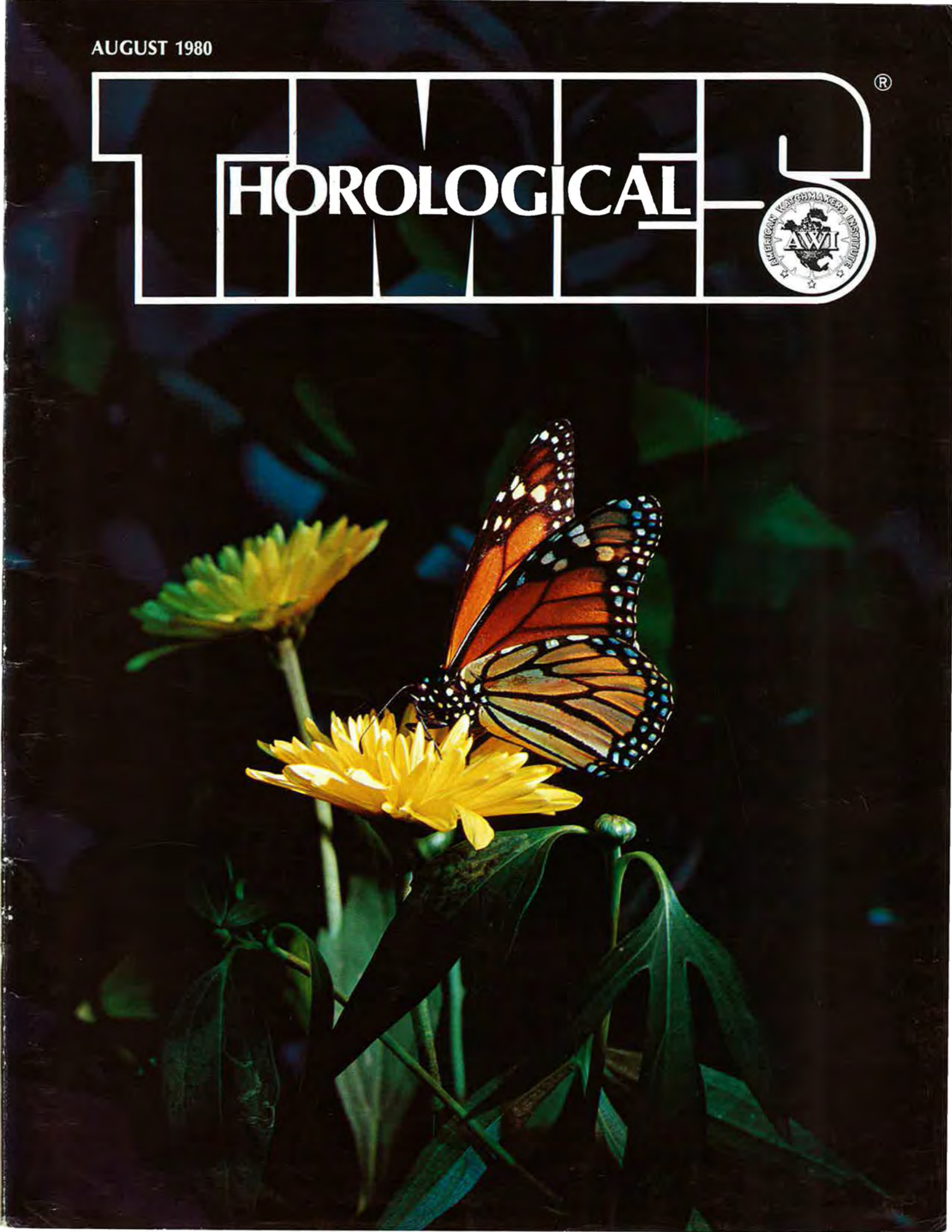
AUGUST 1980

# HOROLOGICAL TIMES®



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VOLUME 4, NUMBER 8 AUGUST, 1980

# HOROLOGICAL TIMES

Official Publication of the American Watchmakers Institute



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DEPARTMENTS

HOROLOGICAL TIMES

*Executive and Editorial Offices*
AWI Central
P.O. Box 11011
3700 Harrison Avenue
Cincinnati, Ohio 45211
Telephone: (513) 661-3838

Harold J. Herman: *Editor*
Maury Norrell: *Managing Editor*
Virginia C. Montgomery: *Associate Editor*

LuAnn Martin: *Art Director*
Sue Scott: *Business Manager*

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# *Editorial*

During the past couple of years, noticeable changes have taken place in the design and streamlining of *Horological Times*. Tom Herman was instrumental in bringing about these changes which have resulted in the more aesthetic and professional appearance of the magazine. We at AWI know that in his new position in the printing industry, he will prove to be a very helpful addition to his new firm.

We realize our good fortune in acquiring the services of Mr. Maury Norrell, formerly of Denver, Colorado. His years of experience in the publishing business will bring still further progress to *Horological Times* and will ensure the continuing high quality of the publication. The great esteem in which he is held by his peers attests to his abilities.

Welcome, Maury!

## On the front

A monarch butterfly graces our August cover. Prevalent throughout North and South America, the species migrates to warm climates in the late summer and early fall, sometimes traveling as much as 1,800 miles. Though they generally take advantage of air currents high above the earth, a flock of these fragile, luminous creatures coming to rest in the grass or trees—or on the flowers—is a sight to behold.

# Quality Clock Movements

## # 425

Quartz Alarm
Ultra Thin

A most desirable feature coupled with quartz accuracy makes this a perfect choice for movement replacement. Two screws enable the movement to be easily fixed to any case. Alarm stopper, alarm hand setting knob, second setter, and battery compartment are conveniently located on the back. Runs over one year on a single AA size battery. Features electronic alarm and step second motion. Comes complete with four hands—hour, minute, second and alarm.

**$8.75** In Quantity

1 or 2 @ $12.95—3 to 9 @ $11.75—10 to 24 @ $10.50—25 to 99 @ $9.75—100 @ $8.75

## # 475

Tiny Quartz

ALMOST AS SMALL AS A WATCH!
Weighing only 1.25 ounces, this Versatile Movement will carry a sweep second hand and run for over one year on a single "AA" cell—only 9/16" thick this compact unit can be fit into any type case or panel. A single center nut enables the movement to be easily fixed to a dial. The hand setting knob, seconds setter, and battery compartment are conveniently located on the back. Accurate to (±) 10 seconds per month.

**$5.25** In Quantity

1 or 2 @ $8.50—3 to 9 @ $7.00—10 to 24 @ $6.50—25 to 99 @ $5.75—100 to 299 @ $5.25.

## # 450 Quartz

**$5.25** In Quantity

2 3/8" x 2 13/16" x 7/8"

Extreme accuracy is now available at very moderate cost for customers that demand precise time keeping. Quality features such as high quartz oscillation of 4.194304 MHz. Assures reliable time keeping as well as accuracy. The small dimensions are ideal for all jobs. Fully warranted for one year.

1 or 2 @ $8.50—3 to 9 @ $7.00—10 to 24 @ $6.50—25 to 99 @ $5.75—100 to 299 @ $5.25.

## # 600 Quartz Insert Movement Complete W/Dial - Hands

Precise timekeeping is now available for the clock installation and replacement markets. These units are ready to install quickly and economically. Comes complete with brushed brass finished bezel-dial & hands. Available in 3"-3⅜" 4" diam.

1 or 2 @ $18.95 each
3 to 9 @ $16.95 each

## # 650 Quartz Insert Movement Only

The same movement as used in the above insert complete. Runs on AA Penlite Cells. Can be installed 3 ways, friction, fixing screw or case screws. Only 2⅝" diameter for easy installation in wood, metal or ceramics.

1 or 2 @ $11.95 each
3 to 9 @ $10.95 each

## # 500 Quartz Pendulum

**$9.25** In Quantity

This compact unit can be fitted into any type of enclosure, case or panel. The pendulum does not affect quartz accuracy of one minute per year, so that various lengths of 8 to 14 inches may be used. Noise from movement is negligible, only ticking sound of pendulum can be heard.

1 or 2 @ $13.95—3 to 9 @ $12.75—10 to 24 @ $11.25—25 to 99 @ $10.25—100 to 299 @ $9.25.

## # 575

Quartz Striking Pendulum

8¼" x 5⅝"

**$22.00** In Quantity

This versatile and extremely accurate movement with its beautiful chime tones would be a welcome addition to any room. Can be used with or without pendulum. Comes complete with hands and pendulum.

- Chimes on half hour—Counts on hour
- Accurate to ± 10 seconds per month
- Runs for 2 years on 'D' alkaline cell
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- Dependable—Fully guaranteed for one year

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# Outgoing thanks–Incoming thoughts

LESLIE L. SMITH
PRESIDENT OF AWI 1979-1980

Serving as president of AWI has been a great honor and privilege. The cooperation and support which I have received has been most gratifying, and I feel that much has been accomplished this past year.

I'm very grateful to the AWI office staff–individuals who have diligently attended to the mechanics of the past year's activities. We are inclined to overlook the tremendous amount of work done at AWI Central and the people who carry out these chores, but the efficiency of the office is dependent upon them.

The *Horological Times* has made very noticeable strides this past year. Mr. Tom Herman has accomplished much since he has been with the magazine and we're grateful for his many innovations.

To all the committee members who have worked so hard this past year, I'd like to say thanks. The success of AWI is most dependent upon committee work and every committee has functioned well. We are very fortunate to have so many fine people who are willing to work in behalf of AWI.

My work with the officers and Directors of AWI has been most rewarding. The friendly, cooperative spirit of this outstanding group of people has been remarkable and an experience I will long remember.

JOE CROOKS
PRESIDENT OF AWI 1980-1981

It is the greatest honor and highlight of my life to serve you as president of the American Watchmakers Institute. I realize that any accomplishments to be made this year cannot be gained by me, the

*(Continued on page 63)*

# Introducing The Incredible Portescap Vibrograf M-80 Digital Quartz Analyzer!


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**TESTS ALL KNOWN FREQUENCIES OF WATCHES.**

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# Our Readers Write

## THE BEST OF BURCKHARDT

In reference to Mr. Burckhardt's article, "The Rock Quarry" in your June issue, I can't remember when I have enjoyed an article more. All great humor is based on truth and this article could only have been written by someone who has been down that road. I feel better knowing I am not the only one. Many times I feel like I wish I had made four cents an hour. And people wonder why clockmakers are so serious! It was a joy to read this article and laugh with Mr. Burckhardt–deep down I was laughing at myself also. My father, Clyde Campbell, my wife Sandy, sixteen-year-old daughter Myra , and myself all know how he felt because we rebuild old clocks and love it. Why else would someone work for four cents an hour at times?

James A. Campbell
Lowell, NC

### HABIT FORMING

I'm now completely addicted to your excellent and wonderfully useful publication!

T. F. Flower
Pittsburgh, PA

I'd like to thank everyone who works so hard to get *Horological Times* out every month. It's a great magazine and I'm always learning something new when I get it.

Tamea Franco
Roanoke, VA

### BRAVO!, BUYER'S GUIDE

I just want to express my appreciation to AWI for the fine work and service you provide, especially the new Buyer's Guide. It is invaluable.

Cecil Thomas
Huntsville, AL

### ANOTHER COVER CONVERT

Being comparatively new to the horological field, and a fairly recent member, I thought a few words of appreciation for your publication would be in order . . .. The covers are something to behold. Keep up the good work.

Harold F. Lightbown
Wakefield, MA

### AMERICAN WATCHMAKERS INSPIRATION

When my previous letter praising Gerald Jaeger for the Micro-Electronic Course appeared in the February issue of *Horological Times*, I was amazed to say the least. I had not imagined that my letter would ever be printed, but since it was, I would like to clarify a point.

My instructor in this course was an outstanding gentleman by the name of John H. Judkins. It was his professionalism and guidance that made the course comprehensive. I am sure the selection of Mr. Judkins was made on the basis of his excellent ability. He is 100% in all departments. Gerald must insist on the very best, and in John, he has just that. John's credentials in his profession are outstanding. If the other instructors are his equal–and I am sure they are–then I can only repeat; Gerald has put together the best source a watchmaker can have.

I now refer to AWI as American Watchmakers Inspiration.

David Stoliker
Albany, NY

The *Horological Times* welcomes letters from its readers. Please write us at AWI Central, P.O. Box 11011, Cincinnati, OH 45211. We do reserve the right to edit all letters.

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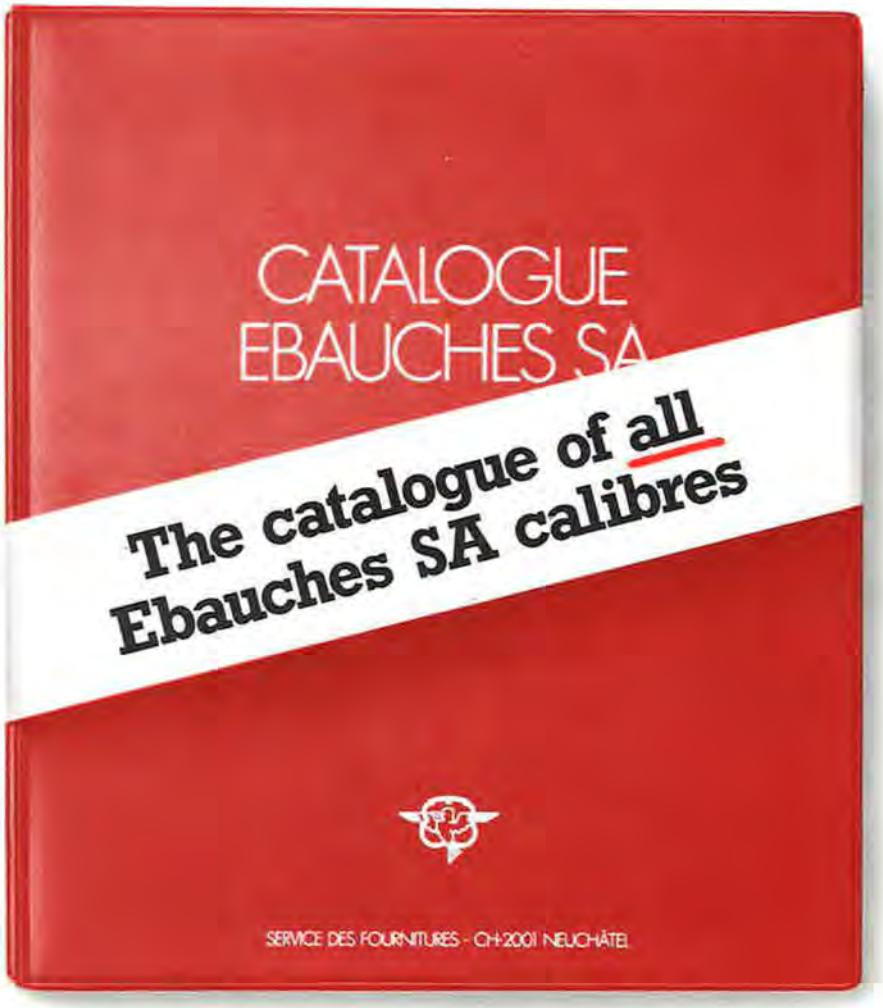


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# Navigation And The Quartz Chronometer

**Part II**

**By Marvin E. Whitney**

The application of electricity to timekeeping is not new. The celebrated physicist, Robert Hooke (1635-1703), a member of the Royal Society, London, constructed a watch in which a magnet was used. A pendulum electric clock was patented by Alexander Bain in 1843. However, it was not until 1916 that one of the most significant feats occurred in the development of an electric clock: the perfecting of a synchronous motor by an American, Henry Warren. Progress was continuous as discoveries in other fields of science and technology were made. The next step forward occurred when vacuum tubes and, in particular, the triode, were put into industrial use. At that time, the triode was considered one of the most important inventions of modern times. This tube not only opened the way for efficient and reliable electronic communications, but also allowed the first electronic clock to be born.

The next decisive step forward in electronic timekeeping occurred after the invention of the transistor by the Bell Telephone Laboratory in 1948. Later followed the microminiaturization of the electronics industry during the 1960's. The Bell researchers found that by using germanium or silicon and adding small amounts of impurities, they were able to make a crystal perform the same functions as a vacuum tube. This tiny crystal could amplify and produce oscillations over a wide range of frequencies. The investigations of outer space—in rocketry, guided missiles, and satellites—brought about necessary reductions in size, weight, and power requirements. Thus, today's achievements in the field of electronic timepieces are the result of these reduced requirements.

In 1880, the Curie brothers discovered the so-called piezo-electric effect in crystals. They discovered that a piece of quartz crystal, upon being rubbed or subjected to mechanical pressure, became electrified in that it generated a voltage across the crystal. Conversely, mechanical deformation occurred when an electrical voltage was applied across the crystal surface, since this caused the crystal to expand or contract depending on the polarity of the volatage. The first characteristic has various uses, e.g., in the sapphire needle pick-up of a record player.

When the quartz crystal is in a suitable form to produce mechanical vibrations, e.g., disc, rod, or tuning fork shaped, then by applying an a.c. voltage, it can be made to produce a stable, undamped oscillation, the frequency of which is determined principally by the geometry of the crystal.

What is quartz? Chemically, quartz is pure silica; that is to say, it is oxide of silicon ($S_1O_2$) and consists, in the purest form, of 46.7 per cent silicon and 53.3 per cent oxygen. Quartz is one of the most common and widely found minerals in the earth's crust, responsible for twelve (12) per cent of its composition. Quartz was well known to the ancient world, especially the purest variety—rock crystal. The name "crystal" is of Greek origin and means "ice." Rock crystal, which is perfectly transparent and colorless, was thus named because it was actually thought to be ice which had been frozen so hard that it could never be thawed. Quartz stands seventh on Moh's hardness scale.

However, large pieces of good quality natural quartz from which vibratile shapes can be cut are not easily obtained and therefore are rather expensive. Most quartz oscillators used today are manufactured from

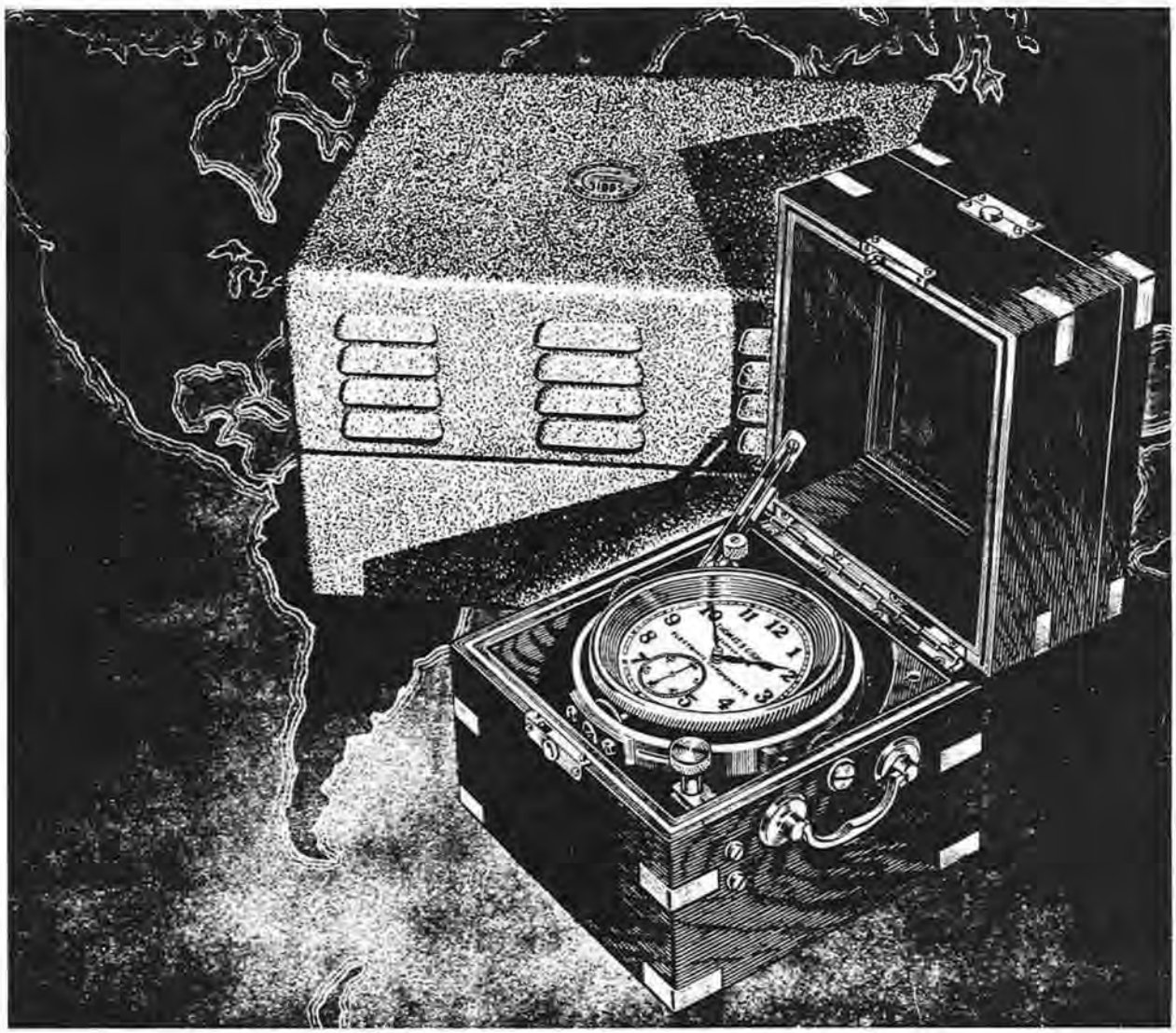

Figure 1. Gibbs Electronic Crystal Control Chronometer

synthetically produced silicon dioxide. Synthetic clear crystals better meet the demands not only for a perfect pure material, but first and foremost, for a material with an internal structure which is monoclinic (having one oblique intersection of the axes). This demand is not usually met in natural crystals, even those which are prefectly suitable for use as gemstones. The production methods for synthetic quartz are very costly and require a high degree of precision. The final orientation of the cut and the tuning to the desired frequency are done by grinding and etching with the aid of optical and x-ray equipment. Thus there is an optimum shape and size of the crystal for each frequency.

The quartz crystal can be electrically excited in a number of ways. In order to use the piezo-electric effect and excite the crystal, tiny metal electrodes have to be attached to the crystal surface. These extremely thin metallic electrodes are created by the vacuum evaporation of metals. Electric leads are soldered to the electrodes. These leads also serve as the mounting support, thus freely suspending the quartz crystal. The electrode-support leads are attached at points, called "nodes," where no vibrational motion occurs so the mechanical vibrations of the crystal are least affected. The crystal is then enclosed in a small hermetic case which is either filled with a protective gas or evacuated under a vacuum.

