLOCKMAKING PROFESSION—AWI. Experts answer everyday questions about clockmaking $14.95
6. QUESTIONS & ANSWERS FOR THE WATCHMAKING PROFESSION—AWI. Helpful information on repairing watches. $5.95
7. REPAIRING QUARTZ WATCHES—Henry B. Fried. Includes a basic course in electricity & electronic horology $22.95
8. STRIKING CLOCKS—Joseph G. Baier. A hands-on survey for the clockmaker. $7.95
9. WATCH & CLOCKMAKERS BUYER'S GUIDE—AWI. Watch & clock supply data is at your fingertips $7.95
10. WATCH & CLOCK INFORMATION, PLEASE—W.H. Samelius. The writing of Samelius edited by O.R. Hagans $30.00
11. THE WATCH ESCAPEMENT—Henry B. Fried. How to analyze, adjust, repair the lever and cylinder, and more $8.00
12. THE WATCH REPAIRER'S MANUAL—Henry B. Fried. A basic guide to watch repairing $17.95

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ETA Industries Relocates

ETA Industries, Inc., the U.S. marketing and service arm for Switzerland's largest manufacturer of watch movements, has relocated to a new headquarters facility in mid-Manhattan. The new address is: ETA Industries, Inc., 8 West 40th Street, New York, NY 10018. The new telephone number is (212) 302-2222.

"Continuing expansion of our watch movement business since ETA opened its first marketing office here two-and-a-half years ago, plus the reawakened consumer interest in Swiss watches, necessitated our move to larger quarters," said Kurt Schaller, President of ETA Industries.

"The new facilities will house ETA's departments for movement marketing, after-sales service, Swisstec training and promotion programs, and quartz crystal sales to the industry," he added.

HANSEN SPEAKS FOR THE JEWELRY INDUSTRY

Getting the word out about jewelry is one area the Jewelry Industry Council excels in. President Gerry Hansen is available as guest speaker not only for industry groups, but other diverse groups as well.

Recently, Hansen was a special guest speaker at the New York State Jeweler's 76th Annual Convention held at Fallsview, NY, speaking on "Watches: Publicity and Fashion Opportunities."

Pointing out that watches make news, Hansen observed "they create a promotional base like no other merchandise sold in retail jewelry stores today." He also outlined different promotional and publicity ideas retail jewelers can use to promote watch sales.

ORGANIZATIONAL CHANGES ANNOUNCED BY GIA

GIA President Glenn Nord recently announced a number of organizational changes at the Institute. Among them is the merging of the Marketing Department with New Project Development, under the management of Bill Boyajian. Boyajian is a ten-year veteran of GIA, having served much of that time as a distinguished educator and speaker. His responsibilities now include the development of marketing strategies, coordination of the efforts among GIA departments, and the creation and implementation of new and special projects.

H. David Morrow, Director of GIA's Marketing Department since its reorganization two years ago, has been named Director of Management Training Programs. In this new position Morrow, who holds an M.B.A., will devote his efforts to the Retail Jewelry Management Program, including the development of a management course for Home Study. He will also be responsible for developing additional business-related courses for the Institute, which will essentially lay the foundation for a "GIA School of Business" for the jewelry industry.

On the occasion of the reorganization, Glenn Nord commented, "These changes have been made to increase the effectiveness of our corporate structure and to enable GIA to pursue its future goals."

14th ANNUAL EUROPEAN WATCH, CLOCK & JEWELRY FAIR—BASEL, SWITZERLAND

The 14th Annual European Watch Clock & Jewelry Fair will be held April 17-24, 1986 in Basel, Switzerland. The original dates were April 3-10, 1986; but due to conflicting dates with other major exhibits and fairs also held in Basel, the original dates were changed. For further information, please contact: Swiss Industries Fair, 608 Fifth Avenue, Suite 802, New York, NY 10020; Telephone (212) 315-0246.

MIKE TURANO JOINS LORUS AS VICE PRESIDENT, FINANCE/ADMINISTRATION

Mike Turano has joined Lorus Products, the all-quartz watch and clock manufacturer, in the position of vice president, finance/administration. Turano will be responsible for all finances and budgets for Lorus. He will also be the coordinator of the Data Processing Group and the Foreign Trade Zone, as well as liaison with Coserv, the after-sales service division of the Hattori Corporation of America.