In the quartz chronometer, as in any quartz timepiece, a vibrating quartz crystal is used as the time standard. The very high frequency is so constant that it can be used for time measurement. For this purpose, the high frequency is divided in an electronic circuit and reduced to a few oscillations per second. Another electronic circuit converts the reduced vibrations into short energy pulses which are further converted via an electromechanical converter into mechanical movement of analogue or digital displays of the time.

Quartz crystal, because of its piezo-electric properties, vibrates at an exceptionally high and stable rate when an electrical charge is applied. In fact, its high speed and regularity are unmatched by any other element known to man, with the exception of the cesium atom used in the atomic clock which vibrates at 9,192,631,770 oscillations per second.

Practical application of quartz, with its piezo-electric properties, is not new. Quartz has been used in frequency standards for some years. During the 1920's, researchers at the Bell Telephone Laboratory were granted several patents on the use of piezo-electric quartz crystals in frequency standards. These devices were first used in controlling the frequencies of radio transmitters. Further research led to the stabilization of the lower and more unstable frequencies so that they also assumed the characteristics of high-frequency quartz controlled oscillators. Thus, a synchronous motor operating off a stabilized low frequency assumed the accuracy of the crystal oscillator and, hence, the quartz precision clock was conceived.

As we all know, the greater the number of beats or vibrations the balance

wheel makes, the more accurate the timepiece. Whereas the quartz chronometer uses a quartz crystal oscillator to control the number of vibrations, conventional or mechanical chronometers use a balance wheel. Since the quartz crystal oscillator vibrates at a rate of tens of thousands of vibrations per second, it would obviously be far more accurate. The frequency at which the quartz crystal vibrates can be controlled by its shape–how it is cut–together with the properties of the crystalline quartz used.

Temperature and aging are two effects, among others, which are important in the design of crystals and crystal oscillators. There is a temperature dependence of the quartz crystal that affects the resonance frequency, and there is also a drift (aging) of the resonance frequency as time passes.

The temperature dependence is caused by a slight change in the elastic properties of the crystal. Different cuts minimize this effect over a rather wide range of temperatures. This small effect requires care in the design of the crystal oscillator if very high frequency stability over longer periods of time is desired. If large temperature fluctuations are to be tolerated, the crystals themselves must be enclosed in thermostatically controlled ovens which maintain a constant temperature.

Aging or frequency drift is a common behavior of all crystal oscillators, whereby crystals change their characteristics. A quartz crystal of 32 kHz may age until its frequency becomes 32.01 kHz. The process of aging is not really understood. Many possible causes have been considered: 1. contamination (depositing of foreign material) on the surfaces; 2. changes in the electrodes or metallic plating; 3. reforming of loose surface materials (from grinding, etching); 4. changes in the internal structure of the crystal. However, recent design changes have in some instances resulted in a slight reduction of the aging process.

Although several companies since the late 1950's–and more, recently, during the advent of the quartz explosion–have made claims that they have produced the first quartz controlled chronometer. I have cause to take exception to these claims. On June 12, 1943, Mr. Brown, chief engineer of the Borg-Gibbs Laboratories, Delavan, Wisconsin, delivered the first electronic quartz controlled chronometer to the U.S. Naval Observatory. See Figure 1.

The Borg-Gibbs Laboratory had a contract with the U.S. Navy which was let September 5, 1942, to design and produce ten electronic quartz chronometers at a cost of approximately $1,500 each. Since, at this point in time, this was an unheard-of possibility, there were no specifications on such an instrument. Hence, the specifications, which were rather general, were written into the contract. The salient features of the specifications were:

1. The unit shall serve as a source of highly accurate and dependable time in the place of the usual high-grade marine chronometer.
2. It shall be similar in appearance to a marine chronometer. The entire unit with the exception of the batteries and the frequency standard shall be mounted in the usual type of chronometer box.
3. It shall be capable of operating from a sufficient number of different sources of power so it can be installed on any type of ship.
4. It shall be capable of continuous operation for at least six hours in case of interruption of the ship's external source of power.
5. It shall be easily and accurately set.
6. Each unit shall consist of a quartz crystal in a temperature controlled oven. Its oscillations shall control the speed of a small synchronous motor and a suitable gear train to transmit this constant speed to the hands.
7. The motor and gear train shall be mounted in a small case approximately the size of the usual chronometer bowl.
8. The unit shall be designed to operate from 110 volts, either a.c. or d.c.
9. The electronic equipment shall be mounted in a vibrating absorbing mount.
10. In order that the chronometer shall continue to indicate the correct time, even if all the power facilities on board ship should be disabled, a small battery bank shall be supplied with the unit. This battery bank shall be kept fully charged from the ship's normal power source.

As a rather interesting side note, when the specifications were being written for the Gibbs quartz crystal chronometer, the question was raised–and I might add, was debated rather heatedly–whether or not it should be called a "chronometer." Webster's dictionary defines chronometer as "an instrument for measuring time; a timepiece, esp. one intended to keep time with great accuracy."

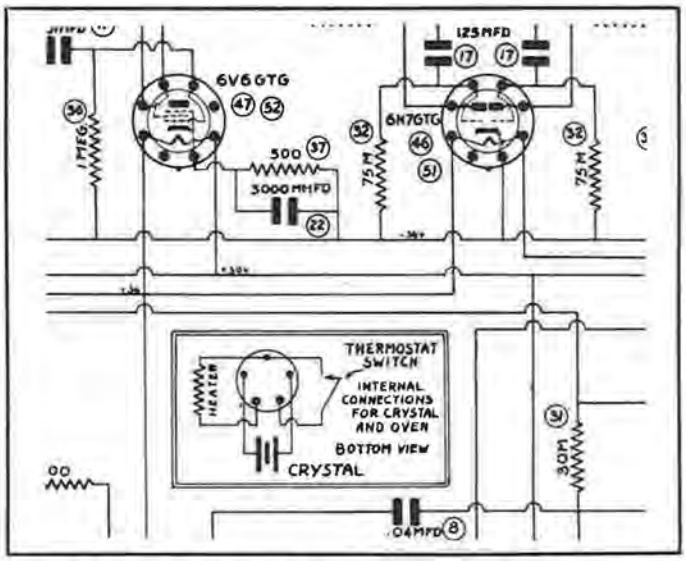


Figure 2. Gibbs Frequency Standard Thermostatic Control Oven

But some of the Observatory staff were still of the opinion that a "chronometer" was a timekeeper with a detent escapement. I am sure the English are still of this opinion today, as they have been since Jeremy Thacker, the witty English clockmaker, first coined the term in 1714 to describe a marine timekeeper.

Although this was a fine example of bureaucracy at work, it did not hinder the completion of the specifications. However, it sure did generate some further research and inquiries.

The case was finally resolved upon receipt of a letter from John P. V. Heimuller, President of the Longines-Wittnauer Watch Company. Mr. Heimuller was highly respected by the Observatory personnel, and rightly so; through his great interest in aviation, he had developed a complete line of navigational timepieces and instrumnets. Mr. Heimuller wrote, and I quote, "Ethynologically, every watch, even a pendulum timepiece, every alarm clock, is a chronometer in as much as

*(Continued on page 55)*

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# THE HERSCHEDE TUBULAR BELL MOVEMENT*

**By Steven G. Conover**

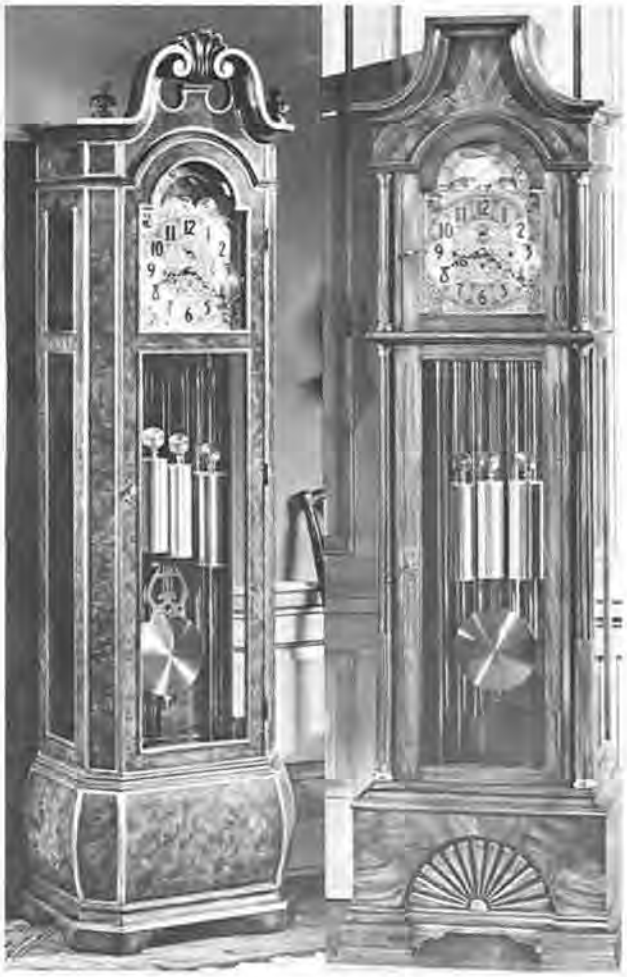

Figure 1. Herschede Model No. 250, "The Clock" (left) and Model No. 120, "Alexander Hamilton" (right). Photos courtesy of Herschede Hall Clock Co.

Herschede grandfather clocks have been with us for a long time–since before the turn of the century. From Cincinnati, the company moved to its present site at Starkville, Mississippi. They continue to manufacture the Herschede line there, including the tubular bell movements. The very fact that the movements are made here in the U.S. is notable at a time when most clock movements are imported from overseas.

For this segment of the series, I have chosen the Herschede tubular bell movement. In keeping with the theme of the series, I will concentrate on the chime and strike mechanisms. The movement has changed little over the years, and everyone who works on grandfather clocks would do well to become familiar with it. In this article, I will cover some of the adjustment procedures I have found effective for the front-movement chime and strike parts.

The tubular bell clocks from Herschede are quite impressive. Figure 1 shows two of them: the "top-of-the-line" Model #250 "The Clock"; and the Model #120, the "Alexander Hamilton." Both are nine tubular bell clocks, 87 in. high. Figure 2 shows the five-tube Westminster chime and nine-tube triple chime movements. The two movements are similar in design, with the major difference being the three-chime selection mechanism in the nine-tube model. Chime and strike function is otherwise the same for our discussion.

A simplified front view of a nine-tube movement is represented in Figure 3. The drawing shows the chime and strike parts as they would appear *before* the hour, when chime and strike warning has occurred. Figure 4 is a separate view of the long lever assembly, and is there to show the warning wheel positions *after* chiming and striking are finished. To prepare the drawings, I worked directly from a current model Herschede. The company does publish a complete set of movement drawings, but I felt that a drawing showing only certain chime and strike parts would better serve our purpose. The part names used in this article are from Herschede's parts lists. Numbering is my own, keyed to Figures 3 and 4.

Let's begin with the chime function. Lifting occurs with the pins on the intermediate wheel (21) raising the lifting lever (18) every quarter hour. A pin on the long lever (5) pushes up the quarter rack hook (14) to release the quarter rack (16). On the quarter snail (19) there are 4 positions, one for each quarter. The distance the rack falls will determine how many notes are chimed. The gathering pallet (15) counts off rack teeth as the chime train runs. Locking occurs as the

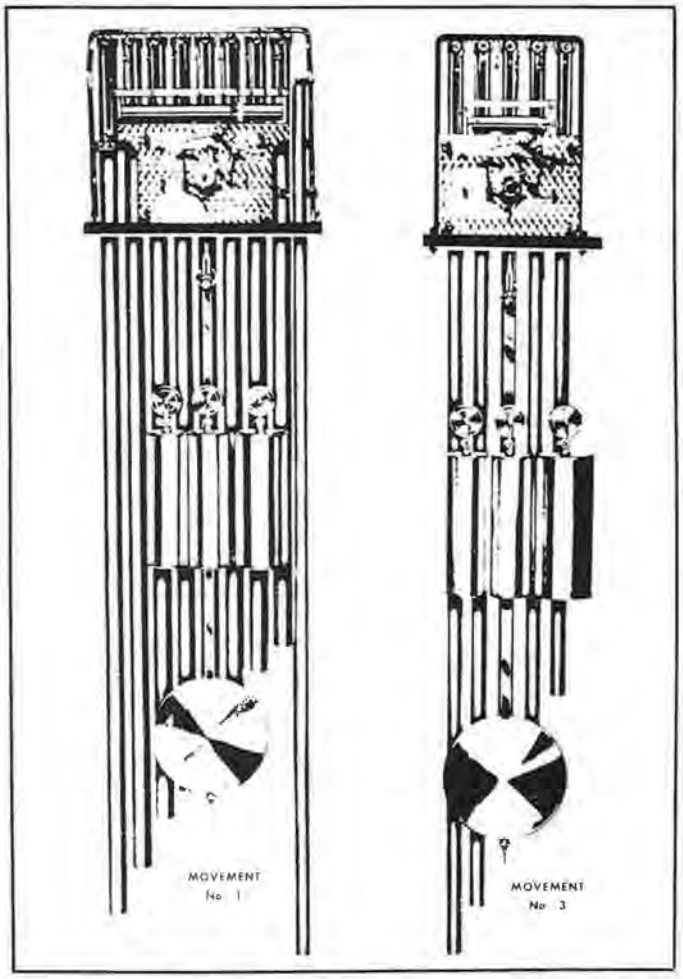


Figure 2. Herschede nine tubular bell movement (left) and five tube movement (right). Illustration courtesy of Herschede Hall Clock Co.

tail of the gathering pallet comes to rest on the quarter rack pallet pin(17).

A gathering pallet can be the cause of chime problems. It is made of a soft steel, and the square center hole can wear large if it is a loose fit to begin with. There is, after all, a strain on the gathering pallet each time it hits the quarter rack pallet pin to stop the chime train. Even if the part does not fail completely, it may become loose enough to throw the chime warning out of adjustment. For current model clocks, the factory can provide replacement gathering pallets in a semi-finished state. They must be hand filed and polished to fit. This work can be done in a customer's home if necessary, without too much trouble.

When the chime train is locked after chiming, the chime warning wheel pin (28) should be at the 3 o'clock position (viewed from the front). The pin can then move more than a quarter revolution of the wheel before hitting the warning arm for the chime (29). If the locking action is later for any reason, the warning wheel pin may come to rest at a 6 o'clock position—very close to the warning arm. Sooner or later, the warning arm will jam against the pin and stop the clock. If the owner forces the minute hand further, the pin may shear off. Even if the clock doesn't jam, the chimes will probably begin to stall because there will be almost no warning run.

You must always check the gathering pallet and warning wheel positions. Although the gathering pallet may not actually be damaged, it may have been put on the wrong way. The square arbor permits installation four different ways. Only one position will give the correct warning wheel pin setting. If none of the four positions is satisfactory and you have found the gathering pallet in good condition, there is only one possibility left; the movement must have been assembled incorrectly. Partial movement disassembly is then required so you can set the warning wheel pin and the gathering pallet exactly where you want them. During reassembly, don't forget to install the pin wheel the right way. The hammer must not be left "on the rise" at the end of the strike sequence.

The warning must also be set on the strike train. Rest position for the strike warning wheel pin (24) is a 9 o'clock orientation, as shown in Figure 4. If the pin ends up at a 6 o'clock position, it will interfere with the warning arm for the strike (23), causing a jam. An 11 o'clock setting will eliminate the warning run and make stalling of the gear train likely. Equally harmful would be any interference with the double lever warning arm (26).

Before the hour, the strike warning wheel pin (24) moves up to the double lever warning arm (26). Then, as the hour chime completes, the arm is lowered, allowing the pin to escape and the gear train to run. There are actually two warning arms for the strike train. During normal operation, the double lever warning arm (26) functions. The warning arm for the strike train (23) takes over for it only when the chimes have been silenced. When the chime silent lever is put on "silent," the double lever is pushed out of the way. It is then that the warning arm, attached to the long lever (5) catches the warning wheel pin every quarter hour for the warning.

The double lever assembly is pulled by a coiled spring. The double lever warning arm is thus kept in the raised position whenever the clock is chiming or at chime warning. During this interval the clock cannot strike because the warning

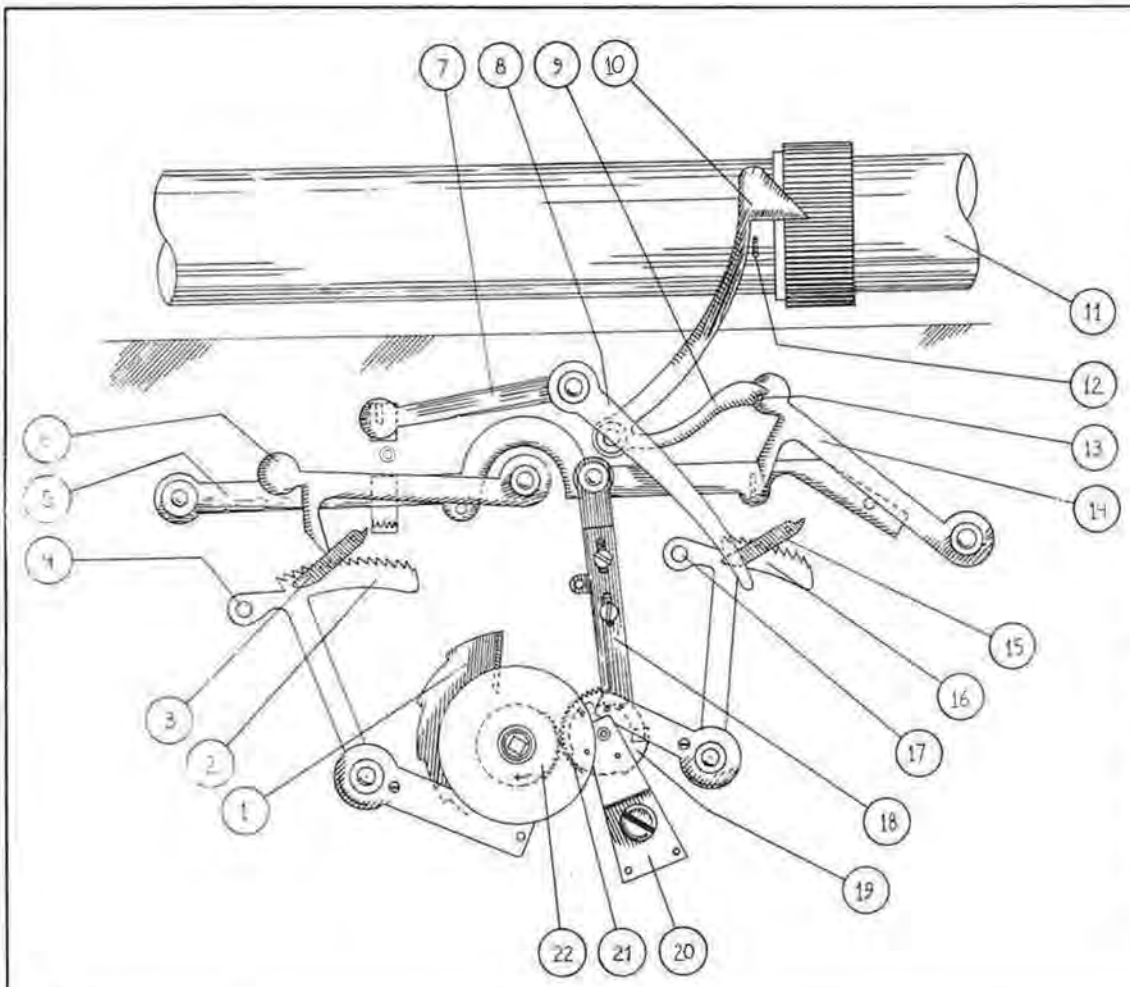


Figure 3

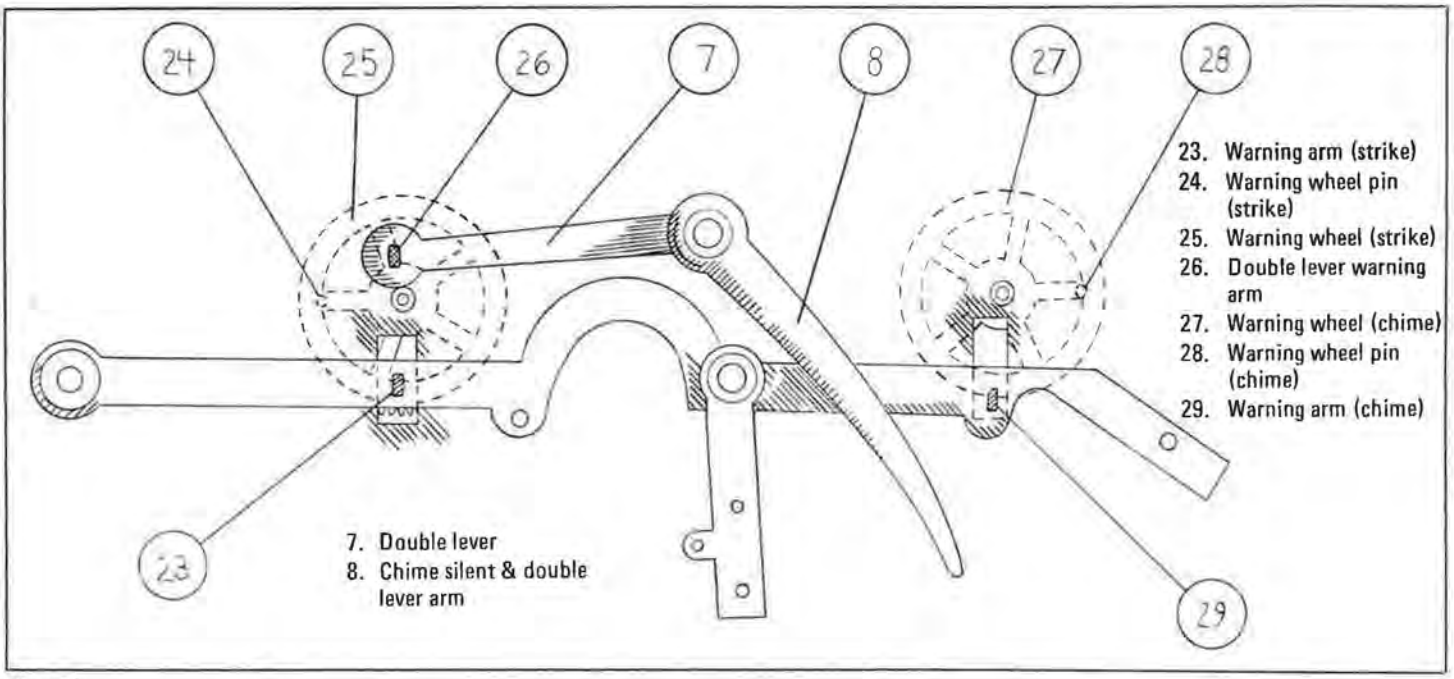


Figure 4

wheel pin is stopped by the double lever warning arm. As the hour chime draws to a close, the quarter rack pallet pin (17) contacts the double lever and pulls against the spring pressure. That is how the strike train is released to run. Be sure the spring is in good condition and properly attached. If it is not working, the double lever warning arm will not catch the warning wheel pin. The clock will go to warning against the other warning arm, but at the hour it will start chime and strike simultaneously.

It is a good idea to check the chime self-correcting device on the Herschede movement. The self adjusting arm (9) catches the quarter rack hook pin (13) at each hour. It holds the quarter rack hook up in the air to prevent the gathering pallet and the rack hook from counting through and locking. If the chimes do not need correction, the self adjusting arm holds the rack hook up for only an instant. However, if correction is needed, the rack hook is held for a longer time. The chiming simply continues until the cylinder self adjusting pin (12) comes by. It is an extra-long pin in the cylinder (11), long enough to lift the self adjusting lever (10) to release the rack hook. The cylinder self adjusting pin is placed so that release occurs at the beginning of the correct hour note sequence. Four sequences of notes are then counted out for the hour chime.

*(Continued on page 49)*

# THE AFFILIATE CHAPTER REPORTS

This will be a short column. Because of the lead time required by the *Horological Times*, this article must be written before the Affiliate Chapter meeting, and by the time you read this, the meeting will be history. The results of the meeting will be covered in subsequent articles, and by your delegate. However, it might be useful to comment on the Affiliate Chapter Report Form that is being used for the first time this year. Twenty-seven reports were received prior to the meeting, and they varied greatly in style and content. I discovered that those twenty-seven chapters represented nearly 4,500 members. Their membership ranged from a low of 20, to a high of 625, with the average nearly 200. It is interesting to note the apparent variation in interest, on the part of watchmakers, in associations in the different areas of the country—or is the difference in the dedication and efforts of the leadership? I suspect that it is a combination of both. There are other reasons, of course. Population density plays a big part, and I am sure that some areas have more watchmakers because people

Robert Bishop

are drawn to those areas by the favorable climate.

The local chapter dues varied also: from a low of $5 to a high of $72, with the $10 to $20 range most common. I am sure there are good reasons for such a varied dues structure. Having to rent meeting rooms would be a prime cause for high dues in a small organization. The expense of maintaining licensing laws could be another.

The number of programs presented by the chapters presented an interesting comparison. One chapter listed only one program on the report, while another listed over 80. The average seems to be about 10 programs per year.

Most chapters consisted of only one guild, but one has eight, another eleven, and another has six. Some reported that there were inactive guilds that they were making an attempt to re-vitalize.

From a quick study of these reports, several facts have already emerged. Many have lost membership in the last few years. Some are having trouble recruiting leaders. Many want more programs from AWI to hold the interest of their members. All of the problems can be solved. One only has to look at the accomplishments and member participation of some guilds to realize that hard work and inspiration still work. Your chapter by now has a complete set of these reports. Ask to see them—it will be well worth your time. HTIES

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# ...from all

**CALIFORNIA**

World famous horologist Orville Hagans was the featured speaker at the June 17, 1980 meeting of the Horological Association of California in Los Angeles. Mr. Hagans, a writer, speaker, collector, watchmaker, and clockmaker, shared his thoughts on the yesterday, today, and tomorrows of the watchmaking profession.

After 70 years at the bench, devoting 50 of those years to association work, Mr. Hagans, now in his early 80's, thought it was time to call it quits and start taking it easy. But when he was once again elected to the AWI Board of Directors, he said to himself, "I cannot let that many people down, so now, God willing, my wife Josephine and I will continue for another three years to do what we can for the horological profession." It was of this desire to help fellow horologists that Mr. Hagans spoke.

Several thought-provoking topics included the decline in the number of professional watchmakers and clockmakers. In 1953 there were 50,000 horologists in the United States. In 1979, only 18,00. In fact, in just one year, since 1978, there was a loss of almost 5,000. "What is going to happen if this continues?" asked Mr. Hagans. Well, for those watchmakers that stick with the profession, taking advantage of all the knowledge available through seminars, technical literature, trade publications, and books, it can only mean success.

Mr. Hagans stressed the importance of reading. "Books! Books are something many people are short on. Books are the most important things in a man's [or a woman's] life. If you folks will give just fifteen minutes a day to reading something about our profession, you will find that you can get paid for that knowledge. And not only do you get knowledge from horological literature, but like everything else, books too are increasing in value; so now your books become an investment as well."

Turning to the subject of professionalism, Mr. Hagans emphasized that "to be a professional, you must act professional." And this includes dressing properly, getting along with people, being businesslike. Belonging to trade associations is also a part of professionalism; and in this connection, Mr. Hagans discussed recent accomplishments of the AWI and its plans for the future.

Mr. Hagans concluded by showing

one hundred awe-inspiring slides of the magnificent timepieces that had been a part of his Clock Manor Museum near Denver, Colorado. Mrs. Josephine Hagans narrated the slides which included such amazing works of art as the Gebhard Astronomical Clock (10 feet high by 10 feet wide by 3 feet deep with 26 mechanical and astronomical movements); the "Empress" clock (a sophisticated automaton made by Jean Francois de Belle for Napoleon as a present to Empress Josephine); and the one wheel gearless clock by C.H. Brigden which received the gold medal at the 1900 Paris Exposition as the most ingenius mechanical device displayed.

HAC sincerely appreciates the many years of service Orville Hagans has given to the horological profession in an effort to make it a vocation to be proud of.

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**PENNSYLVANIA**

The Watchmakers Association of Pennsylvania held its 2nd Annual Convention at the Treadway Resort Inn, Lancaster, Pennsylvania. The convention began with a welcoming speech by Jack Tillman, now the Immediate Past President of the Watchmakers Association of Pennsylvania. The featured speakers of the Sunday morning session were Ann Louise Brackbill, Manager of Technical Services, Citizen Watch Company of America; and Jean Pierre Savary, President of Watchmakers of Switzerland Information Center. Their respective topics were "The Modern Watchmaker–Industry's Link to the Consumer" and "The Swiss Watch Industry Today, and the U.S. Market."

Following lunch, conventioneers were invited to tour the National Association of Watch and Clock Collectors Museum (NAWCC). The NAWCC Museum is currently displaying some 70 watches made by the various Howard companies between 1850 and 1902 as part of their second annual summer exhibition, "Precision Timepieces of E. Howard & Company, Boston." The Hamilton Watch Company's historic collection of various grades produced from 1893 are still on display at the Museum following last year's summer exhibition that featured Lancaster County, Pennsylvania-made clocks and watches.

The Sunday afternoon speaker was Mr. Ewell Hartman, a Past President of AWI, whose topic was "Your Image May Determine Your Success." Mr. Hartman's presentation was followed by a meeting of the Board of Directors and Convention Committee.

The first day of the convention concluded with a banquet. The invocation was given by Mr. Joseph Cass; introductions were made by Thomas Murray, President of the Delaware Valley Watchmakers Guild; the banquet speaker was Mr. Joel Gross.

The concluding day of the convention began with a panel discussion made up of experts in the horological field. The panel topic was "The Watchmaker–Coping With Today'sTechnology." Panel participants were Ewell Hartman, AWI; Jean Pierre Savary, Watchmakers of Switzerland; Herbert Novick, Bulova Watch Company; Ann Louise Brackbill, Citizen Watch Company; Alvin Rudnick, Omega Watch Company; Michael Jenner, Media Digital Corporation; Jack Schecter, Seiko Watch Company. W.A. Hilliard

of Microsonic Corporation was the moderator.

Jack Tillman introduced the new directors of the Watchmakers Association of Pennsylvania at the Monday afternoon luncheon. They are Shirley McDonald, Eugene Eckstein, Paul Fehrenbach, William Hilliard, and Joel Gross. Executive officers elected by the new Board of Directors are Ralph Henning, President; William Hilliard, Vice-President; Joel Gross, Secretary; and Stephen Bodman, Treasurer.

The luncheon was followed by a tour of the Swiss Watch Technical Center in Lititz, Pennsylvania which concluded the two days of convention activities.

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**OREGON**

The Oregon Watch and Clockmakers Guild presented a "No-Host" Dinner on June 30th in Salem, Oregon. This type of meeting was the result of several requests from members. It provided a good opportunity for watch and clockmakers to talk to fellow watch and clockmakers without a time limit.

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**NEW JERSEY**

The May meeting of the Watchmakers' Association of New Jersey was the anniversary meeting commemorating 41 years of existence. Even though the turnout was small, members had a very nice time. Alex Kast was responsible for the food and drink, which was enjoyed by all.

Henry Frystak was the New Jersey delegate to the AWI Convention held in San Fransisco this past June.

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**NEW YORK**

The exciting and fascinating world of clock repairing was revealed by Mr. Nathan Litman at the May meeting of the Horological Society of New York.

Mr. Litman, who is constantly invloved with clocks, gave members some tips on how to simplify clock repairs. Before starting work on a clock, try to find out the ownership and repair history. Also listen to the movement; wind the clock, observe and listen to the winding mechanism.

At the last Executive Committee Meeting, a suggestion was made to bring important medical information to members in the form of "The Harvard Medical School Health Letter," which is published by the Department of Continuing Education, Harvard Medical School. This publication contains articles pertaining to all types of illnesses as well as their treatments and possible preventions. Each month, important items are discussed, described, and explained in clear language. A drastically reduced price is available if these letters are ordered in bulk.

New Officers of The Horological Society of New York. Seated left to right: Aaron Cohen, Executive; Ann Louise Brackbill, Recording Secretary; Howard Levy, President; Aaron Rennert, Vice-President. Second Row: Ben Matz, Executive; Irving Albert, Trustee; Harry Fisher, Editor; Dennis Tricarico, Executive. Third Row: Alvin Rudnick, Executive Secretary; Peter Davis, Financial Secretary; Henry Loeser, Trustee; Victor Hull, Sergeant At Arms. Not shown: Mort Silver, Executive and Jay Meiselmen, Executive.

## OBITUARIES

### Otto Stern

Otto Stern, founder and president of Stern, Inc., Columbus, Ohio for 43 years, died of acute heart failure June 18, 1980. He had had 8 previous heart attacks but recovered from each and returned to work. He was a hard working member of the industry and is well remembered by the many watchmakers whom he assisted in obtaining their first tools for G.I. Bill training after WW II.

He was a member of WMDAA, WAO, Masonic Scottish Rite and Jewish War Veterans.

### V.E. "Biv" Biven

V.E. "Biv" Biven passed away suddenly on June 11, 1980 at the age of 56. Mr. Biven, a certified gemologist, had been the service manager for Downie Jewelers in Pompano Beach, Florida since 1965. He was formerly employed by Gus Lawton, the founder of Lawton Jewelers of Orlando, Florida for over twenty years.

**ONTARIO**

The Ontario Watchmakers Association held their annual picnic on Sunday, June 15th, at the Museum of Time. Members brought their families for a day of food, games, and good fellowship followed by tours through the Museum of Time in the afternoon.

The OWA held its annual business meeting on April 27, 1980 in Toronto, Ontario. President David Barthau presented a report on the continuing certification. The trade is certified under the Apprenticeship and Tradesman Qualification Act. It is administered by the Ministry of Colleges and Universities for the government of the Province of Ontario. The previous exams consisted of multiple choice questions and a practical examination. The last time this examination was administered was May 24, 1979. There have been no tests since that time. The department has completed the new examination that is strictly multiple choice. The Project Advisory Committee disagreed with having a strictly multiple choice test. It is agreed that a practical examination would be much better. However, the government feels that multiple choice is the only manner of testing that they can support.

The new officers for the OWA 1980-1981 term of office are President, Robert John Phillip; 1st Vice-President, H.O. (John) Blankenburg; 2nd Vice-President, James D. Hill; 3rd Vice-President, Michael G. Cosby; Secretary, Robert Phillip; Treasurer, M. Dave Murakami.

Robert John Phillip, the OWA President elected April 27, 1980, is congratulated by his father who was President in 1938.

Joseph Rugole, Teaching Co-ordinator at the George Brown College, Horological Dept., and the REC Chairman for AWI 1978-1980, addresses the members at the OWA Annual Meeting, April 27, 1980.

David Azoulay, Andre Jewelers, Toronto, conducts the Lucky Draw at the President's Banquet.

# AWI's 20TH YEAR OF PROGRESS


TOP ROW (left to right)

1) Opening remarks by AWI's immediate Past President, Leslie L. Smith.
2) Newly elected AWI directors: (left to right) Jay Foreman, Jr., California; Orville Hagans, Colorado; Ewell Hartman, Virginia; Otto Benesh, Florida; Bob Nelson, Minnesota; Bob Bishop, Pennsylvania.
3) Joe Crooks (left) receiving oath of office from Bob Phillip (right).

2ND ROW (left to right)

1) Honorary life membership presented to Les Smith.
2) Elected officers of AWI: (left to right) Marvin Whitney, Virginia, Treasurer; James Broughton, Ohio, Secretaty; and Dr. Joseph Baier, Arizona, 2nd Vice-President. Other officers not shown are Dorothy Aderman, Florida, 1st Vice-President; and Joe Crooks, North Carolina, President.
3) Bob Bishop presides over Affiliate Chapter meeting.

BOTTOM ROW (left to right)

1) Robert Bishop, reelected chairman of the Affiliate Chapters (right) welcomes Bob Allis as vice-chairman.
2) Joe Rugole (left) honored as past chairman of the Research and Education Council.
3) Co-hosts of the meeting were Warren Rogers (left) President of the Horological Association of California; and Ed Hitchcock, President, Bay Area Watchmakers Guild.

# F.A.W.I.

## AWI's Most Prestigious Award Presented For First Time At Annual Meeting

TOP ROW
1) Fellow American Watchmakers Institute presented to (left to right) Orville R. Hagans, Josephine Hagans, and Henry B. Fried.

2ND ROW (left to right)
1) AWI's 20th year Celebration.
2) Bob Nelson, President of AWI 4½ years ago when headquarters building was purchased, holds mortgage while Orville Hagans ignites it, signifying complete ownership of the building by AWI. Proceeds from "The Best of Coleman" book donated by Mr. Hagans were responsible for the very early retirement of the mortgage.

BOTTOM ROW (left to right)
1) Old friends Milt Stevens and Ewell Hartman participate in a fireside chat.
2) AWI Past Presidents: (top row, left to right) James Broughton, Don Leverenz, Hal Herman, Ewell Hartman, Bob Nelson; (bottom row, left to right) Les Smith, Jerry Jaeger, Orville Hagans, Henry Fried, Marvin Whitney.

# Questions and Answers / Henry B. Fried

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

## BREITLING

Q I would like a little information on a pocket watch that I purchased. I am enclosing a picture of a watch that is very similar to the one I own.

Engraved on the inside cover in blue is the following: Detached Lever, 13 Jewels, Compensation. Breitling Haederich in Locle Suisse, No. 9313.

I would like the approximate value, date of manufacture, 14K or 18K gold content, and any other information that you may have concerning this pocket watch.

Thank you.

Alfonso Waitkus
Chicago, IL

A *Watches such as you picture were made in great quantities around 1845-1855 in leLocle, Switzerland, which is near the French border and near Neuchatel.*

*The legens thirteen jewels with compensation is also indicative of this period when the lever escapement was being brought more into play over the previously predominant cylinder escapement.*

*Breitling Haederich . . . I have records of examining a watch by Breitling Laedewick with the same features and of the same date. Check again.*

*As for values, we have a firm policy of not rendering appraisal services as this would be in direct conflict with our many professional appraiser members and advertisers.*

Q I have a 19s, key wind and set Elgin, Serial No. 215040, 10 jewels. It has M D Ogden on the back plate.

My source on the Elgin National Watch Company by Manfred Truring, Yorktown Heights, New York, shows this watch to be Grade 12, 1st Model, 7 jewels. The watch I have has 10 jewels: two each balance jewels, cap jewels, two pallet jewels, one each third, fourth, fifth wheel and one pallet fork jewel. All are set in the back plate. All of these jewels were factory set.

I don't remember reading or hearing about any even-number jeweling for American-made watches. I know that the name Ogden could be a retailer. I would like to know if you could give any information on this watch and how rare it is.

The case is Nickel, No. 5304. Both watch and case are in excellent condition and the watch keeps good time.

Thank you.

John W. Harrison
Lincoln, Nebraska

A *Elgin did make many watches with even-numbered jewels such as 16 and 20 jewel watches. Yours originally was a seven jewel watch, but most likely someone did a nice repair and changed the train bridge with one from a higher jeweled watch, thus adding three unannounced jewels to the watch. That happens once in a while at the repair bench when the original train bridge has been botched and the watchmaker replaces it by cannibalizing some other movement to repair the piece. Also, at times this was done at the factory when a large order was placed, and in a rush, not having enough seven jewel or unjeweled train bridges, they used what was on hand and didn't charge extra.*

*I do not think the watch is rare.*

---

Q I have a watch torn down and can't get the balance staff out of the upper hole jewel. I can see that by pushing the whole thing out and breaking the jewel and the staff, I would be able to remove it, but isn't there some way to take it out without injuring the jewel or the staff?

I feel that I could break the staff off, save the jewel, and just replace the staff, but if there is some way that I might be able to save the jewel and the staff together, I would appreciate your letting me know.

My greatest interest and challenge is to repair and restore antique watches. As you know, it is best to retain their originality as much as possible. Your solutions to problems concerning old watches have been very helpful to me in this regard. I'm sure that there are many others in the field who appreciate this as much as I do.

Thank you for all this.

Candida Sacchetti
Scranton, PA

A *Your problem stems from the watch having been dropped and landing dial up or down, the pivot mushrooming. This, of course, has prevented the pivot from being removed from the bridge or the bottom plate. The solution that works best is to provide a wax dam around the pivot and dab the pivot with a tiny drop of nitric acid. The wax dam prevents the acid from eating away any of the plate or the jewel setting. The wax can be melted, dropped onto the jewel, and then cleared with a pivot drill-point. Sometimes the acid can be applied directly by using a "hair" from a glass brush, much like applying oil to a balance hole jewel.*

---

Q I have a problem with which I would greatly appreciate some help. I have in my shop a grandmother clock which was damaged in shipment from England. The damage was so extensive that my customer filed an insurance claim for a new movement which was readily accepted. I was able to purchase an identical movement from S. LaRose, Inc., of Greensboro, North Carolina. However, there is a difference in the

*(Continued on page 45)*

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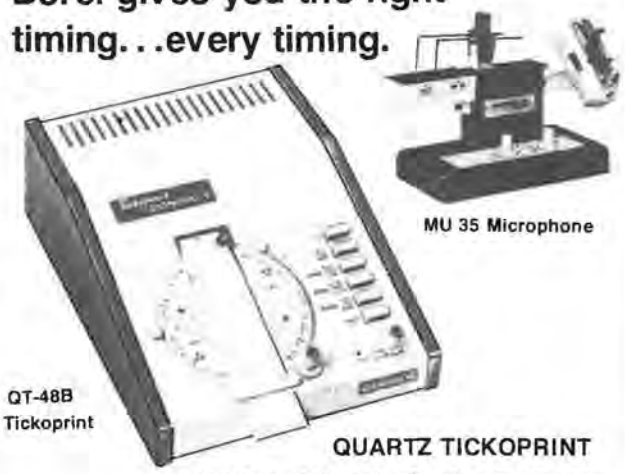


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The solder contains flux but it is sometimes necessary to use additional flux. 30 ml. bottle. **QR-30 $2.00**

**Contact Cleaner**
Cleans battery and pusher contacts of electronic watches and module. Recommended formula to remove oxidation and corrosion, without damage to other parts of module. 4 oz. **MS-180 TF Cleaner $3.95**


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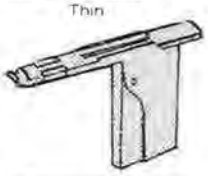

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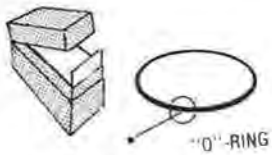


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# TECHNICAL LETTER FROM BULOVA

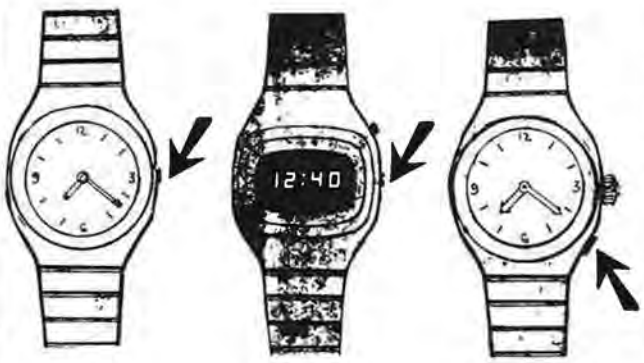
## REQUIRED PROCEDURE FOR ACTIVATING ELECTRONIC RECESSED BUTTON WATCH

Some jewelers, watchmakers, and consumers have experienced "will not set" difficulties with the electronic recessed button watches.

With the introduction of "thin" cases, smaller diameter button tubes are required. Therefore, many watch companies recommend using a "**FINE**-tipped ball point pen or SIMILAR pointed tool to depress the button."

The instructions are not being followed. Ball point pens or objects having MEDIUM or LARGE tips, because of their size, will not penetrate the button tube sufficiently to activate the electronic circuit.

For this reason, it is *imperative* that when depressing a recessed setting button, a **FINE** pointed pen or tool be used. This will eliminate many problems for all concerned. TIMES



# TAX TALK

**QUESTIONS AND ANSWERS BY COMPREHENSIVE ACCOUNTING CORP.**

Comprehensive Accounting Corporation, Aurora, Illinois, provides a monthly bookkeeping, accounting and tax service to over 19,000 business clients through its nationwide network of franchised accountants.

**QUESTION**: Did you know that you can save taxes by employing your children?

**ANSWER**: The Internal Revenue Service allows you to deduct reasonable wages or salaries paid for services rendered by your employees. Your employees may include your children and other family members providing that they are treated the same as any other employee and that the compensation paid to them is reasonable in light of the services rendered.

Instead of giving your child or children allowances, you can employ them and deduct wages paid to them for services rendered even though they may use the wages to partially support themselves. In the event that your children are under the age of 21 and you operate an unincorparated business, you are entitled to an additional advantage since you are excused from paying social security or unemployment taxes on wages paid to them. Similarly, you are excused from paying social security or unemployment taxes on wages paid to your spouse.

By reason of the increased personal exemption and zero bracket amount, your child can receive wages up to $3,300 per year without paying any federal income taxes. You can still claim your child as a dependent providing that you furnish over half of his or her total support and he or she is under 19 years of age or a full-time student for at least five months during the year.

The IRS may be more likely to scrutinize wages paid to your children, thus it is important that the wages paid be reasonable in light of the services performed and that you keep customary records showing the amounts paid and hours worked. The tax you save should substantially outweigh the additional effort in maintaining accurate records. THES

# Altering Crystal Cement Applicators

Most brands of crystal cement are supplied in soft squeeze tubes with a "hypo" type of needle attached for applying the cement. The needle has one flat-ground side cut diagonally across the hole to form a round, sharp point.