Mike Turano, Vice President
Finance/Administration
Lorus Products

SWISS FLYING TEAM WINS "BREITLING CHALLENGE"

Willi Schwarz of Schweiz, Switzerland and his co-pilot Rolf Rymann were awarded the "Breitling Cup" and a cash prize of $10,000 as the overall winning team in the "Breitling Challenge" held in Paris, France recently. He successfully piloted his single-engined aircraft named "Albatros" through six legs of the world's first Transatlantic Air Rally.

Of the 68 original participants, 64 completed the rally.

CAS-KER TO DISTRIBUTE PANASONIC BATTERIES

The Cas-Ker Company is proud to announce that it has been appointed a U.S. distributor for Pansonic Watch Batteries. Dan Cassedy, company spokesman, said that Cas-Ker added the line because Panasonic is recognized as a leading brand name. He added that it is Cas-Ker's policy to offer the retail jeweler all major brands of batteries. According to Cassedy, "We offer a complete selection of batteries at some of the most competitive prices in the industry."

LESLIE MIRIN DOMINO NAMED CITIZEN DIRECTOR OF MARKETING

Leslie Mirin Domino has been named Director of Marketing for Citizen Watch Company of America, it has been announced by Masao Itoh, president and chairman of the company.

In this new position, Ms. Domino will be responsible for all consumer and trade advertising, corporate communications and related activities. She will report to Laurence R. Grunstein, recently appointed executive vice president.

Ms. Domino has had extensive marketing experience in the jewelry industry, most recently as Regional Manager of the Jewelry Division at Intergold, where she spent eight years. Prior to that, Ms. Domino spent eight years with the Diamond Information Center at N.W. Ayer, advertising agency for De Beers.

"The appointment of Ms. Domino to this key position is part of Citizen's effort to build a strong management team of professionals with in-depth jewelry industry experience," said Mr. Itoh, "and it further underscores our commitment to support the traditional channels of distribution with broadly based, quality advertising and marketing programs."

Ms. Domino is a member of the Women's Jewelry Association and Fashion Group, and is a former director of the Jewelers Vigilance Committee.



Leslie Mirin Domino

TIMEX CORPORATION WINS EFFIE AWARD

Timex Corporation's widely acclaimed "Great Watch" advertising campaign has been awarded a silver EFFIE by the American Marketing Association.

Launched in April 1983, The "Great Watch" campaign was developed by Grey Advertising to place a greater emphasis on the watch itself. The dramatic advertisements feature "larger-than-life" watches in real situations.

By using highly advanced computerized production techniques, an actual working watch is portrayed as a bridge, an elevator door, and a dock in a boatyard—only a few of the many exciting treatments. A modular concept was executed enabling individual vignettes to be used alone as ten-second commercials or combined for thirty-second ads to communicate various themes, such as sports or fashion.

The EFFIE Awards are presented each year to outstanding advertising campaigns. Entries are judged on effectiveness, creativity and results.



Dave Rahilly, vice president of marketing and sales, Timex Corporation, (left), and Jim Morrissey, vice president, creative director, Grey Advertising, (center), accept a Silver EFFIE from Martin Beilinson, president, American Marketing Association, New York.

Free Window/Counter Display From Batt-tronic and Maxell



Self-contained window or counter display from Batt-tronic offered free with purchase of 100 Maxell watch/calculator batteries.

BATT-TRONIC is offering a beautiful double paneled counter display free with the purchase of each 100 Maxell watch/calculator batteries. This unique merchandiser is an attractive, self-contained window or counter display designed to support the sale of replacement batteries and the Lady Liberty Silver Pendant to the consumer. The Lady Liberty Pendant is available through Batt-Tronic's silver oxide reclaim program. Batt-Tronic plans to provide retailers with additional pre-printed sales promotion material throughout 1985, for use with the display.

The merchandiser may also be used as an attractive frame for photos. Each panel will accomodate a 3½" x 5" photo. The entire unit measures 9½" x 6½". This offer expires September 30, 1985. For details contact Batt-Tronic Corp., Battery Park, P.O. Box 10, Orangeburg, NY 10962; Nationwide 1(800) 431-2828.