I am not recommending any one brand, but G.S. crystal cement is most commonly used by watchmakers because it does not turn brittle when hardened, but remains flexible; it stays tacky, adheres to the crystal and bezel when both are properly cleaned, and withstands great shock before the crystal can be knocked out of the bezel (when properly cemented and fitted). It will not attack most plastics or cause the side walls of a plastic crystal to crack, fracture, or become cloudy when used step-by-step as recommended in the instruction pamphlet that comes with each tube of cement.

Since the bezel is at a 90° angle and the tip of the cement needle is shaped at a flat 180° angle (See Figure 1, A), it's tough to keep from applying too much cement in the square corner of the bezel. See Figure 1, B. When the crystal is pressed in, the excessive cement will form bubbles or squeeze out the top or bottom of the bezel. ANY SOLVENT USED TO REMOVE EXCESS CEMENT WILL WEAKEN THE CEMENT AND RENDER IT PRACTICALLY USELESS.

With an Arkansas stone, modify the tip of the hypo needle at a 90° angle as in Figure 2, A. Then lightly slide the sharp edges across a crocus cloth so the needle will slide smoothly in the bezel.

The tip will then act as a spatula and evenly spread the cement in the bezel as in Figure 2, B.

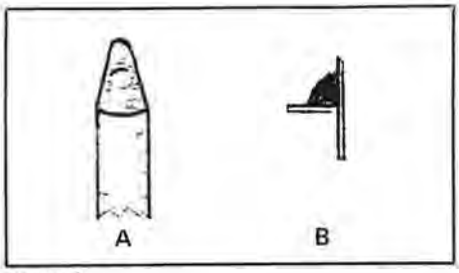


Figure 1

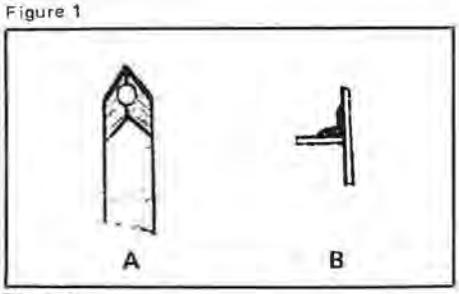


Figure 2

For best results, follow these simple steps:

1. Soak bezel in material can with acetone and carefully remove ALL old cement with a screwdriver. Rinse in the acetone and dry quickly with a clean, soft cloth.

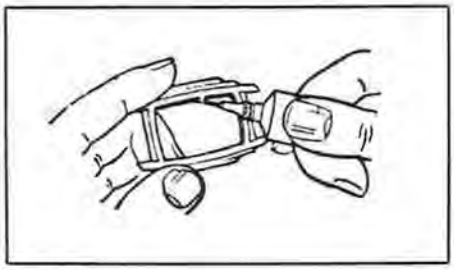


Figure 3

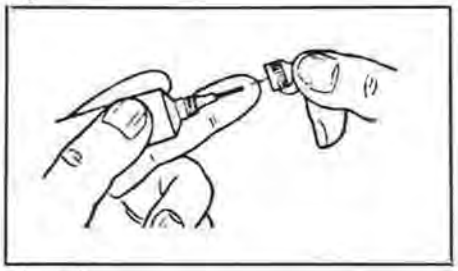


Figure 4

2. Carefully shape crystal to fit the bezel tightly with G.S. emery board. (Rough down with coarse side and smooth with fine side.) Hold crystal upside-down while shaping and *make sure original back taper of sides is not altered.*

3. Polish sides with flat felt board charged with Crystal-Kleer polishing compound until there is a slight friction fit. DO NOT FIT CRYSTAL TOO TIGHTLY.

4. Clean polish compound from crystal with corner of Selvyt™ cloth, slightly moistened with Benzine or alcohol and quickly rub dry. CEMENT WILL NOT STICK TO POLISHING COMPOUND ON CRYSTAL. DO NOT USE BENZOL OR CRYSTAL THINNER FOR CLEANING.

5. Apply cement away from the hypo point, fitting in square of the bezel as in Figure 3. Start at corner and slide smoothly around bezel. SQUEEZE VERY LIGHTLY; cement will flow freely. If you have a skip or heavy spot while cementing bezel, do not go back and try to touch up. The cement will string or ball up. Clean cement out of bezel with acetone and start over.

6. While allowing the cement to slightly dry and become tacky, clean end of hypo tube and replace cap wire in needle hole. See Figure 4 for easy insertion.

7. Allow cement in groove to dry for one minute before pressing crystal firmly into bezel. (The factory recommends 2 to 3 minutes, but with the 90° tip applicator, there is less cement in the bezel and the thinner in the cement starts drying sooner.)

8. DO NOT PUT BEZEL ON CASE BEFORE CEMENT IS DRY! It takes about 5 minutes for the thinner in the cement to dry, and if fumes are trapped in the case, they could damage the crystal or contaminate the oil in the watch movement.

# REPLACING BALANCE STAFFS

**Part II**

**By Archie B. Perkins** 

Replacing balance staffs is a delicate procedure and requires considerable conscientious effort on the part of the watchmaker. Half of the operation involves removing the old balance staff and selecting and staking the new staff into the balance wheel. Once this is completed, there still remains the very important task of truing and poising the balance wheel.

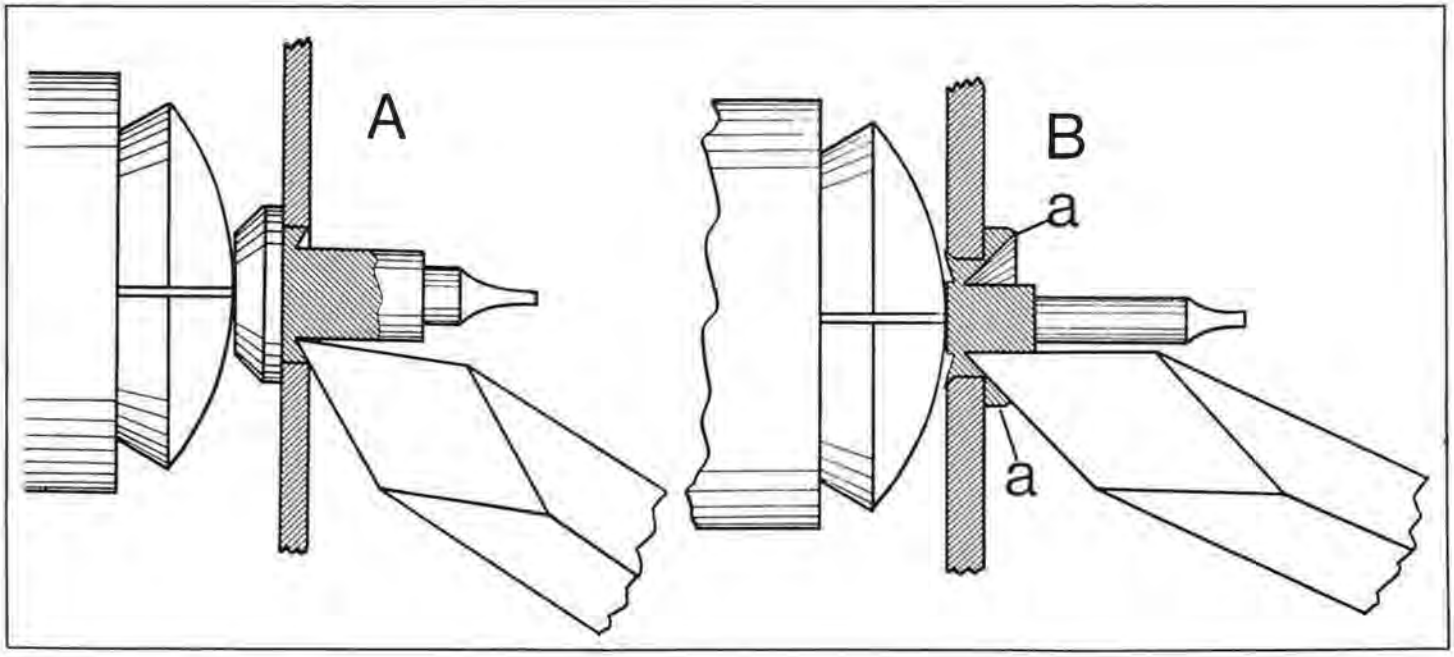
To replace the standard, riveted type of balance staff, the following procedure can be used. First, remove the balance staff from the balance wheel, using care to avoid damaging the balance arm and the hole in the arm. To protect the balance arm, one of two methods can be used. In the first method, the balance wheel is chucked up in the lathe by the roller table shoulder and a graver used to remove the rivet on the staff. This is shown in Figure 1, View A. Then the staking tool is used to remove the staff. After the rivet has been cut off, a hole is selected in the die plate of the staking tool that will just clear the hub of the staff. Then a cross hole type punch is used on the cone of the upper pivot to press out the staff. Sometimes a light tap on the punch is needed to remove the staff. If the rivet has been removed correctly, the staff should come out without damage to the arm or the hole in the arm.

The other method involves undercutting the hub of the staff. This is done by chucking the staff by the hairspring shoulder and using a graver to undercut the hub as in Figure 1, View B. When the hub has been undercut sufficiently, the portions "a" will snap off in the form of a washer. Then, in most cases, the wheel can be removed easily with the fingers. If the wheel doesn't come off easily, a stump is selected which has a hole in it that will clear the rivet of the staff. A cross hole punch is then used on the cone of the lower pivot to gently press the staff out of the wheel. A light tap on the punch is sometimes necessary. One good reason for removing the staff by undercutting the hub is that the wheel comes off of the staff in a direction away from the rivet, which assures that the rivet cannot damage the hole in the wheel as the staff is removed. When this method is used, the staff is no longer a good sample. When a sample staff is needed with which to compare new ones, it would be better to use the first method where the staff is removed by cutting the rivet away.

**FREE OFFER**

In response to Mr. Perkins' article, "Spring Bars and Watchbands," which appeared in our March issue, Jacoby-Bender Inc. is making available to our readers two of their products, free of charge. "The Jeweler's Friend" and "The J-B Third Hand" are two devices which aid in the attaching and removal of watch bands and in the adding and removal of band links. Both tools may be had by writing to: Jerome G. Hahn, Jacoby-Bender Inc., 62-10 Northern Boulevard, Woodside, NY 11377.

Figure 1



Note: Some balance staffs are left very hard by the factory, making them difficult to cut with an ordinary steel graver. To make the staff easy to cut, it can be annealed. An annealing tool, number RM-354, can be purchased from your local watch material distributor for this purpose. Care must be exercised when using this tool to avoid damage to the balance wheel from the heat. If a carbide graver is used, annealing the staff is unnecessary.

To select or order a new balance staff, the following information is needed: make of watch, size, model or grade, collet size, and whether regular or shock proof. If the watch is an older American make, some additional information is needed such as hunting or open face, single or double roller, large or small waist, and pivot size. If the exact number for the staff cannot be obtained from a material catalog, it would then be better to furnish a sample as well as all of the above information. To obtain the staff number on an Elgin, Waltham, or Hamilton, the movement number can be looked up in the material catalog from the particular company, which furnishes the grade or model of the watch. Then, by taking the grade or model number and going to the balance staff section for that grade, the staff number will be obtained. After the balance staff has been selected and bought, it must still be tried in the watch for fit. Before trying the pivot fit in the jewel holes, make sure the jewels are clean and not broken. First, place the lower pivot in the lower hole jewel while the cap jewel is in place. If the pivot fits the hole jewel correctly, the staff will lean about 5° to each side of an exact vertical position. See Figure 2. Note: The pivot should be about .01 mm smaller than the jewel hole. If the watch is turned upside down while the pivot is in the jewel hole, the staff must drop out and not stick in the jewel hole. On the other hand, if the staff leans more than 5° or will not stand up at all, then the pivot is too small for the jewel hole. Next, make the same test of the upper pivot in the upper jewel hole. If the pivot fits too tightly in the jewel hole, it can be chucked in the lathe and ground down with a jasper stone, then polished to fit the jewel hole. If the pivot is too small for the jewel hole, then another staff should be selected which has larger pivots, or the hole jewel should be changed for one that fits the pivot correctly. Now that the pivots on the staff fit their jewel holes, the staff is tried in the watch for proper length. When the staff is placed in the watch and the balance cock tightened down, there should be about .02 mm endshake on the staff. If there is no endshake on the staff, the balance cock should be checked for burrs underneath it that would cause it to be tilted down at its end which would take up the endshake. Sometimes the balance cock has been bent down at its end, causing lack of endshake. If there is too much endshake, there could be a burr under the balance cock, or the balance cock could be bent up at its end.

The level of the balance cock can be checked with a small straight edge by placing it lengthwise on top of the balance cock. If the endshake isn't correct, it is also a good idea to check the cap jewels to make sure they are tight and are flush in their settings. If there is no apparent reason for the staff not having enough endshake, then it can be assumed that the staff is just slightly too long. The staff can be chucked up true in the lathe and the required amount can be ground and polished off of the end of one or both pivots. After the pivot fit and length of the staff have been checked, check the fit of the balance wheel on the balance shoulder of the staff. This can be done by pressing the roller shoulder of the staff into a block of pithwood, and then placing the hole of the wheel onto the balance shoulder of the staff. The wheel should go onto the shoulder with a snap when pressed down with a pair of brass or bellmetal tweezers. After the wheel has been pressed down against its seat, the height of the rivet should be noted. The rivet should stand up above the balance arm about .1 mm to allow for tightening the staff into the wheel. When the wheel fits this tightly on the staff, a flat faced punch with a hole is all that is needed to tighten the staff in the wheel. A round face spreading punch is not needed. If the wheel has some sideshake on the staff, then the round face punch would be needed first to spread the rivet, followed by a flat faced punch for flattening the rivet down on the

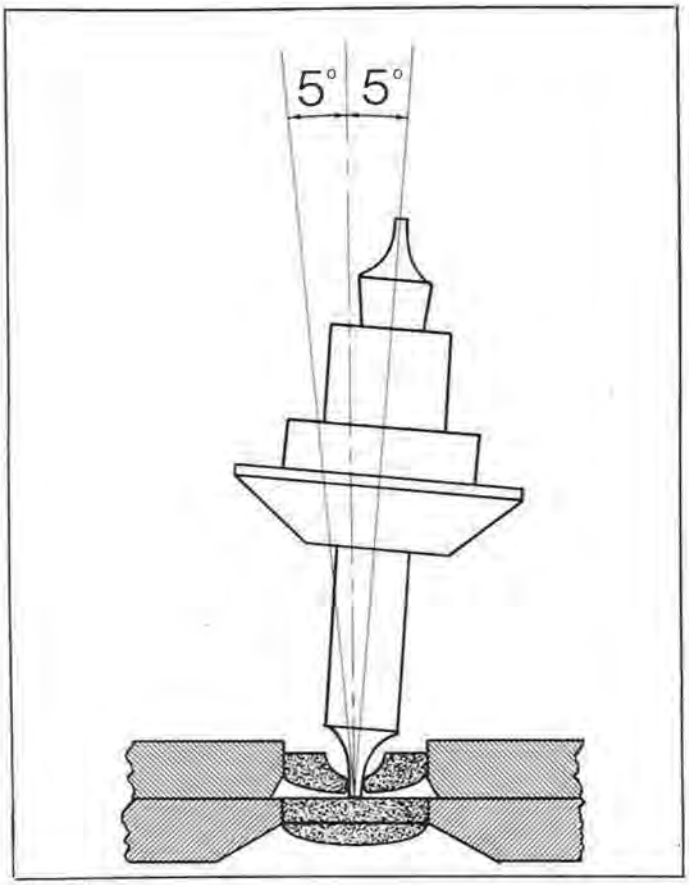


Figure 2

Technically
# WATCHES

by **ARCHIE B. PERKINS, CMW, FNWCCA**

# BERGEON

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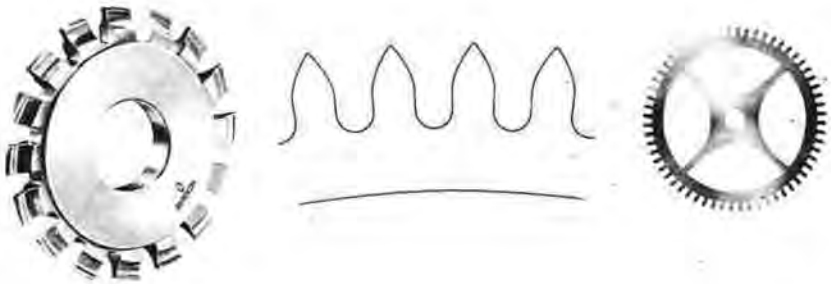

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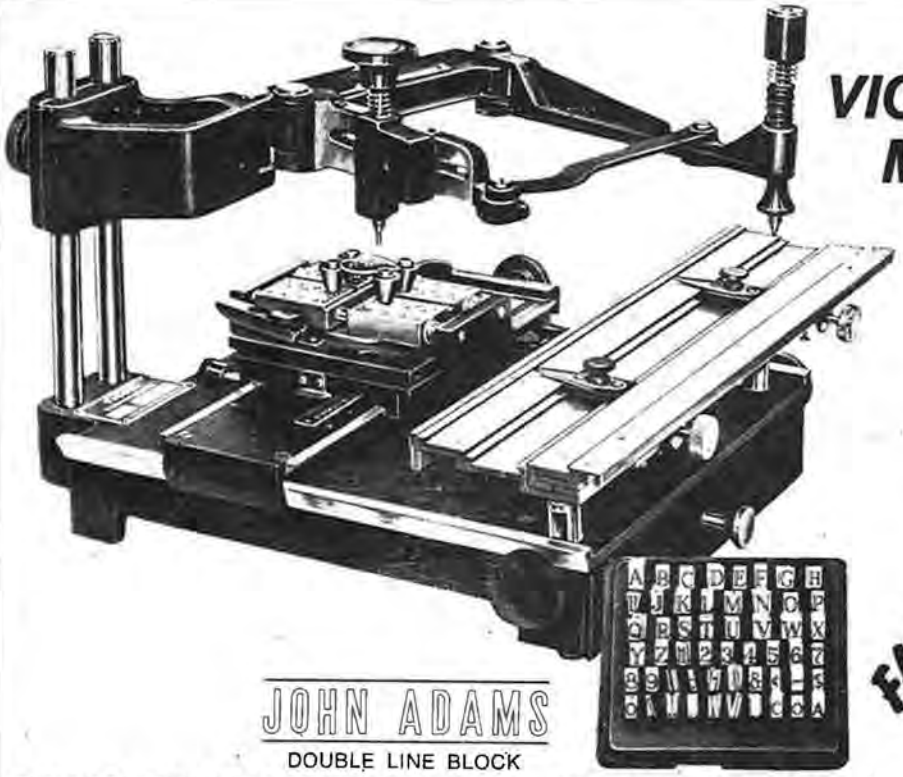

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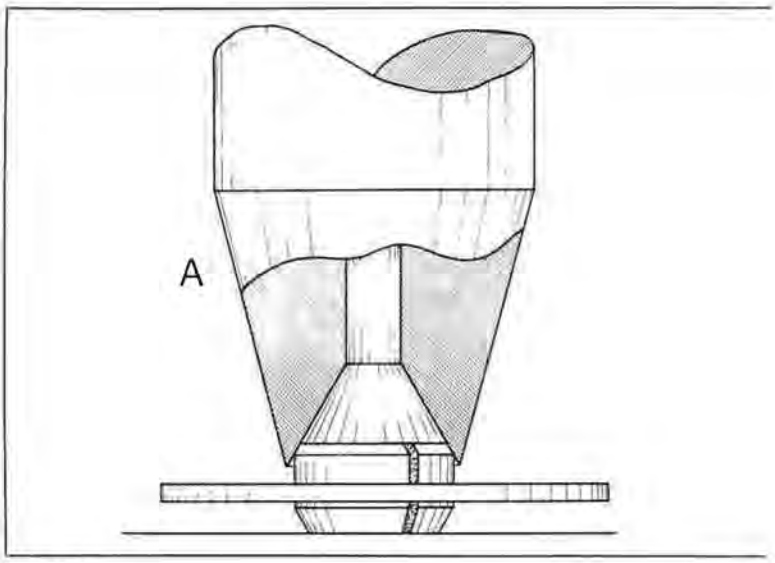
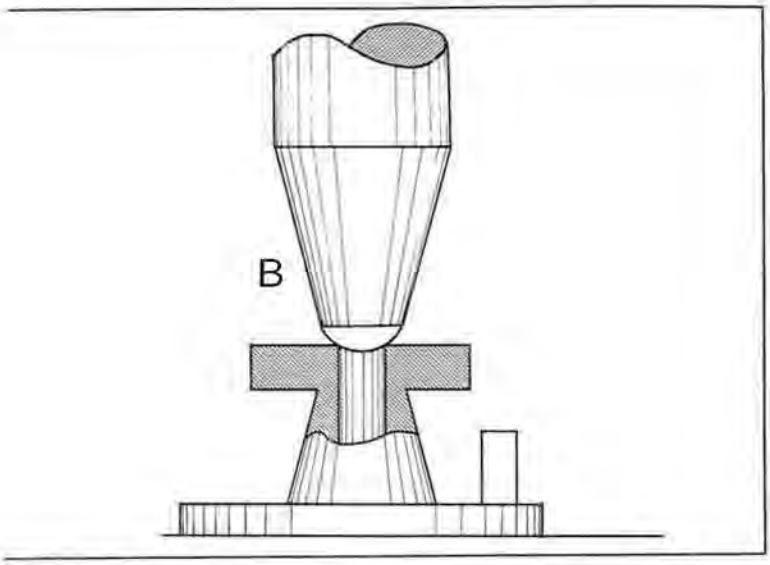



Figure 3

balance arm. If the wheel should not start onto the shoulder of the staff, then the shoulder should be reduced in the lathe by grinding or with a graver.

Now check the fit of the hairspring collet on the hairspring shoulder of the staff. The collet should just start onto its shoulder. If the collet will not start on, then another staff with a smaller collet shoulder must be selected or this one reduced in the lathe with a graver. If the collet fits just a little too loosely on its shoulder, it can be closed a small amount if its slot is wide enough to allow this. To close a hairspring collet slightly, use a taper mouth punch as in Figure 3, View A. The punch must fit over the edge of the collet but not go down far enough to touch the hairspring. The punch is tapped lightly with a brass hammer while the collet is supported on the die plate of the staking tool. Next, check the fit of the roller table on the roller shoulder of the staff. If the fit is correct, the roller table will go onto the staff to a point where the space between the impulse roller and the bottom of the hub of the staff is equal to the thickness of the impulse roller. If the roller table doesn't go onto its shoulder this far, there is danger of it becoming crushed while being pressed on. If it is a steel roller table, the hole could split out as the table is pressed on. If the table fits too tightly, another staff of proper size should be selected or the roller shoulder can be turned or ground down to fit the table. If the table fits a little too loosely on the staff, its hole can be closed slightly with the staking tool. To close a roller table, use a solid round end staking tool punch as in Figure 3, View B. Either use a very light tap on the punch or turn the punch with the fingers while applying slight pressure on the punch. This burnishes the corner of the hole in the table, which closes the hole slightly. CAUTION: Very little pressure should be applied to the punch in order to avoid crushing or otherwise damaging the roller table.

The proper procedure for staking a new balance staff into the balance wheel is as follows: First, select a hole in the die plate of the staking tool that the roller shoulder of the staff will go into without binding and with very little sideshake. This hole is then centered up with the die plate centering punch, and the die plate is locked in this position. Now a flat face punch with a hole is selected to rivet the staff into the wheel. This punch should go over the hairspring shoulder all the way down against the top of the rivet without binding and with very little sideshake. Note: If the staff fits a bit too loosely in the wheel, then a round faced




punch must be selected for use before the flat punch to spread the rivet. The round faced punch should never be used if the staff fits the hole in the wheel correctly or if the staff is a side or top groove style. If the staff fits the hole of the wheel very closely, there is danger of spreading the hole when the round faced punch is used. Figure 4, View A shows a round faced punch being used to spread the rivet, and Figure 4, View B shows the flat faced punch being used to flatten the rivet down against the arm of the wheel. The round faced punch is selected the same way as the flat punch. If a K & D staking tool is being used, then selecting the punch is easier.

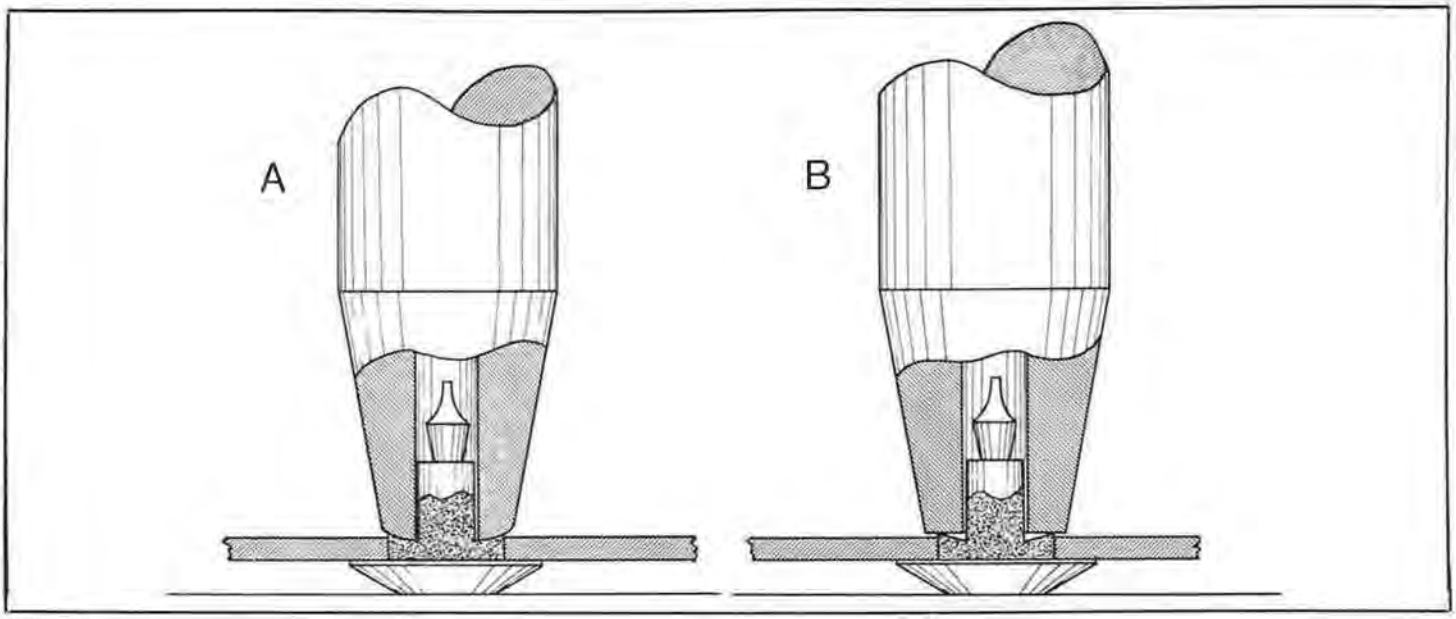



Figure 4

There will be 30 numbers difference between the round faced and the flat faced punches. For example, if the round faced punch has a number of 89, then the matching flat faced punch will be numbered 59.

To stake the staff, place the staff in the hole in the die plate of the staking tool. Then place the balance wheel in position on the staff. Now place the punch in the staking tool frame and, while holding the punch down against the rivet of the staff with the fingers, lightly tap on its end with a brass hammer. Now turn the punch 180° on the rivet with the fingers and tap the punch once again. The reason for turning the punch each time between taps of the hammer is to insure a uniform riveting job in case the end of the punch isn't square. Note: Use light taps at the beginning; then, if necessary to tighten the staff in the wheel, increase the pressure of the hammer blows. The tightness of the staff in the wheel should be checked quite often to avoid over-staking the staff and damaging either the balance wheel or the staff. The tightness of the staff can be checked by chucking the staff in a chuck in the lathe or in the jaws of a pin vise. The wheel is then checked with the fingers for tightness. When the wheel cannot be shifted on the staff with the

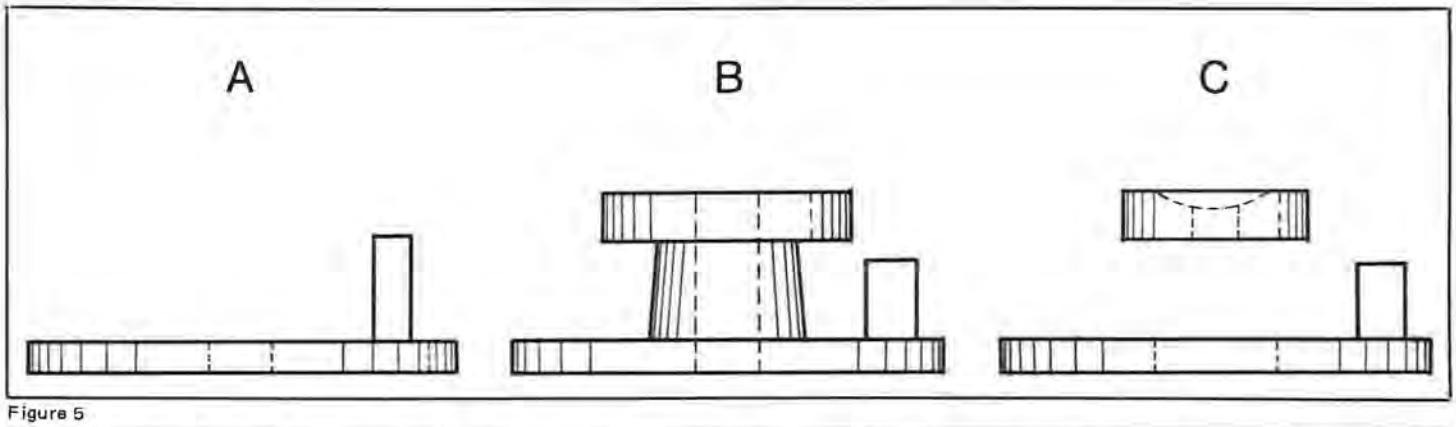


Figure 5

fingers, the staff should be sufficiently tight in the wheel. Another test is to place the ear close to the chucked up staff. Now use a fingernail to pluck one of the balance screw heads. If the wheel is tight on the staff, there will be a slight ringing sound. After the staff is tight in the wheel, it is placed in the watch and the balance cock is tightened. Now check the freedom of the wheel in the watch. The balance should clear the pallet bridge and center wheel sufficiently. Now the balance can be removed from the watch and the roller table replaced. The method used is determined somewhat by the type of roller table used. There are three main types of roller tables and these are shown in Figure 5. View "A" shows a single roller. This style is used in the older watches. This table carries the roller jewel and also has the crescent in the edge of the table in front of the roller jewel to allow the guard to pass from one side of the table to the other. View "B" shows the combination roller. This roller has an impulse roller that carries the roller jewel and a safety roller combined with the impulse roller. The two tables are separated by a tube. View "C" shows a two piece roller. The impulse roller that carries the roller jewel is separate from the safety roller. These two tables fit on different shoulders of the staff, allowing the tables to be correctly spaced apart.

When replacing single roller tables, a special stump that will clear the roller jewel can be used to support the roller table while the staff is pressed into the table. The same flat faced punch that was used to stake the staff can also be used to press the staff into the table. See Figure 6, View A. Another method for replacing the single roller is to support the balance wheel upside down on a stump with a hole that just clears the hairspring shoulder of the staff. Now select a roller table punch which has a hole large enough to clear the roller shoulder of the staff and a groove to clear the roller jewel. This punch is used to press the roller table onto the staff.

*(Continued on page 44)*

# Report From The Annual Meetings

Perhaps the single most important yearly function of the American Watchmakers Institute is the annual Board of Directors meeting. This year's annual Board of Director's meeting was held June 28 and 29; it was immediately preceded by the annual Affiliate Chapter meeting which was attended by delegates from the AWI Affiliate Chapters. This year's series of meetings was held in the Bay Area of San Francisco, California. The meetings were moved to San Francisco as the result of a recommendation made by the Affiliate Chapters last year. I believe the change of scenery was welcomed by all who attended. A special note of thanks is due to the Bay Area Watchmakers Guild and the Horological Association of California for their hospitality.

The annual Board of Director's meeting was chaired by AWI President, Les Smith. President Smith impressed everyone with his fairness and business-like manner as he guided the meeting through two days of deliberations. In last month's column, I reviewed with you some of the committee reports which were to be presented at the annual Board meeting. At that meeting, there were more committee activities reported that are worthy of note.

In his report to the Board, AWI's Administrative Director Michael Danner reviewed some of the highlights of the recently completed year. He pointed with pride to the financial picture of AWI and the fact that the mortgage for our building is being retired after only four and one-half years. Mr. Danner revealed that we have secured the services of Mr. Maury Norrell of Denver, Colorado to replace Thomas Herman as Managing Editor of the *Horological Times*. Tom Herman resigned to accept a very responsible position with a large Cincinnati printing company; Maury Norrell brings to *Horological Times* a lifetime of experience in magazine work.

Mike Danner reported on a number of new AWI publications which are currently in preparation, and on the fine reception AWI's *Watch and Clockmakers' Buyer's Guide* has received. The next AWI book to appear in print will be *Questions & Answers for the Clockrepair Profession*. This will be a companion book to the very popular *Questions and Answers for the Watchrepair Profession*. Following this book will be the *Essence of Clock Repair* by Sean C. Monk and *Automatic Watches* by Henry B. Fried.

Another very important publication was approved by the Board of Directors. The Board has entered into an agreement with Orville R. Hagans to publish *Watch & Clock Information Please!* based on the writings of W.H. Samelius, Dean of American Watchmakers. The agreement is much the same as that made with Mr. Hagans for the publication of the *Best of J.E. Coleman* in which Mr. Hagans makes the profits from this publication available to the AWI building fund. It was the profit from the Coleman book that made it possible for us to retire the mortgage on our present building.

The Seminars and Workshop Committee report revealed that during the fiscal year just completed, AWI speakers and workshop instructors had appeared at more than one hundred programs in the United States and Canada. The committee reported that additional workshops and speakers will be added to the list of programs available for 1980-1981. Robert Nelson, Chairman of the Visual Aids Committee, showed previews of five new slide tape programs which will be available for watchmaker meetings beginning in September of this year. These programs are:

**Watch Casing Made Easy**, made by Robert Bishop. This shows how to open and close many of the cases that give watchmakers difficulty. Special tools are also demonstrated. Specific methods are shown for Seiko, Rolex, and Omega cases.

**Sales Talk**, made by Wes Door, covers a topic which has been discussed for many years. Professionally recorded, with background music and using pictures and voices of several characters, demonstrations of methods which sell watches, jewelry, and repairs are shown. The problem of overcoming objections and how technical you should be with a watch repair customer is also covered. This program should appeal to jeweler-oriented meetings as well as to watchmakers.

**Repairing Solid State Watches**, made by Darrell Archer, is filled with practical, down-to-earth information for anyone doing any amount of this type of work. Mr. Archer demonstrates that a mechanical watchmaker can make the transition to electronics without a lot of formal electronic training. Common sense and "using the old noggin' " will go a long way.

**How to Make and Mount a Clock Wheel** and **How to Make and Mount a Clock Pinion** are two programs made by Archie Perkins that will help AWI be of more service to the ever-growing field of clock repair. Even watchmakers who do not engage in this work will benefit from the knowledge of how it is done.

**Repairing Ladies' Watch Case Lugs**, filmed and produced by Robert Nelson with the help of Jewelmont's Jewelry Repair School, shows step-by-step methods of repairing gold-filled and solid gold cases.

Mr. Nelson revealed that a number of other programs are being worked on and will be completed early in 1981. He also requested ideas from organizations and individuals for topics for future programs.

On Sunday, June 29, the newly elected directors were installed by Robert Phillip. These included Otto Benesh, Jay M. Foreman, JR., Orville R. Hagans, Ewell D. Hartman, Robert A. Nelson, and Affiliate Chapter Director Robert Bishop. Retiring from the Board this year were Leslie L. Smith, Karl Buttner, and Charles H. Mann. The new Board of Directors then selected the following to serve as officers during 1980-1981:

Joe Crooks, President, Mooresville, North Carolina; Dorothy M. Aderman, 1st Vice-President, Hallandale, Florida; Dr. Joseph G. Baier, 2nd Vice-President, Phoenix, Arizona; Marvin E. Whitney, Treasurer, Alexandria, Virginia; James H. Broughton, Secretary, Columbus, Ohio.

On Friday, June 27th, the delegates from the various AWI Affiliated Chapters held their annual meeting.

*(Continued on page 65)*

# AWI Bench Courses / 1980

| Programs | | Instructors |
|---|---|---|
| A | Basic Electricity & Use of Meters | Jeager |
| B | Citizen LCD Alarm | Carpenter |
| C (a) | Citizen LCD Multi-Alarm | Broughton |
| C (b) | ESA/ETA Quartz Analog | Broughton |
| D (a) | Seiko 4300 Ladies' Quartz Analog | Smith |
| D (b) | Seiko LCD Chronograph/Alarm | Smith |
| D (c) | Seiko 0903A Men's Quartz Analog | Smith |
| E | Intro. to Solid State Watch Repair | Nelson |
| F (a) | Bulova Quartz Analog (SMQ) | Opp |
| F (b) | ESA LCD Chronograph | Opp |
| G | ESA Digital/Analog | Biederman |

**AUGUST, 1980**

| | | | |
|---|---|---|---|
| 3 | C (a & b) | Dallas, TX | Broughton |
| 24 | D (a & c) | Waterloo, IA | Smith |

**SEPTEMBER, 1980**

| | | | |
|---|---|---|---|
| 7 | F | Orlando, FL | Opp |
| 7 | G | Columbia, MO | Biederman |
| 14 | A | Birmingham, AL | Jaeger |
| 27 | C | Binghamton, NY | Broughton |

**OCTOBER, 1980**

| | | | |
|---|---|---|---|
| 11 | A | Fond Du Lac, WI | Jaeger |
| 12 | C | Atlanta, GA | Broughton |
| 19 | D | Austin, TX | Smith |
| 19 | G | Richmond, VA | Biederman |
| 19 | A | Peoria, IL | Jaeger |

**JANUARY, 1981**

| | | | |
|---|---|---|---|
| 11 | F | Houston, TX | Opp |

# BELL REPAIR

**By Otto Benesh**

"CLOCK CHATTER" ©1980

*by* **Otto Benesh, CMC**



Contrary to what one might hear, repairing a cracked or broken bell is not like repairing a broken egg. Fixing the bell is really quite easy.

Clock bells come in all sizes and shapes. They vary from the four-toned, tinned and polished set in Figure 1, to the multi-toned monsters such as the ones in Westminster Tower in London. They vary in shape from the half-round domed varieties to the pork pie example at the lower right in Figure 1. This shape was a favorite of Joseph Knibb, one of the great English clockmakers of the 17th century. They also come in the beehive shape used by the Japanese with the internally thickened lip (which is supposedly a casting secret), as well as in the shape we normally associate with church bells. In the lower left of Figure 1 are two rough castings just as they come from the mold. They will require turning, tinning and polishing before they are ready for a clock. In work such as long-cased clocks and many of lesser quality, the tinning is omitted.

Bells are made from many materials: bell metal, cast iron, glass, silver, etc. One of the best tones I have heard was from a contemporary bell made from Duraluminum.

As was mentioned, bells come in all sizes. Figure 2 shows a bell that was cast for me for an early 18th century repeating watch and is about an inch and an eighth in diameter. Notice that it has a hole drilled through it for the winding key and this does not affect the tone. It is compared for size with a bell for a standard-size English lantern clock.

The small bell was cast by the Whitechapel Bell Foundry in London, England. On one of my trips, I spoke with Mr. Hughes, a principal of the firm, and he told me how many Americans kidded him about the Liberty Bell which was originally cast by the firm. The clock bell broke and it was melted down and recast. It is the second casting done in America that also cracked and is now an important part of our history. I suggested that if they wished to stop the good-natured kidding, they should suggest that the bell be sent back and they would be happy to recast it. They are a superb organization and each member is a true craftsman.

One of the problems when you encounter a bell that goes "clunk" instead of producing a pleasant ringing sound is finding the source of the discordance. This can be extremely difficult when the cause is a tiny crack at the edge of the rim or lip. Figure 3 shows a bell being examined in order to locate the crack. By using your fingers to spread the edge, often with considerable force and with as much magnification as provided by a ten power loupe, you may find the source. At times, you may need to use a file or a scraper to clean the edge and hope that will assist in finding the hairline crack. It has often taken me more time to locate the crack than to repair it.

Once you have located the source of discordance, there remain two problems. One is the method of holding the bell while it is being repaired. While cracks are the most common flaw, it is often necessary to reaffix a piece that has broken away. Obviously there is no difficulty in locating the source of the "clunk" when a piece is broken out.

A sand box is one of the best holders for items of odd shapes. It is used by restorers of porcelains, bronzes,

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

and other unusually shaped objects. Figure 4 shows a bell in a sand box. You can see where the soft solder was applied to the crack. It should be mentioned that this is an Eli Terry type of bell and is cast iron. The small hole which appears at the end of the crack is not a drilled hole but a flaw in the original casting.

As can be seen, the sand box lends itself to holding the bell in almost any position while you work on it. You can even solder in sections, moving the bell to another position in the sand as you work. You must be careful to provide a method of heat dissipation so that you do not melt the solder in finished portions and thereby undo all that you have accomplished. Don't forget that the sand box does not eliminate the need for binding wire when you must have something to hold the work in close contact for successful soldering.

Figure 5 shows the completed repair. While the solder can be seen on the inside of the bell, it is not visible from the outside. It can be further reduced by scraping.

When the repair consists of merely filling a crack, the bell can be placed on a metal rod of iron or brass. The end of the rod should be tapered to allow the bell hole to be seated on it. You may either hold the rod in your hand without danger of being burned, or you can place it in a vise, giving you two hands to work with as shown in Figure 6.

This brings us to the second problem: the application of solder and heat. In this case, a propane torch is being used, although my normal apparatus is an oxygen and propane torch. Without sufficient heat, it is impossible to get a good soldered joint. I have often placed the bell to be soldered on a tripod and supplied extra heat from a bunsen burner while using the torch directly on the area to be soldered.

When soldering bells, be careful to apply heat slowly and get the entire piece warm before concentrating the heat. This is especially important when you are using one of the hard solders such as silver solder. Failure to bring the bell to overall heat may result in cracking that is often worse than the problem with which you started.

Personally, I find that one of the eutectic solders does just as good a job as hard solder. Eutectic solder is formulated so that its melting point corresponds with the melting point of the lowest component of the compound without losing strength. However, the hard solders are useful for tacking a piece in place. The work can then be filled in with soft solder without fear of the piece coming undone.

Now is the time to recall all the lessons learned from former articles in *Horological Times* on making solder flow in the desired direction. With the application of heat and flux to the proper places, you can apply the solder to the inside and stop it when it just reaches the outside of the bell.

Figure 7 shows a bell that had a long crack. The edge was silver soldered and the crack was filled with five-minute epoxy. It was an experiment and was successful. As it was an experiment, the work was not finished off, although from the other side, the repair is not apparent.

Figure 7

Figure 8

Having mentioned the use of epoxy, this is an appropriate place to mention the cyanoacrylates such as Alpha®, Krazy Glue®, Super Glue®, etc. These anerobic adhesives have great application in bell repair. With them you can make excellent repairs to glass bells which were almost impossible prior to the development of these adhesives. There are also many other applications.

So you see, bells are not so hard to repair. However, when the bell in Figure 8 came in for repair—on second thought—send me the broken egg.