HEUER'S NEW BLACK AND GOLD VERSIONS OF 3000 SERIES SPORTWATCHES

Heuer, a pioneer in the use of black and gold styling, has now added a popular styling to its 3000 Seriess quartz sportwatches.

The new Black and Gold 3000's will be available in four models: Men's, Men's ¾ size, Ladies, and the distinctive Chrono-Quartz analog chronograph.

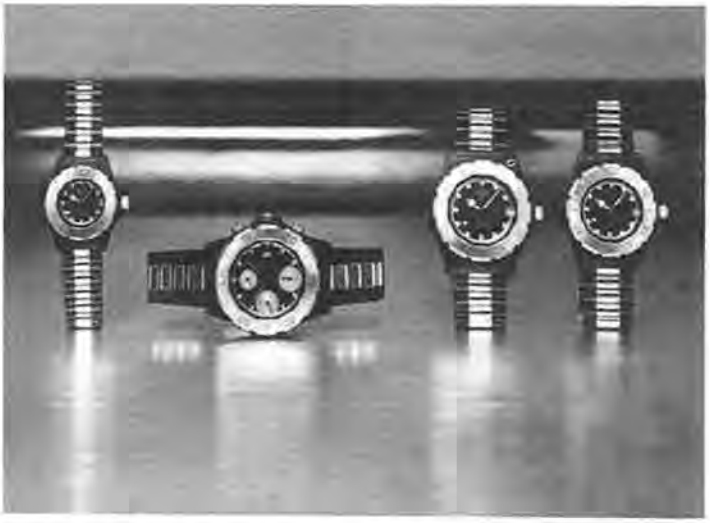
These watches have been specifically designed to meet the needs of today's active sportsperson. They're water-resistant to 660 feet (200 meters), with double-protection screw-in crowns and scratchproof sapphire crystals.

For more information on the 3000 Series, contact: Heuer Time & Electronics Corp., 960 South Springfield Avenue, Springfield, New Jersey 07081.

ZENITH AWARDED PATENT ON *AUTOMATIC* ULTRASONIC CLEANING SYSTEM

The U.S. Patent Office has awarded a patent to Zenith Manufacturing and Chemical Corporation for its design on the first ultrasonic power cleaning system to clean, rinse and dry items, automatically, in a single, enclosed cleaning tank. The new system is a breakthrough in the ultrasonic cleaning industry, which until now has had to rely on separate tanks and manual labor or cranes to move cleaning baskets between tanks.

In the patented design, already available and in use, the cleaning and rinsing solutions are stored in separate containers and pumped in and out of the cleaning tank according to a timed cycle of operation. Drying also takes place within the same tank.



New Black and Gold 3000 Series Quartz Sportwatches from Heuer.

Patent Number is 4,409,999.

"The demand for ultrasonic equipment has increased substantially over the last five years," Zenith president and system inventor Edward Pedzy pointed out. "We expect our new automatic units to open up many more new and exciting applications."

For more information, contact: Ed Pedzy, Zenith Manufacturing and Chemical Corp., 90 Herbert Ave., Closter, NJ 07624; (201) 767-1332.

KASSOY'S INEXPENSIVE SYSTEM FOR COLORED STONE COMMUNICATION

GemDialogue™, a highly graphic, proven color chart system, allows retail jewelers and gem dealers to discuss and order colored stones properly. An easy-to-use, series of charts and masks, endorsed by the American Gem Trade Association, can pinpoint the exact color of stones being discussed.

Developed by a professional gemologist, the system consists of two manuals—one is a color chart manual which allows comparison of gem colors to 6300 possible combinations for transparent, translucent and opaque gemstones. The other manual is a quick-learning instruction booklet.

A complete list of nationwide gem dealers using the system is available. GemDialogue is for jewelers, gem dealers, appraisers, gemologists, and takes the color guesswork out of the colored stone business.

The introductory offer is $300. Contact KASSOY, 32 W. 47th Street, New York, NY 10036, or call toll-free: 1(800) I-KASSOY.



GemDialogue from Kassoy.