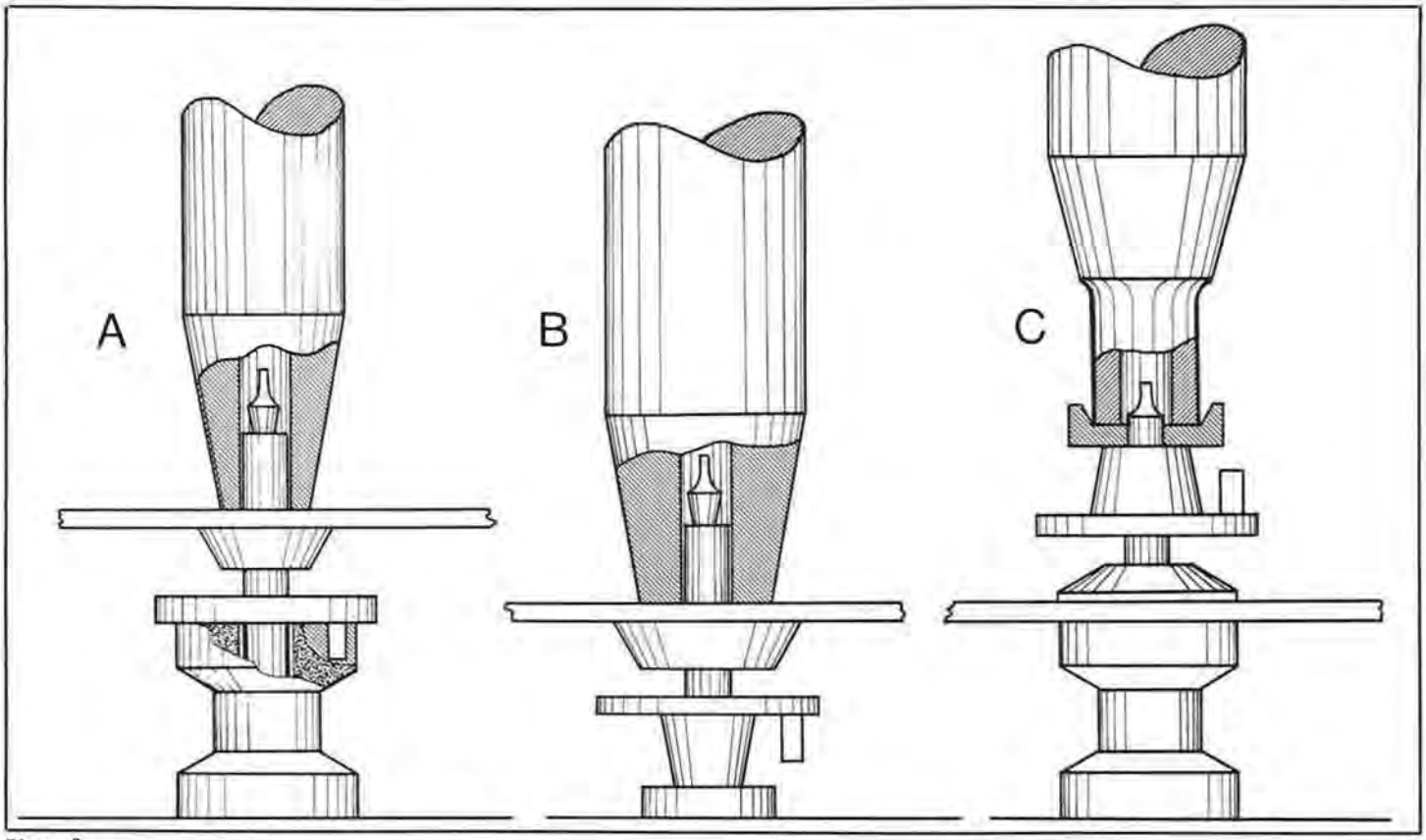



Figure 6

## TECHNICALLY WATCHES

*(Continued from page 39)*

When replacing the combination roller table, it is started onto the staff and the same hole in the die plate is used to clear the staff and support the table as was used to stake the staff into the wheel. Then take the same flat faced punch that was used in staking the staff to press the staff into the roller table. See Figure 6, View B. To replace the two piece roller, the impulse roller is replaced using the same method as was used to replace the single roller. Usually the safety roller can be replaced with the same punches. When replacing Incabloc rollers, special punches and stumps are used. The stumps have flat faces with small holes which just clear the hairspring shoulders of the staffs. The punches have small holes with flat faces and are turned down near their end to go inside the sink of the safety roller. See Figure 6, View C. This prevents the safety roller from being crushed as the table is replaced.

Friction staffs are removed and replaced in a different manner than are riveted staffs. Figure 7 shows the Waltham friction staff being removed and replaced. View A shows the staff being removed. The bevel on the blue hub of the assembly is supported in the beveled hole of a special stump while the staff is staked out from the top of the wheel with a special cross hole punch. The blue hub has been riveted into the wheel and is never removed from the wheel when the balance staff is changed. View B shows the Waltham friction staff being replaced. The wheel with the blue hub is supported on a stump which has a hole large enough to clear the hairspring shoulder of the staff. A special punch with a hole to just clear the roller shoulder and which is turned down at its point to be slightly smaller than the shoulder on the staff is used to stake the staff into the blue hub. These special punches come in most staking sets.

To replace Hamilton friction staffs, refer to Figure 8. View A shows the staff being removed. To remove the staff, the blue hub is supported on a flat stump which has a hole just large enough to clear the shoulder of the staff. A cross hole punch is then used to

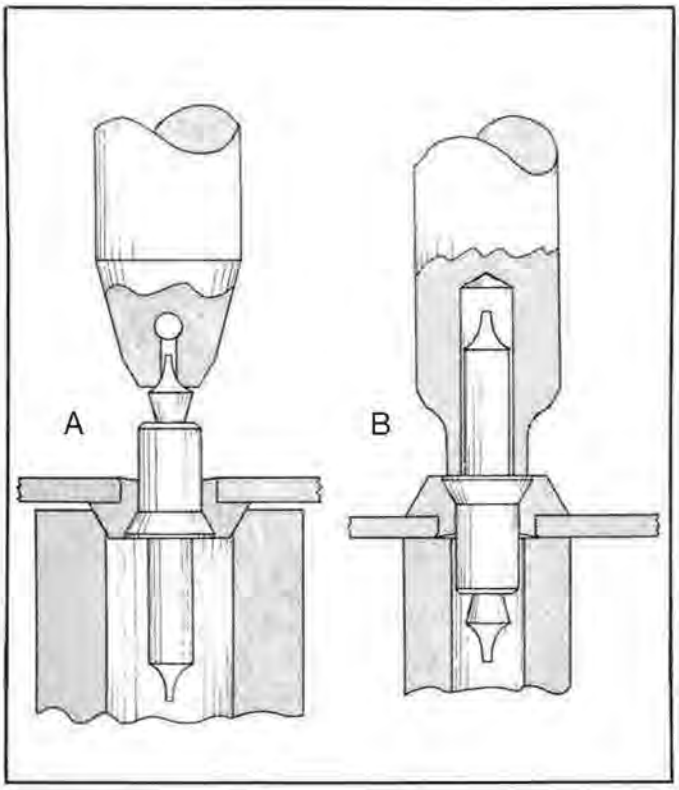



Figure 7

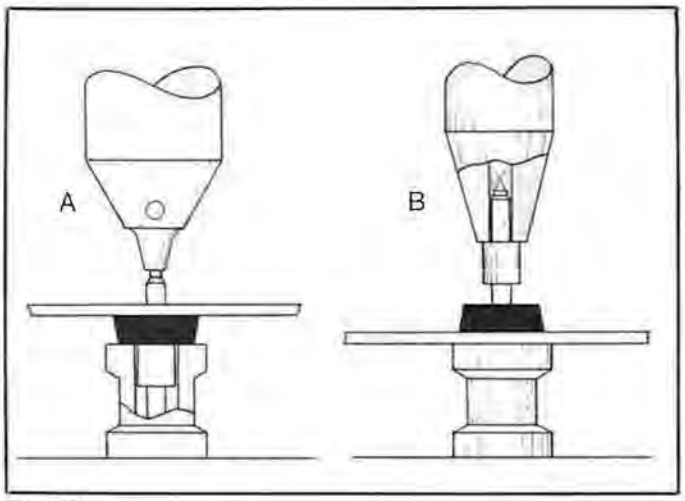



Figure 8

stake the staff from the blue hub. To replace this staff, the wheel with the blue hub should be supported on a flat stump that has a hole large enough to clear the hairspring shoulder of the staff. Then a flat end punch with a hole large enough to just clear the roller shoulder is used to stake the staff into the blue hub. This is shown in View B. Other friction staffs are removed and replaced in a similar manner.

Next month, the truing of balance wheels will be discussed.

**QUESTIONS AND ANSWERS**
*(Continued from page 26)*

pendulum. The new pendulum has a wooden rod with a spun brass bob. My customer's pendulum has a brass rod and both rod and bob are polished to a mirror finish. The polished pendulum was a feature which appealed to my customer and one which he does not want to compromise.

I called S. LaRose and was told they do not carry polished pendulums for grandmother clocks and could give me no suggestions as to where I might get one. The clock was manufactured in Denmark and I have no idea as to how I might order something from a foreign country. The old pendulum would suffice very well if I knew where I could send it to be refinished to a mirror polish. Any suggestions would be greatly appreciated.

J. Louis Wade
Ogden, Utah

A *I don't think you have an insurmountable problem. If the LaRose clock movement is O.K. and fits into the case, there should be no problem with the replacement with the mirror-finish pendulum bob. Actually a wooden rod pendulum keeps better time than a brass rod pendulum as brass will cause many seconds to be lost in hot conditions and a similar gain in cold, while wood is almost ideal. However, to please your customer, the original brass bob and rod pendulum can be refinished by any metal finisher who polishes it, takes out the dents, or fills in those dents and scratches, and then plates it to a high gloss.*

*A search through the yellow pages will soon put you in contact with metal finishers who do statues, bric-a-brac, lamps, etc. I see no problem.*

*As for the real maker in Denmark, without full details on the orignial movement, I would not know where to look. A good photo of the original movement AND the pendulum and bob would help me to help you.*

# POLISHING AND CLEANING JEWELRY

**By**

**Marshall F. Richmond**

The polishing of jewelry can be a trade in itself, the same as watchmaking, jewelry repair, stone setting, or engraving, but we as all-around watchmaker/jewelers need only know how to finish repaired jewelry, leaving the appearance of a new article. We have to earn while we learn to be practical, so we can start with the basics and expand our skills as we produce by continually experimenting with the articles on which we are working. If you always try to make the next job better than the last one, soon you can be doing excellent work.

Polishing can be done with a very small investment in equipment and polishing abrasives. First of all, we need a polishing motor with a dust collector. Although the dust collector is not absolutely essential, it serves a dual purpose: first, it keeps the dust created by polishing from getting in the air we breathe and settling over the furniture and fixtures in the room where we work; secondly, it collects the metal particles so when the filter or dust bag is full, it can be sent to a refiner who will salvage the precious metal and send you a check for its value. In a relatively short time, the salvage from the dust collector will pay for your polishing outfit.

Some polishers are made with one tapered spindle on one end of the motor only, but most have the tapered spindle on each end of the motor. The dual spindle has a definite advantage as tripoli abrasive buffs can be used on one spindle and rouge buffs on the other. This saves the time that would be spent in changing buffs. A two-speed motor is also an advantage as the high speed of 3450 rpm is advantageous in most jewelry polishing jobs, particularly on the harder metals such as platinum, palladium, or stainless steel. The slow speed of 1750 rpm is advantageous in polishing plastics or soft metals, especially plastic watch crystals or pens and pencils. Most watchmakers have polishing equipment used for polishing the cases and bands of the watches they have repaired, and this equipment is adequate for jewelry polishing with the addition of more buffs. As the two-speed motor is relatively new to the market, I do not have one. I have a factory-made high speed motor with dust bag collector, and a slow-speed motor that I made myself. See Figure 1. For a dust collector, I used an old furnace blower with two 16 x 20 furnace filters. It is quite powerful, and I often run it to take the dust and lint out of the air while doing watch work which can reduce come-backs of my repaired watches. These two outfits are the equivalent of one two-speed polisher, so if you are in the market to purchase a new polisher, this should be given consideration.

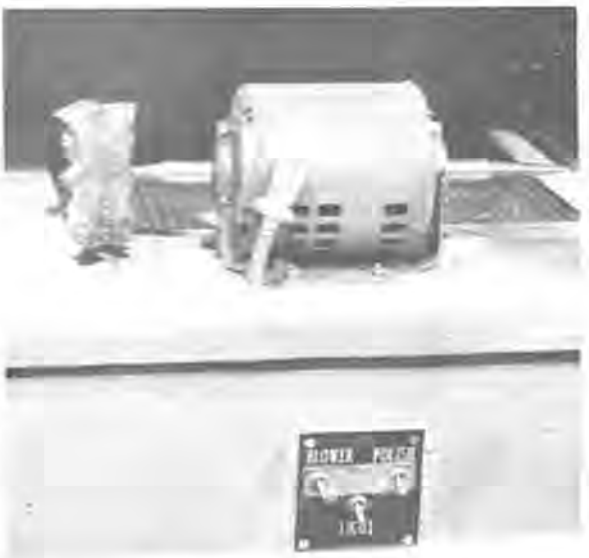


Figure 1. Polishing motor with two tapered spindles for quick change of buffs.

Buff wheels are available in many sizes, shapes, and materials. I have always stayed with the baisc cotton and felt buffs, although buffs are available in muslin, chamois, and other materials. See Figure 2. Hard felt wheels are available in flat or knife-edge shapes, and in sizes ranging from one-half inch in diameter to six inches in diameter. The knife edge are available in sizes suitable for putting on a small mandrel and using in

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**and**

**BATTERNS®**

In previous articles, references have been made to "a hoke-type torch" and "batons flux." We regret having used these terms loosely, as these products are known under the trademarks HOKE-JEWEL® and BATTERNS®. The tradmarks belong to the Grobet File Company and are not generic terms.

the flex shaft machine for pre-polishing grooves, ridges, and around heads or in places that are difficult to polish on the polishing motor. Flat felt buffs can be used to keep flat places flat as the softer cotton buffs will tend to round edges. Bristle brush wheels are also of great value in polishing around heads, beads or prongs.

Many polishing abrasives have been introduced in the last few years, but tripoli and rouge are the most common abrasives and should be used until you gain enough knowledge and experience to experiment with others. Tripoli is available in brown or white: the brown for general use, and the white for polishing harder metals or even glass. I use white tripoli on a hard felt buff for polishing the edges of glass crystals that have been wet ground. Tripoli is a fast cutting abrasive that is suitable for removing file marks or emery dullness before final polishing with rouge which will give a mirror-bright finish. Rouge is available in red or green and removes very little metal; in fact, it almost burnishes the metal. Green rouge–like white tripoli–is used for polishing the harder metals.

Before starting to polish with tripoli, a very rough surface can be quickly smoothed with emery cones or a piece of emery cloth wrapped around an inside polishing finger and held in place with a brass ring size twelve or even larger. See Figure 2, View 4. Depending on the roughness, start with coarse grit and then progress to medium and fine so very little will be required of the tripoli to quickly obtain a finish suitable for fine finishing with rouge. Tripoli will leave an article with a dull finish as the abrasive is coarse, but if you let the buff wheel become shiny with metal, it will actually burnish the finish and make it brighter. However, this is a job for rouge and can result in wasted time. Burnishing has been explained in a previous article and is usually done with a hard metal burnishing tool. Burnishing is still metal-to-metal contact whether done with a burnishing tool or a metal-charged buff wheel. The final polish should be applied with rouge on a soft cotton or muslin buff wheel, running at high speed (3450 rpm). These wheels can be made soft by using an old large file, and while running at high speed, applying pressure with the edge of the file. This will remove hardened abrasives, leaving the wheel soft and fluffy. Charge with rouge and this will produce the brightest finish you can hope to achieve. All buff wheels and inside buffing fingers–whether cotton, muslin, chamois or felt–should be well marked so you know which ones are charged with tripoli and which with rouge. See Figure 2, Views 6 and 7. Rouge buffs can be contaminated with tripoli even if kept in the same drawer or container with tripoli buffs. When contaminated with tripoli, they will no longer produce the fine mirror-bright finish that they should.

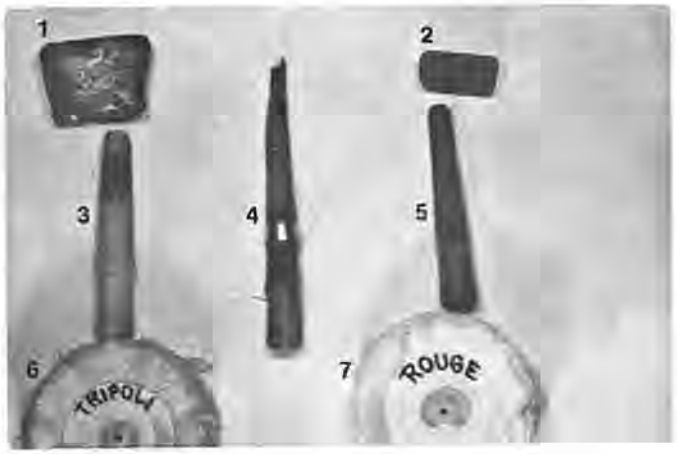



Figure 2.

1. Tripoli polishing abrasive
2. Rouge polishing abrasive
3. Inside ring buff for tripoli
4. Emery cone on inside ring buff
5. Inside ring buff for rouge
6. & 7. Cotton polishing buffs for tripoli and rouge.

Polishing using buff wheels can produce enough heat from friction to burn the fingers, but tools are available for holding rings and keeping heat from the fingers. Often when polishing rings where great pressure is necessary, I use a ring mandrel. The ring mandrel, being massive, will absorb the heat and keep the ring from getting hot and will keep the heat away from your fingers as well.

Polishing chain can be treacherous. If held in the hands, it can catch in the buffs. Fine chain can easily be destroyed and heavy chain can inflict injury to your hands or fingers. One way to polish chain is to wrap it around a ring mandrel, holding one end tight against the mandrel with the thumb of your right hand and the other with the thumb of the left hand. The mandrel, being tapered, will allow you to keep the chain tight by pressing toward the large part of the taper. When the exposed surface is polished, rewind the chain to expose the other surface, and then repeat the process until the chain has been completely polished. Another way to polish chain is to wrap it around half of one end of a ring clamp, and with the ends in the inside between the leather jaws, polish a portion of the chain. By rewinding three or four times, the complete chain can be polished.

Ornate surfaces such as florentine or filagree can best be polished by using bristle rotating brushes charged with tripoli and rouge. Again it is important to have them marked tripoli and rouge so the rouge wheel will not become con-

THE PICKLE BARREL

Marshall F. Richmond, CMW

taminated with the tripoli. For the final finish, use the soft fluffy cotton rouge wheel brush and polish lightly. Florentine finishes should always be buffed very lightly as the abrasives, especially tripoli, can easily remove the florentine engraving.

Polishing around stones, between ridges, or in grooves can easily be done using knife-edge hard felt buffs. These buffs get flat or dull on the edges, but while rotating, they can easily be trimmed sharp by using a sharp bench or pocket knife. Small brushes, felt laps, and abrasive-charged rubber laps are available in many sizes and shapes. They come either on small mandrels or with holes to fit small mandrels that can be used in the flex shaft tool. These are excellent for pre-polishing places that are almost impossible to get to with the larger buffs used on the polishing motor. Polishing can be made much easier if the article to be polished is properly prepared by filing or cutting away excess metal with gravers. The marks left by these tools can be removed with the various grits of emery cloth or cones that fit over the inside ring finger buffs. The abrasive-charged rubber buff wheels are fine for this on many jobs.

In cleaning jewelry there are many things to be considered, such as the stones involved, the foreign matter to be removed, and the type of solution that will do the job without damaging the stones. Diamonds, rubies, sapphires or most natural or synthetic hard stones can be cleaned with the harshest of chemicals, while pearls, opals, or foil-back glass stones (rhinestones) must be cleaned with only mild soap or detergnet solutions. Even ammonia can be damaging, especially to pearls or rhinestones. For removal of paints or lacquers from jewelry containing the tough stones, soaking for a few minutes in lacquer thinner and brushing with a stiff bristle brush will remove them. Brushes with nylon or plastic bristles can be damaged by lacquer thinner so be sure to use a genuine bristle brush. Again, never use this type of solvent on opals, pearls, or fragile stones. Finger rings that are worn continuously will accumulate a build-up of soap or detergent mixed with body oils under and around the stones. This is quite difficult to remove. Sometimes even the strongest chemical solutions are unsuccessful, but if the piece is boiled in pickling solution or soaked in the pickle for a half hour, normal cleaning solutions will usually be sufficient to remove the debris.

Ultrasonic cleaning is probably the greatest development to ever come along for the watchmaker or jeweler. The cavitation created by the ultrasonic sound waves will reach even the most remote crevices and scrub away the dirt. For jewelry cleaning, ultrasonic tanks are available in almost any size you might need, ranging in capacity from one quart to many gallons. For the small jewelry repair department, one quart to one gallon capacities would be sufficient. These machines and commercial concentrated solutions that can be mixed with water are available from your material distributor. I have access to many formulas for making your own solutions, but find the ingredients too hard to obtain for the average jewelry repairman. However, I will pass along a formula that works for me and the ingredients can be purchased at the local supermarket and drug store.

1/4 cup of Spic and Span®
1/4 cup of Mr. Clean®
1/4 cup of strong ammonia

1. Put in one-gallon plastic jug (such as milk comes in).
2. Fill with tap water and shake well.
3. Let stand 24 hours and use full strength.

I find this solution works well in an ultrasonic tank, and can also be used to boil the polished jewelry in. One jeweler I know uses this formula but substitutes Tide® for the Spic and Span® and claims it works well for him.

The ultimate in final cleaning is the steam cleaner which blows live steam over and through the article being cleaned. This removes the remaining residues and soap films, leaving a perfectly clean surface. The article, being hot, will instantly dry which eliminates the need for drying with a heat lamp. Another item of equipment that some watchmakers and jewelers use is the small sand blast machine which is excellent for pre-cleaning before polishing unless a frosted finish is desired. The sand blast machine combines fine sand and air pressure and will remove almost any type of foreign matter. It is especially good for precleaning watch cases and rings with heavy deposits of soap or detergents. Another system for polishing is the tumbling process. A rotation drum is charged with powdered abrasives and small steel balls (steel shot). The articles to be polished are placed in the drum and it rotates at slow speed. The abrasives polish while, at the same time, the steel balls provide a burnishing action. Some use dry mix and others add oil or water and wet-tumble the jewelry articles. This produces a fine finish. Many manufacturers of jewelry and findings use this system because numerous pieces can be polished at the same time.

Split lap polishing is done on a special polishing motor from which the tapered spindle protrudes at a forty-five rather than a ninety-degree angle. This motor uses a hard felt buff, the edge of which is beveled to a knife edge with four splits. While rotating, you can look through and see the work you are polishing from the underside of the wheel. This is especially helpful when polishing multi-flat surfaces. These split laps are available in sizes ranging from six to eight inches in diameter and one-fourth to one-half inch thick. They come in several degrees of hardness: medium, hard, rock hard, flint hard, or diamond hard. They are also available charged with grits eighty, one-hundred twenty, one-hundred eighty, or three-hundred

twenty—the larger the number the finer the grit. This type of polishing is used by professional polishers and may not be practical for the individual jewelry repairman.

Some of the more sophisticated methods mentioned in this article would be of little value to many of us, but were mentioned simply to enlighten and inform anyone interested in broadening their knowledge and skill in jewelry repair.

In the next article, we will discuss necessary and useful tools and equipment.

## CHIME AND STRIKE

*(Continued from page 17)*

The Herschede movement will chime the right *number* of notes on the first, second, and third quarters. It does this even if the chime sequences have been upset and the clock is playing the wrong musical notes for that particular quarter. Then, on the hour, the self adjusting lever assembly takes over. The clock may chime as many as four extra note sequences before the start of the correct hour tune. I should point out that a "sequence" or measure of notes is four for Westminster, six for Canterbury, and eight for Whittington chimes.

You must be sure to verify that the chime self adjusting system works for *all three chimes* in a nine-tube Herschede. There is, in some movements on which I have worked, a slight difference in how the three chimes operate with respect to the self adjusting lever. Because the cylinder moves side-to-side from the left (Whittington) to the center (Canterbury) to the right (Westminster) when the chimes are shifted, naturally the cylinder self adjusting pin moves with it. The pin will contact the self adjusting lever at one of three different places, depending on which chime is playing. To be sure of the self adjusting mechanism, check it on all three chimes.

Problems can result if the notch in the self adjusting arm is damaged in some way. It may not hold the quarter rack hook pin at all. There will not be any chime self correction if this happens. At each quarter hour and hour, the clock will chime the correct number of notes. However, once the sequence is thrown off for any reason, it stays that way. The self adjusting lever assembly must be repaired or replaced.

Other difficulties may develop in the quarter rack and the hour rack, and with their respective rack hooks. Burrs, damaged rack teeth, and poor alignment between the rack and hook will cause mislocking. File and polish any bad spots. At the end of the chime or strike cycle, the rack hook must stay firmly placed and not jump off the rack again. Check to be sure the gathering pallet can catch every rack tooth safely. Be sure that no teeth are missed, and that they are not gathered up two at a time. A brand new gathering pallet which has been incorrectly fitted will cause problems like these.

Turning our attention to the hour snail (1), we find that no adjustment is needed as with most other clocks. The hour hand bushing is slotted so that the hand will go on only one way, and when the hour hand is turned separately, the snail moves with it. If you push the hour hand from 2 o'clock to 5 o'clock without touching the minute hand, the clock will strike 5 at the hour. Most other clocks would still strike 2 unless the *minute* hand was advanced.

Before completing any set-up or repair on a Herschede tubular bell clock, check the minute hand for accurate chime points. The clock should chime the quarters exactly at the 15 minute marks, and should ideally begin chiming the hour about 15 seconds before the hour. The "early" chiming helps to center the hour music better, so that the clock is not still striking too long past the hour. To make an adjustment of the minute hand position, the hand bushing can be moved. However, the bushing is pressed in very tightly at the factory. Pliers will not move it. A tool with a squared end is required, and you can make this yourself. My recent efforts at moving these bushings have shown that even with a tool made just for this purpose, it is still very difficult to move the bushing. The point is that it *can* be done, and is the right way to adjust the chime points. In order to do this work in the field, you have to make a tool for yourself and pack it in your tool kit.

You may find that the chime points are off by different degrees. After adjusting the hand bushing as closely as possible, there may be one or two quarters that are still off. To correct this, remove the intermediate bridge (20) and the hour tube assembly. You can now take out the intermediate wheel (21). Gently bend the pin corresponding to the quarter hour that needs adjustment to achieve earlier or later drop-off of the lifting lever assembly (18). You must put the intermediate wheel back in mesh with the minute wheel (22) the same way it was before, or you will have to adjust the minute hand bushing all over again. In actual practice, bending the pins on the intermediate wheel is risky. The pins are soft and all too easily pulled out or loosened.

The chime and strike adjustments described here only scratch the surface of our subject. I have tried to cover at least some of the problems that can develop in the front movement parts. The Herschede tubular bell movements are complex, and they require close study. However, one thing is sure: they are always fascinating to work on.

I want to take this opportunity to thank the Herschede Hall Clock Company for their technical support and cooperation, and for the loan of a nine tubular bell movement.

# APPRAI$AL$

**By Fred S. Burckhardt**

If there is one bit of advice which I would like to pass on, it would be **DON'T GET MIXED UP WITH APPRAISALS IF YOU DON'T KNOW WHAT YOU ARE DOING!** Making appraisals is one of the most misunderstood and abused facets of our industry. Incompetency cannot be tolerated when it comes to appraising customers' jewelry.

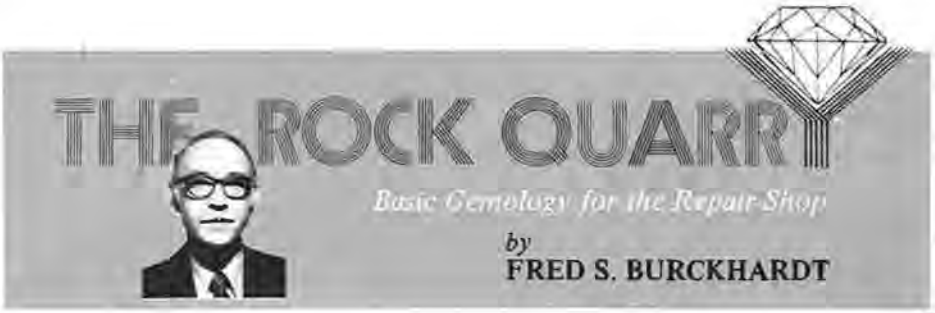
First, one rule you should strictly adhere to is **NO ORAL APPRAISALS.** I wish I had a dollar for each time a customer has said, "How much is this worth? Just give me a figure off the top of your head." There is no way you can win by doing this, especially if the piece in question has been recently purchased. If you name a figure and it is more than what they paid, they'll think they got a bargain and will go back to that place the next time they are ready to buy. If you name a figure that is too low, they'll tell everybody you don't know what you are talking about. Not only that, they'll be angry with you for telling them the truth. There is enough aggravation in this business. Don't add to it by playing games with customers.

Appraisals are performed mainly for insurance purposes. In this type of appraisal, you are saying to the customer and the insurance company that this is how much your store will charge for replacing or recreating the article in case of loss, damage, or theft. It doesn't mean that the amount represents how much you would offer to buy the article, nor does it mean how much the owner could get if the article were offered for sale.

Another type of appraisal is done for estate purposes. The value arrived at in this type of appraisal is what you think the item should sell for when there is a willing seller, a willing buyer, and not a forced sale. The value on the item will be much lower than that given for insurance purposes, because replacement and recreation are not involved. The estate appraisal is not as detailed, as exact replacement is not required.

Now that you know what an appraisal is, consider the next item. Do you have enough gemological training to do a proper appraisal? For example, I once saw an appraisal which listed an item as: "One strand of Pearls – Value $450.00." If this strand were stolen or lost, how would you be able to match it if the customer wanted a duplicate strand?

What is involved in the proper appraisal of pearls? Are they natural, salt water cultured, fresh water cultured, or simulated? How many pearls are on the strand? What is the millimeter size? Are they spherical, baroque, oval, or one of the other shapes? Do they have good luster? Don't forget the spotting or blemish grade. What about the nacre thickness and orient? Of course, you mustn't forget the color. Are they pink, white, black, blue, grey, silver, or one of the cream colors? Don't forget the overtone. Is it blue, green or rose? Now that you know the color, is it a natural color or have the pearls been treated?




Last but not least, do they match in quality, shape, color, and luster? A good appraisal will answer all these questions.

Can you, with any accuracy, grade a diamond according to color, clarity, and proportion? Remember, a one-carat diamond that is colorless and flawless now costs about $62,000.00. One very small inclusion can drop the stone down to the next clarity grade–which reduces the price by $20,000.00. Three steps down in color grade, which still looks colorless to most people, reduces the price by about $40,000.00. Can you afford to make a mistake?

Colored stones should be identified. Do you know the difference between a fancy yellow diamond and a yellow sapphire? Can you test them to make a positive identification? Can you be sure the stone isn't one of the synthetics? Suppose it turns out to be a diamond; have you seen enough of this particular type of stone to recognize good color? Is it just a very yellow diamond or does it fall into a fancy color or canary diamond category? A canary diamond will command a higher price than a low yellow color grade diamond. If it's a yellow sapphire, is it a good color? What about the clarity and cutting? Do you know how to figure the approximate weight? To give you an example of weight, one time a doctor's wife brought in a beautiful ruby and diamond ballerina ring for appraisal. She said the ruby weighed five carats. After checking the dimensions, the most weight I could come up with was about two-and-a-half carats. The stone was very shallow. I called her and told her I couldn't write an appraisal, stating the ruby didn't figure out to be anywhere near five carats. I told her the only thing we could do would be to remove the stone and weigh it, but we wouldn't do that unless she were in the store and watched. She came in and we weighed the stone. It was two carats and seventy-two points. Yet she had two other appraisals, both stating the ruby weighed five carats. What does this prove? Number one, the store that sold the piece misrepresented it, as both the sales slip and their appraisal called it a five-carat stone. Number two, the person who appraised it later never checked the stone for weight.

Now, what about the mounting? An accurate and complete description should be listed. It should also be tested to make sure the quality stamp is correct. Is it a cast, die struck, or hand wrought piece?

Now that you have all this information, can you put a fair price or value on the item? If it contains a stone you are not familiar with–for instance, a five-carat diamond or a thirty-carat Morganite–how do you arrive at a figure? If you price it too high, the customer will be paying extra premiums for something they don't have. If it is too low, they won't be able to replace what they do have. And if you appraise it too low and they come in to you for a replacement, what then???

Don't get caught up in something in which you are not knowledgeable. The person who will lose the most will be you! THE

# Overcoil Hairsprings

**By Joseph Rugole**

Making an overcoil to a hairspring has always been considered one of the more difficult tasks a watchmaker has to perform. Modern watchmaking requires less and less of such expertise because modern watches no longer use overcoil hairsprings. The need to understand the principles of overcoiling, however, still remains as long as there are numerous watches fitted with overcoil hairsprings still in circulation. The inevitable question that follows is why have the overcoil hairsprings been abandoned. Were they just a worthless edifice to the watch—or are there other possible reasons. The answer to these questions can best be understood by examining the principles of overcoiling, the results obtained, and the difficulties encountered in making the necessary adjustments.

Although we associate the overcoil hairspring mostly with the isochronous performance of the balance, the principal thought governing its invention was not isochronism, but rather the need for eliminating the poise error of flat hairsprings which is caused by their irregular development. Because of the fact that a flat hairspring cannot expand and contract uniformly (the stud and the regulator prevent outward expansion and restrict contraction), the heavy point on the hairspring wanders around and causes irregular timekeeping in vertical positions. Another problem resulting from such action of the hairspring is considerable side pressure on the upper balance staff pivot which causes variations in friction and also varies with fluctuations of amplitude of the balance.

Abraham Louis Breguet, the famous French horologist and inventor of the overcoil, considered these problems to be the biggest obstacle to better performance of the watch balance. He reasoned correctly that by eliminating the erratic motion of the hairspring, the watch balance would be able to perform much better than was possible with the existing flat hairspring.

When he succeeded in making the hairspring develop concentrically by raising the last half of the hairspring coil above the body of the spring, he also realized that there was a considerable difference in performance between short and long amplitudes of flat hairsprings and overcoil hairsprings. Further experiments would show that when the overcoil was moved closer to the staff, short amplitudes would speed up and vice versa. Thus the ability of the overcoil to compensate for differences due to variations in amplitude was discovered by chance. Although the rules for manipulating the overcoil to equalize the short and the long amplitudes were quickly discovered through experimentation, general rules for making an overcoil for every situation could not be developed through experimentation alone. Professor Eduard Phillips (1821-1899), who was a mathematician, investigated theoretical aspects of hairsprings and, after a three-year study, published the results in a treatise titled "Memoire sur le spiral reglant des chronometres et des montres." The study is a mathematical analysis and solution of isochronal properties of the hairspring. It can be summarized in three significant statements about overcoils which also became the ground rules for all manipulations of the overcoils. They are:

1. To be isochronous the hairspring must have between 12 and 14 coils.

2. The center of gravity of the overcoil must lie on a line which is perpendicular to the radial line passing through the point of departure (the starting point of the overcoil). See Figure 1.
3. The distance of the center of gravity from the center of rotation is equal to $\frac{R^2}{L}$ where:

   R= the radius of the hairspring at point of departure. (See point A.)
   L= the length of the overcoil measured from point of departure to the regulator pins.

If the three rules are adhered to when forming an overcoil, the hairspring will be theoretically isochronous, i.e., it will perform the same number of vibrations in a given unit of time in all amplitudes.

The rules sound simple and easy to understand. The problems arise, however, when we try to apply them. There is no problem measuring the radius of the regulator pins, nor the length of the overcoil. With some ingenuity and some basic mathematics, those two measurements can be obtained quickly. It is only when we try to determine the location of the center of gravity and its distance from the center of rotation that we run into higher mathematics and problems with actual measurement. When Phillips first published his studies, the leading watchmakers of the time found them of little use to the average craftsman. The benefits were mostly utilized in production where the engineers were able to design a certain shape of the overcoil and reproduce it in large quantities for the given model watch in production. Fortunately, two such knowledgeable watchmakers, namely L. Grossman and L. Lossier, developed a simpler way to determine the type and shape of overcoil. They calculated the new shapes from Phillips' formula and drew a set of different overcoils which could then be copied from drawings made in actual size. The same tables were repeated several times in different diameters to cover a large range of watch hairsprings from the smallest to the largest. Same shapes and diameters were drawn for left-handed and for right-handed springs. The method for selection will be explained later.

I wish to further elaborate on the fact that the solution is a mathematical one which presuposes some ideal conditions. The actual situation in a watch is never ideal, so theoretical solution of the problem only partially compensates for the error. It is after the overcoil has been made that the fine adjustments of the oscillatory system begin. It is equally true that no two watches and hairsprings require the same amount of compensation for isochronal variations. Every movement brings with it a unique set of frictions for which the hairspring must compensate in order to achieve uniform timekeeping. Furthermore, in practice the hairspring cannot compensate for all amplitudes of the balance because in very low amplitudes the kinetic energy developed is too small to maintain uniformity of motion under variable losses to friction. The best results are obtained when the balance well exceeds one turn motion at low winding and is not greater than 1½ turns when the watch is fully wound.

Although we cannot fully utilize the theoretical formulas as presented by professor Phillips, his rules do have a very real meaning for every practicing watchmaker. They emphasize several important characteristics of the overcoil.

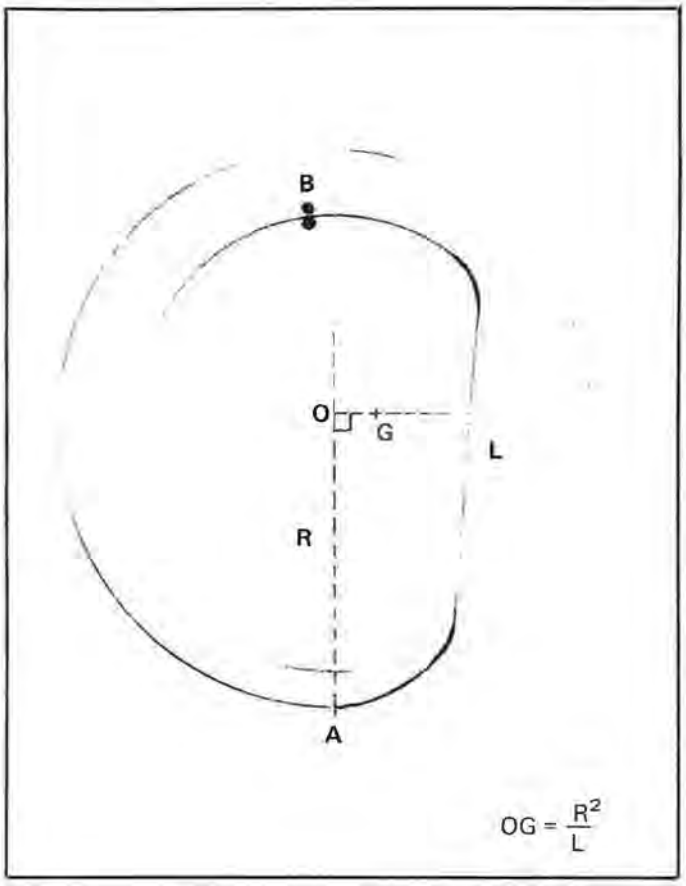



Figure 1. The conditions for a theoretically correct overcoil.

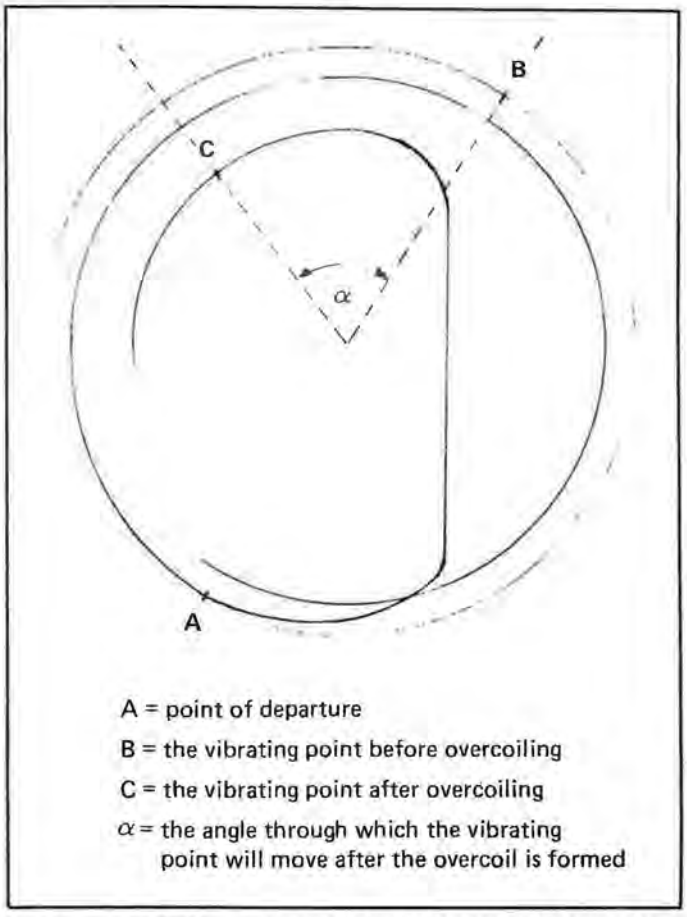



Figure 2. The four important reference points on Grossman's curves.

The rule about the number of coils the hairspring must have is very important. When selecting a spring we must previbrate it to determine whether it is suitable for the balance. In doing so, we use the rule as a standard measurement of suitability. If the spring vibrates the required number of beats but has too few or too many coils, we look for a slightly weaker or slightly stronger spring respectively.

The location and the distance of the center of gravity relative to the starting point and the center of rotation are exceedingly important. In stating that the theoretical overcoil does not properly compensate in actual practice, I meant only that a theoretical terminal curve would produce a somewhat slower rate in short amplitudes than in long ones if the friction were greater than the absolute minimum obtainable. The final shape of the curve is always determined by the amount of friction on the balance and the escapement for which it must compensate. However, we must not lose the point that the rule about the location of the center of gravity remains unchanged. The only changes that are made during adjustments are in the distance of the center of gravity from the center of rotation, and consequently also the length of the overcoil.

The length of the overcoil presents another problem. When overcoils are being made, it is rather difficult to judge just how much of the hairspring should be used for forming the overcoil. If the completed overcoil is either shorter or longer than required, the hairspring will not develop concentrically when the balance is set in motion. Whenever that happens, the center of gravity will not be on the line which is perpendicular to the radius of the spring passing through the point of departure. The rules for adjustment of this condition which will be discussed later are designed to obtain the required proportions when the adjustments are made in the prescribed way. Although most watches with overcoil hairsprings are equipped with a regulator, it is essential that the regulator pins be closed to the extent that there is no visible motion of the hairspring between them, and yet the spring must not be pinched. Furthermore, the movement of the regulator must be restricted to a minimum. Any correction of the mean time greater than 30 sec./24h should be adjusted by the mean time screws or by changing the mass. The regulator should always stay in the middle of the scale or very near to it. This rule was not made just for the sake of appearance, but rather to maintain proper position and proper ratios of the center of gravity of the overcoil so that the hairspring maintains its concentric development and its isochronous rate. Whenever the regulator is moved to any extent, these properties are altered and the rates will be changed. The changes are small, but nonetheless, they do exist.

Knowing how important the rules for overcoiling are should help us to be more particular in execution of various operations when forming an overcoil. Grossman's and Lossier's method of overcoiling is rather simple to follow if we work with a little foresight and follow the instructions. The tables of overcoils which are drawn in actual size and shape are numbered according to the ratio between the distance of the regulator pins and the radius of the hairspring. To find the overcoil number for a given watch, we require two measurements. With a pair of dividers we measure the distance from the center of the balance jewel to the inside of the regulator pins.

This measurement is marked with the letter "a." Measurement "b" is obtained by placing the vibrated hairspring on a metric ruler and measuring its diameter between the vibrating point and the point opposite to it. The diameter is divided by 2 to obtain the required radius. The overcoil number "N" is the ratio between "a" and "b" multiplied by 100, i.e., $N = \frac{A}{B} \times 100$. The multiplication factor is needed only to change the decimal number into a whole number. The overcoiling tables are found in many books on watch adjustments. De Carles' book, *Practical Watch Adjusting* has a set, and they are also available separately from various book dealers.

Every overcoil has three distinct points marked by letters A, B, and C in Figure 2. Letter A marks the beginning of the overcoil or the so-called point of departure. Letter B represents the vibrating point before overcoiling, and letter C indicates the position of the vibrating point after the overcoil has been formed. If lines were drawn from the center of the hairspring through points B and C, the angle between them would represent the angular distance the vibrating point will travel when the overcoil is formed. This distance is different for every overcoil number. Because of that, the angles are precalculated and published with the tables of overcoils. They are necessary to determine the proper location of the pinning point at the collet so that upon completion of the overcoil, the first half of the hairspring coil around the collet is located above the horizontal line when the watch is placed in the vertical position, in which it is worn most frequently. (See the article on natural error, *Horological Times*, May 1980.) The step-by-step procedure for overcoiling will be explained in the next article.

## THE SHIP'S CHRONOMETER

*(Continued from page 12)*

this word is composed of two parts, namely 'Chronos,' meaning time, and 'Metron,' meaning measure of time."

I might add that Mr. Heimuller was the author of a most interesting book, *Man's Fight To Fly*, a chronology of aviation which includes an eye-witness account of the world's outstanding record flights up until 1940 and many interesting side notes about some of the timepieces and navigational instruments that were used by Lindbergh, Post and Gatty, Earhart, Byrd, and others during these flights.

In searching for a definition of the work "chronometer," it was found that the Swiss defined chronometer as any timepiece that had met a certain standard of performance after being subjected to exhaustive tests.

The timekeeping ability of the Gibb's chronometer depended upon a quartz crystal controlled frequency standard, resulting in an accuracy of plus or minus one-tenth of one second in 24 hours. It was designed to operate accurately at temperatures ranging from minus 30° to plus 50° centigrade. The frequency standard was mounted in a shock-proof metal cabinet, while the lead acid batteries were contained in a separate unit. The chronometer was operated by a 60-cycle synchronous motor. The motor was fitted in a standard brass chronometer bowl, swung in a gimbal mounted in a mahogany box. The chronometer per se had the appearance of any other standard detent escapement chronometer except the second hand did not move in half-second beats.

The battery unit weighed 136 pounds and measured 30 in. x 27 3/4 in. x 15 in. The frequency standard weighed 25 pounds and was housed in a 20 in. x 24 5/8 in. x 12 3/4 in. metal, vented cabinet. The chronometer was mounted in a 7 5/8 in. x 7 5/8 in. x 7 5/8 in. three-part wooden box.