OMEGA IS OFFICIAL WATCH OF TEXAS SESQUICENTENNIAL

Specially created for the 1986 Texas Sesquicentennial Celebration, Omega's "Proud to be Texan" watch is expected to become a popular collector's item to those across the country who identify with the Lone Star State. The watch will be marketed as a fundraising vehicle by the 1,500 sanctioned Texas Sesquicentennial committees with a percentage of funds to be used by the committees for community interests. The watch will also be sold through Omega dealers. Both men's and ladies' models feature precise Swiss quartz accuracy, calendar, gold-tone case with gold-tone bracelet or leather strap. Prices are: $525 for the men's bracelet style; $515 for the ladies' bracelet style; and $395 for the leather strap model.



Omega's "Proud to be Texan" watch for the 1986 Texas Sesquicentennial Celebration.



IMPROVED DIXCEL® "BB" BRUSHES

Brushes for cleaning, polishing, and finishing small jewelry pieces have been announced by GFC, Carlstadt, New Jersey. These special purpose brushes, designed for use on a threaded mandrel, as shown above, now have 30% more bristle than previously available brushes. This additional fill material gives the brushes a more secure "feel" for the polisher, and the brush lasts longer. In addition, they have thinner, tightly constructed metal hubs which give the brush a trim profile and eliminate washer spin problems.

Literature on Dixcell "BB" brushes and the extensive GFC line of jewelry tools, equipment, and supplies is available from local jewelers' supply houses carrying Grobet-Swiss® files, Herkules® saws, and Pro-Craft® equipment, or by writing GFC, P.O. Box 243, Carlstadt, NJ 07072.

CAS-KER U.S. DISTRIBUTOR OF WITSCHI Q TEST 4100 WATCH TIMING MACHINE

The Cas-Ker Company recently announced that they have been appointed U.S. distributor of the Witschi Q Test 4100 watch timing machine. The Q Test is capable of measuring accuracy for both quartz analog and LCD's, plus tuning fork and mechanical watches. It performs all of the functions necessary in the repair of watches, including variable voltage supply, and the ability to test batteries under load. It also has sensors capable of detecting acoustical, capacitive, and magnetic signals. The Q Test is manufactured by Witschi in Switzerland.

For a limited time Cas-Ker is offering the Q Test 4100 on a free 10-day trial basis. The price is $1,595. Contact The Cas-Ker Co., 128 E. Sixth St., P.O. Box 2347, Cincinnati, Ohio 45201.



The Q Test 4100 watch timing machine, capable of measuring accuracy for quartz analog and LCD's, tuning fork and mechanical watches.

Classified Ads

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Wanted: Watchmaker's Lathe and/or accessories. Pivot Polisher, Slide Rest, Wheel Cutter, Index Plates, Idler Pulleys, etc. Older tools in good condition preferred. Richard Koskovich, Box 4-1532, Anc. Ak. 99509.

IMMEDIATE CASH PAID for Gold, Silver, Platinum, any form! Jewelry scrap, filings, gold filled, sterling! Immediate top dollar cash offer return mail! Satisfaction guaranteed. Ship insured/registered mail to: American Metals Co., 253 King St., Charleston, SC 29401. (803) 722-2073.

SCRAP WANTED TO BUY - Gold filled watchbands, $27.00/lb.; Plated watchbands, $12.00/lb.; Silver Watch batteries, $12.00/lb.; (Mixed acceptable, we sort free of charge and we pay for mercury). Gold Filled Watchcases, Optical, etc., $5.50/ounce. Gold, 95% of the market price for 10K, 14K, etc. We buy all types of jewelers scrap in any condition, including Bench Sweeps, Filings, Filters and Buffing Waste. Postage and UPS reimbursed. Please call or write for more information: Specialty Metals Refining Company, 10 Bay Street, Department 1076, Westport, Connecticut 06880. (203) 426-8079.

Wanted: Light and motion watch display unit. W.R.C., #1, Narvon, PA 17555.

Schools

Correspondence courses in Quartz-Accutron-Watchmaking-Jewelry-Lost Wax Casting and Rubber Mold Making. Free folders. Watchmaking Institute of Canada. 1012 Mt. Royal St. East, Montreal, H2J 1X6. (514) 523-7623.

Miscellaneous

DONATION NEEDED: We are a non-profit organization dedicated to teaching the trade of watchmaking to the handicapped. We are in desperate need of workable and repairable movements, pocketwatches, Gents, Ladies, Accutron Quartz and chronographs. All donations are tax deductible. Call or write: Ohio Valley Goodwill Industries, 10600 Springfield Pike, Cincinnati, Ohio 45215. Phone (513) 771-4800, ext. 224.

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Dates To Remember

AUGUST 1985

10-11—Common Sense Quartz Watch Repair Bench Seminar; St. Louis, MO; Bishop, instructor.

11—ESA Analog Quartz Repair Bench Seminar; Milwaukee, WI; Adams, instructor.

11-12—Jewelers of America Chicago Jewelry Trade Show and Conference; Expocenter; Chicago, IL (212) 489-0023.

11-13—Introduction to Jewelry Skills Bench Seminar; Iowa; Hoover, instructor.

16-18—Nebraska and South Dakota Jewelers Association Annual Convention; Holiday Inn, Grand Island, Nebraska (308) 234-3773.

18—ESA Digital/Analog 900.911 and ETA Analog 961.101 Bench Seminar; Columbia, SC; Biederman, instructor.

21-23—Introduction to Jewelry Skills Bench Seminar; Denver, CO; Richmond, instructor.

24-25—Minnesota Jewelers Association Fall Convention & Trade Show; Radisson South Hotel, Bloomington, MN; (612) 483-3613.

26-28—Introduction to Jewelry Skills Bench Seminar; Salt Lake City, UT, Richmond, instructor.

SEPTEMBER 1985

1-2—Mid-America Jewelry Show, Cincinnati Convention Center, Cincinnati, Ohio. (614) 221-7833.

2-5—Fourth Hong Kong Watch and Clock Fair; Miramar Hotel, Kowloon, Hong Kong. Phone (5)263783.

4-6—Introduction to Jewelry Skills Bench Seminar; Phoenix, AZ; Richmond, instructor.

7—Meter Microamps and Modules Bench Seminar; State College, PA; Jaeger, instructor.

13—AWI Certified Citizen Quartz Watch Technician Bench Seminar; Manden, ND; Carpenter, instructor.

13—Quartz Watch Test Equipment Bench Seminar; Salt Lake City, UT; Sustachek, instructor.

14-15—Introduction to Striking Clocks Bench Seminar; Dallas, TX, Baier, instructor.

15-17—Introduction to Jewelry Skills Bench Seminar; Milwaukee, WI, Callahan, instructor.

17—Quartz Watch Test Equipment Bench Seminar; Sacramento, CA; Sustachek, instructor.

19—Quartz Watch Test Equipment Bench Seminar; Fresno, CA; Sustachek, instructor.

19-21—Introduction to Jewelry Skills Bench Seminar; Cleveland, OH, Callahan, instructor.

21-22—Watchmakers Association of Indiana Convention; Holiday Inn Southeast, Indianapolis, IN; (317) 398-7811.

21-23—Using the Watchmakers Lathe Bench Seminar; San Francisco, CA, Perkins, instructor.

22—Pulsar Quartz Analog Y590 and Y112 Bench Seminar; Richmond, VA, Broughton, instructor.

22—Seiko Quartz Combos Bench Seminar; Denver, CO, Smith, instructor.

24—Quartz Watch Test Equipment Bench Seminar; Los Angeles, CA; Sustachek, instructor.

26—Quartz Watch Test Equipment Bench Seminar; San Diego, CA; Sustachek, instructor.

30-2—Introduction to Jewelry Skills Bench Seminar; West Virginia, Callahan, instructor.

OCTOBER 1985

4-6—New York State Watchmakers Convention, Holiday Inn Cortland, 2 River St., Cortland, NY 13045.

6—AWI Certified Citizen Quartz Watch Technician Bench Seminar; St. Paul, MN; Carpenter, instructor.

12-13—Ninth Annual Convention of the Illinois Watchmaker's Association; Holiday Inn Conference Resort; Decatur, IL; (217) 422-8800.

12-13—Common Sense Quartz Watch Repair Bench Seminar; Hartford, CT; Bishop, instructor.

13-15—Introduction to Jewelry Skills Bench Seminar; Bismark, ND; Hoover, instructor.

17-19—Introduction to Jewelry Skills Bench Seminar; Pierre, SD; Hoover, instructor.

20—ESA Analog Quartz Repair Bench Seminar; Shreveport, LA; Adams, instructor.

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