The heart of this electronic chronometer was a small bar of quartz, mounted in a thermostatically controlled oven, which, when energized by 110 volts, was caused to vibrate 87,480 vibrations per second. See Figure 2. This high number of vibrations was reduced to 60, and, instead of being fed into a tiny integrated circuit as is the case in today's electronic quartz timepieces, the vibrations were fed into a series of vacuum tubes. As one can readily see, when this instrument was developed, the only amplifying devices available were vacuum tubes. Hence, a relatively large number of tubes were required and the power requirements were thus rather large.

The vacuum tubes converted these vibrations into electrical impulses which were first reduced by dividing them once by two (2) and then by three (3), six times, bringing it down to exactly 60 cycles per second. This was then fed to a synchronous motor which operated the hands.

Upon delivery of the first electronic quartz chronometer, Mr. Brown of Gibbs set it up and it was placed on test. After running for a period of approximately one month in the test room at 72½o F., and with a mean daily rate of +0.32 seconds, it stopped, due to a blown fuse. On August 5, 1943, Mr. Brown delivered chronometer #2 and replaced the fuse in #1. Then, on the 16th of September, 1943, quartz chronometer #1 was delivered to the Boston Navy Yard and installed aboard the destroyer, U.S.S. Knapp.

On January 11, 1944, three more electronic quartz chronometers were received, but in damaged condition. They were shipped via motor freight and the frames were badly broken and battery acid was spilled over the instruments. The second chronometer was taken to Baltimore, Maryland and on January 14, 1944 was installed aboard the U.S.S. Butner.

Although the mean daily rates of these instruments was under 0.50 seconds, they never really lived up to performance expectations, nor were they given sufficient time to prove themselves. The instruments that were placed aboard ship were not readily accepted. The battery and frequency standard units took up too much space and there was a constant problem of blown fuses.

Although the Gibbs electronic quartz chronometer was never given sufficient time to prove itself or to iron out the so-called "bugs," we must record it as an achievement in the field of electrical horology.

By 1944, our superiority on the battle fields and the seas had definitely begun to manifest itself, and the tide of war had changed in our favor. Also, there were sufficient Hamiltons (ship chronometers) of unsurpassed performance to meet the Navy's needs. The Borg-Gibbs contract was cancelled.

In the latter part of the 1950's, Thomas Mercer Ltd., who for over 100 years had been one of the foremost manufacturers of 2 and 8-day marine chronometers, announced to the horological world the development of an electronic chronometer (chronostat). This instrument was developed in conjunction with the French firms of Leroy and Hatot.

Frank Mercer, shortly after the close of World War I, realized that electricity would no doubt open up many new avenues and thus become the catalyst in the development of a whole new area of horology. He took the lead in developing chronometer-controlled electric clock systems and control panels for ships. Mercer designed and built an electrically wound chronometer movement which would activate lighthouse and lightship beacons, thus eliminating the need for them being manned.

The Chronostat electronic chronometer employed the usual chronometer-type compensating balance and helical hairspring, but the impulses were imparted to the balance assembly magnetically instead of mechanically. The Chronostat received four impulses per second and, through the use of transistors, eliminated the need for electrical contacts. The frequency of the impulses was achieved through the use of a static electronic ATO relay which acted as a frequency multiplier or de-multiplier. It operated on 1.5 volts with a consumption of 150 micro-amps. The chronometer and batteries were fitted into a shock-proof, mangetic shield case.

In the early 1960's, Mercer announced the development of a quartz crystal chronometer consisting of an electronic and an electro-mechanical unit.

The crystal was maintained at 75° C. in a thermostatically controlled oven, so that the ambient temperature would have no effect on its accuracy. The oscillator stage, tunable by a 100 pf. variable capacitor, generated positive pulses of 1 M/cs. frequency. These were passed to the transistorized divider chain which had an output frequency of 50 c/v., consisting of two anti-phases

*(Continued on page 62)*



# KRAZY CLOCKS

**Part I**

**By Orville R. Hagans**

*This series of nonconventional Krazy Clocks accumulated over the years is presented to break the somber trend of serious and commercial motivation:*

*Smile a while–It's worth while*

*If you have a Krazy Clock, send photo and information to O. R. Hagans, 6930 E. Girard Ave., Denver, CO 80224.*

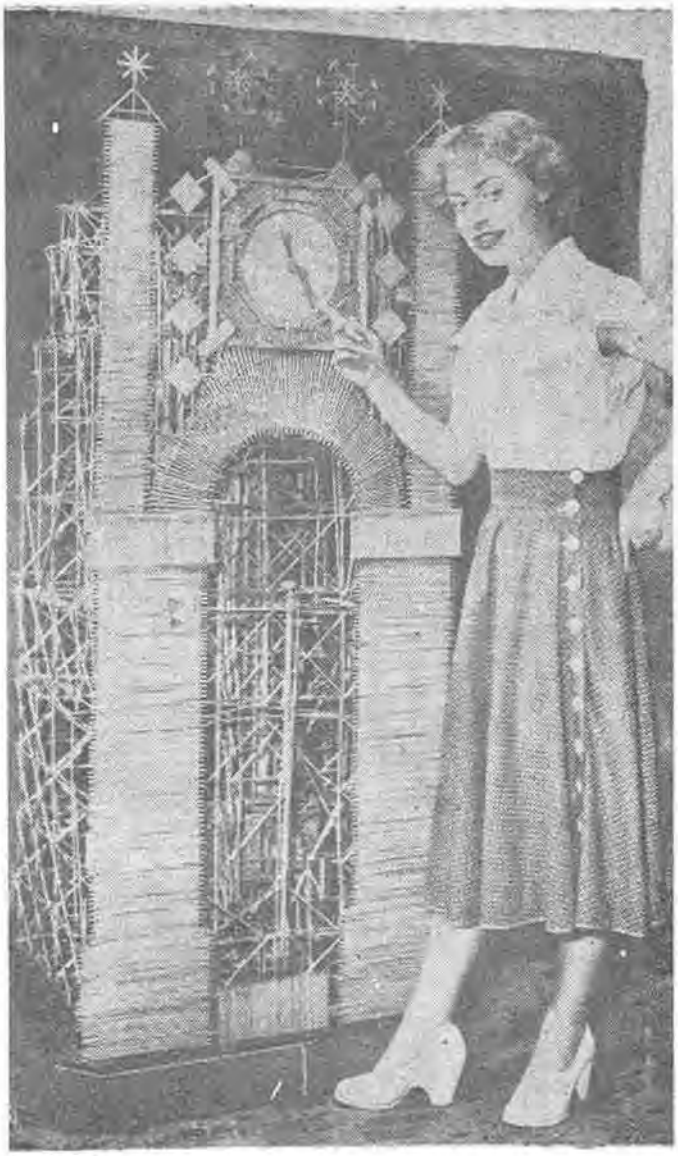
## COLEMAN'S VIOLIN CLOCK

Nashville, Tennessee, the folk music capital of the world, was where Jesse Coleman conducted business in his clock repair shop located in the Arcade. Just across his balcony, there was a violin repair shop presided over by Herbert Sayles.

When Jess and Herb got together for their daily coffee breaks, there was always "bow hair" or clock oil in the coffee–a very serious situation that was bound to erupt sooner or later in one form or another. It did–in this joint effort, a violin clock.

On his birthday in 1956, their friend, neighbor, and customer, Roy Acuff, star of the "Grand Ole Opry" for many years, champion fiddler, and "King of Folk Music," was presented with this unique "fiddle-clock."

Our photo scarcely does it justice. The back was specially finished by masking out the dial circle and leaving that portion the natural wood (blond) color. Coleman then lettered the dial and Sayles applied the high violin varnish, giving the whole thing a built-in, tailored look. The movement of the clock is Swiss, jeweled, and battery-driven.



## Hay-Hay!

Not knowing about farm commodities, I am incorrect. It is straw. This German Miss in Hanau points to the face of a clock made out of straws which took 15 years to build. It was started in 1892 by Otto Wegner, a shoemaker and amateur clockmaker, and was completed in 1907. Although it stands five and one-half feet high, it weighs only about a pound. It runs about eight hours. Everything in it, down to the smallest balance wheel, is made of straw.

## Arms Akimbo

The museum of Helsingfors, capital of Finland, contains a long-case clock, the maker of which was evidently a bit of a wag as well as a good mechanic.

The case is suggestive of an energetic Finnish housewife—comfortable and capable, dressed in a red jacket and yellowish skirt, and characteristically with arms akimbo.

More than 100 years old, this unique timekeeper appears to have come originally from Osterbotten in Finland, but history is silent, it seems, as to who was the designer of the case or what was the origin of his inspiration. But if husbands in Finland stay out late and wander home when dawn is on the way, such a clock in the angle of the stairs might appear to be standing in the gloom in a very uncompromising attitude.

## It's Different!

A few years back, my good friend, J. E. Coleman of Nashville, created this unusual clock after creating his previous holiday gift, the "Sour Mash Barrel Clock."

This "Toilet Seat Clock" was a problem. Where to install it? The powder room, naturally. But I was confronted with a marital problem which was overcome by eliminating a guest clothes closet and installing another powder room.

My friend wanted his gifts to be different and practical. This one was, even though a special warning sign had to be made as the movement operates on 110 V. TIMES

# SEIKO TO LAUNCH NATIONWIDE "AUTHORIZED DEALER" CAMPAIGN

"You get the best of Seiko only where this sign (Seiko Authorized Dealer) is displayed. When you buy your Seiko anywhere else, someone could be getting the best of you."

This hard-hitting, explicit statement by Robert Pliskin, president of Seiko Time Corporation, forms the basis of full-page and large size newspaper advertisements in all major markets beginning next month. It will signal the launching of an intensive nationwide public information campaign by Seiko to educate consumers on the advantages of purchasing Seiko watches from Seiko Authorized Dealers versus unauthorized alternatives.

It will mark the establishment of a "Seiko Authorized Dealer" identification plaque to be displayed by quality jewelers and department store jewelry departments, and a supporting program of public information counter cards and other point-of-sale materials.

"We want consumers to know that when they see our "Authorized Dealer" sign, they will get the best selection, the best warranty, the highest quality standards and the best service and parts—none of which can be guaranteed by unauthorized retail sources," Mr. Pliskin stated here today.

The consumer ad, which will also be reproduced as a counter card take away, makes this salient point:

"There are many people, not Authorized Dealers, who will try to sell you a Seiko. And when you buy your Seiko that way, you may not get what you pay for, regardless of what you pay."

The ad lists the advantages of purchasing from Authorized Dealers, versus the unauthorized alternatives. It points out the security of knowing that one owns a current-model, genuine Seiko covered by a valid Seiko U.S. warranty as opposed to a Seiko from an unauthorized dealer which could be obsolete, not under warranty, and for which parts may not be available in the U.S.

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## NEW STYLING TEAM AT BULOVA

David Holman (center), Bulova's vice-president for watch merchandising, has announced a reorganization that "will have far-reaching effect on each of the company's product lines." Mr. Holman explains: "Until recently, the same people were responsible for styling the modestly priced Caravelle line and the higher-priced Accutron watches as well. Now Bulova's three product groups—Accutron, Bulova, and Caravelle—will take on distinct personalities of their own, depending on their positioning in the market place."

Barry Gell (second from left) will be responsible for the design of ladies' and men's Caravelle; Edward Goldberg (left) will style the men's Accutron and Bulova ranges; Sylvia Marenco (third from right) has been assigned the fashioning of the ladies' Accutron and Bulova collections.

Other members of the styling team are: Ceil Duca (right), merchandising administrator and Robert Stafford (second from right), designer.

Holman promises: "Each one of them has many successful years in the watch business and their vast experience will greatly benefit Bulova and its dealers. It's all part of the new Bulova."

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## JAY FOREMAN APPOINTED TO 1984 LOS ANGELES OLYMPIC CITIZENS COMMISSION

Los Angeles is the site for the 1984 Olympics, and in this connection, Jay Foreman, Founder and President of House of Clocks, Inc., Los Angeles, has been appointed to serve on the Los Angeles Olympic Citizens Commission and Sports Federations Advisory Commission.

The Sports Federations Advisory Commission serves as liaison with the Los Angeles Olympic Organizing Committee and provides special host services to members of international and national Olympic governing bodies and leaders of the International Sports Foundations.

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## A TIMELY CATCH

Dave Parker, star right fielder for the Pittsburgh Pirates, is awarded a Longines watch for being elected a recent Player of the Month in Kappels Jewelers'


area promotion which honors the Pirate of the Month. Bob Wells (left), General Manager of Kappels Jewelers, Pittsburgh, and Bob Abrams (right), the Longines District Sales Rep. for the Pittsburgh area present Longines' International Quartz watch No. 425 to Parker.

In Kappels' promotion, a watch will be awarded each month to the Pirate who receives the most ballots from fans from newspaper ads, in the Pirate program, and from ballots cast in the jewelry store. At the end of the season, the player with the most ballots will receive a solid gold Longines.

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## SWEST ANNOUNCES CALIFORNIA WORKSHOP

Swest, Inc., a leading supplier of tools, supplies and equipment to the jewelry industry, announced plans for its next Jewelry Casting Workshop to be held in Los Angeles on October 11 and 12, 1980.

Long known for its annual workshops held in Dallas, Swest only recently began holding workshops in California. Though attendance is limited to 50 people, the California workshops are very similar to the Dallas show which normally draws about 500 attendees.

The October workshop will feature a loosely structured format of continuous sessions, allowing individuals to spend as

much or as little time as they desire with each activity. Activities include wax model design; sprueing, investing and burnout; casting; mold making; and finishing.

Reservations are on a first come, first served basis. For brochure and registration form, contact Swest, Inc., 1725 Victory Blvd. Glendale, CA 91201.

## MARSCHING ELECTED VICE CHAIRMAN OF TIMEX CORPORATION

Ronald Marsching was recently elected Vice Chairman of Timex Corporation, Waterbury, Connecticut. The annoucement was made by Timex Corporation.

Mr. Marsching continues to be General Counsel and Secretary of the corporation.

He joined Timex in 1967 as General Counsel and Secretary and has been a member of the Board of Directors since 1970. In 1971 he was elected a Vice President and in 1975 a Senior Vice President.

Mr. Marsching formerly was associated with the New York law firm of White & Case. He is a graduate of Princeton University and of Harvard Law School.

## MAJOR ADVERTISING CAMPAIGN FOR SEIKO'S SOLID GOLD QUARTZ WATCH LINE

Seiko Time Corporation has introduced a totally coordinated in-store display program for its extensive new line of 14k and 18k solid gold quartz men's and ladies' watches.

The cornerstone of the display program is an eyecatching window display fashioned in attractive tortoise shell with stunning tawny, rust colored ultrasuede pads. The Seiko gold logo identification header can be adjusted to be used vertically or horizontally depending on available space. This window display, 21½ in. wide x 9¼ in. deep, adjusts from 13½ in. to 16½ in.

Matching sculptured watch holders, luxurious counter pads and handsome brass Seiko Gold ID plaques complement the display, and plush ultra-suede gift boxes, which are also being offered for each of Sieko's 70 solid gold quartz watches.

The Seiko gold line will be the most heavily supported collection of its kind, with full color ads in many of the nation's most influential magazines—including "Town and Country," "The New Yorker," "Newsweek," "Harper's Bazaar," and "Vogue." Also planned are saturation major market TV commercials plus a generous cooperative advertising program all built around the theme, "Seiko Makes Gold Even More Precious." AC&R Advertising, Inc. is the agency.

Full details of the Seiko Gold support program for department and jewelry stores is available through Seiko's nationwide network of distributors.

## NELSON NAMED V.P. TIMEX U.S. MARKETING AND SALES

Fred Nelson was recently appointed Vice President, U.S. Marketing and Sales for Timex watches. The announcement was made by Nicholas M. Mihalas, President of Timex Corporation, Waterbury, Connecticut.

Nelson returns to Timex after three years as President of Equity Industries, a Virginia based corporation, a manufacturer and marketer of clocks, security products and housewares. Prior to joining Equity, he worked for Timex for 28 years where he began as a salesman in California and later became Vice President of Sales.

## NEW NON-MAGNEGIC PRECISION TWEEZERS

Intrade, Inc. of Litchfield, Connecticut, an import/export management firm specializing in precision hand tools for the electronics industry is pleased to announce the introduction of a new material for Viola precision tweezers that is 100% non-magnetic, so as not to affect even the most sensitive of instruments. This steel is superior to Carpenter steel in that it has more chromium and nickel content, and thus is ideal for highly critical assembly operations.

Designated "SN," they are available from stock in the following more popular types: 2a, 3, 3c, 5, 5a, 7, and SS.

## BULOVA ANNOUNCES NEW CERTIFIED QUARTZ TECHNICIAN DIPLOMA

Leo Helmprecht, manager of Bulova's Field Training Services, reports that a numbered "Certified Bulova Quartz Technician" diploma will be awarded to graduates of a recently introduced intensive 8-hour Bulova Quartz training program. In addition, qualifying watchmakers will be able to display a decal in view of the public to show that a trained quartz technician is on the premises. This bench program is open to all watchmakers.

Both LCD and stepping motor movements will be studied, with emphasis on diagnosing, trouble shooting and servicing. Although Bulova movements will be used in the course, the knowledge acquired will be applicable to quartz-based products of any brand. The diploma will be awarded upon completion of the Certification Test.


For information regarding programs in your area, please contact the Bulova Sales representative or Field Training Services at Bulova Park, Flushing, NY 11370. Or call 212-335-6000, Ext. 777 or 778.

## "TEX" KAWASE APPOINTED PRESIDENT OF RICOH TIME

Mr. Hiroshi ("Tex") Kawase has been appointed President of Ricoh Time of America, Inc.

Mr. Kawase recently moved from Japan to the Dallas area with his wife and three children. He has held previous executive positions with the parent company, incluidng General Manager of the Export Department of the Ricoh Watch Company and General Manager of the Ricoh Sales Co.

Mr. Kawase also announced the appointment of Mr. Jack Tweddale as Vice President in charge of Sales and Marketing.

# "GOLDEN QUARTZ" SOLID-STATE LADIES' CALIBRES SEEN AT BASLE

Two stunning new solid-state LCD calibres were introduced at the Basle Fair by the ASUAG affiliate at Marin (EEM): one an LCD laides' analogue and the other an easy-to-read ladies' LCD.

Called the Golden Quartz series, they were, appropriately enough, introduced at the 50th anniversary of the Swiss watch industry's participation in the Basle Fair as an organized body. In actual fact, the series gets its name from the golden background of its digital display which provides a high degree of legibility.

Golden Quartz I (ESA-EEM 932.161) has a permanent display of hours and minutes with a blinking star on its gold background and also provides the date and seconds. The corrections are performed by pulling the crown which is designed to look like a standard adjusting crown when in fact it is actually a button. Pushing the crown in provides the date and seconds display.

Golden Quartz II is the analogue "sister" module. This one, (ESA-EEM 932.051) shows the time by means of "electronic hands," and has four dots, one in each corner of the face, each of which blinks for 15 seconds. Correction of the time is made by pulling out the crown.

Both modules have the same dimensions: 17.20 mm by 4.60 mm. This enables the module to be used in a great variety of standard size ladies' cases.

Dr. Peter Daly, Production Division manager at EEM, explained the rationale behind the two new calibres by saying that "we wanted to take the LCD from the realm of technology and put it into the realm of jewelry. We believe that the 'jewelry look' is coming back and people—particularly ladies—are tired of 'macho-looking' LCD watches and want something more feminine.



"As far as we know, this is the first digital-analogue dedigned for ladies and it is also the smallest," he said.

Both watches were designed to be assembled through automation and have flexibility in their construction so that modifications can be made if the design requirements change, as so often is the case with ladies' watches.

In addition, Golden Quartz I and II are designed for mass production. "They are not just to set records, but are to be made in large quantities and sold at reasonable prices, depending, of course, on the type of case and the metals used," Dr. Daly explained.

Thinner glass was used in the creation of the display in order to improve legibility from varying angles, long a problem with LCDs.

It is expected that deliveries of the two modules will begin in late summer.

## NEW BULOVA QUARTZ

This Bulova Quartz men's watch, a fine example of Bulova's new, crisp look and clean lines, is now being introduced. In a yellow gold tone case with stainless steel back, it features polished screws set into a white, brushed bezel which denote the hours. The champagne-color dial is protected by a scratch resistant Dura-Crystal®. A bar link bracelet completes the matched look. Model 92691 will have a suggested retail of $190. Additional information is available from: National Sales Manager, Bulova Watch Company, Inc., Bulova Park, Flushing, NY 11370. Phone 212-335-6000.

## NEW PROPORTIONSCOPE SCREENS

Gem Instruments Corporation, wholly owned subsidiary of Gemological Institue of America, now offers new screens for the ProportionScope and a new reticle for the Diamond Proportion Analyzer eyepiece.

These new screens for the ProportionScope and the Diamond Proportion Analyzer reticle have been developed to accommodate proportion analysis in the new GIA Diamond Grading System. These new screens and reticle feature indices for measuring crown angles as well as the other important factors in proportion analysis.

ProportionScopes can be updated by purchasing two new screens. One screen is used to grade stones .18 to 1.3 carats while the other is used for stones 1.21 to 8 carats. The set of two screens comes complete with instructions. Price is $45.00. The newly designed reticle can be placed in the Diamond Proportion Analyzer eyepiece by sending the eyepiece to Gem Instruments Corporation. The cost of this modification is $23.00, which includes detailed instructions.

Both instruments, the ProportionScope and the Diamond Proportion Analyzer can be updated to stay abreast of recent diamond grading changes without purchasing a whole new piece of equipment.

The movable screens and the eyepiece reticle allow a jeweler to place a loose diamond in the instrument and quickly and accurately determine girdle thickness percentage, the pavilion depth percentage, total depth percentage and, of course, the crown angle and the crown height percentage of that stone.

Both of these valuable instruments are outstanding diamond merchandising tools. They enable jewelers to professionally explain to customers how proportion affects diamond value. Customers can visually compare the diamond they are considering with proportions of an ideal cut displayed on the screen.

For more information write Gem Instruments Corporation, P.O. Box 2147, Santa Monica, CA 90406.

## NEW MINIATURE BENCH GRINDER

Foredom miniature bench grinder is a precision power tool for industrial shops. Only 4½ in. high and 8 in. long, it grinds, deburrs, buffs and polishes at speeds up to 14,000 rpm. Foredom Electric Company, Bethel, CT 06801 is a division of Blackstone Industries.

## BOREL BALL WATCH AGAIN AVAILABLE

The famous Ernest Borel Ball Watch, an indispensable fashion accent, is available again. The yellow case is decorated in black or white and inlaid golden designs. Ref. 4452 (white) and 4453 (black) have a suggested retail of $145.00 K. The chain is included. Distributed through Borel Watch Company, 1008 Walnut Street, Kansas City, MO 64106.

## METAL TEST KIT FROM GFC

The new do-it-yourself precious metal test kit, JNT/45-210, introduced by GFC consists of a test stone; testing plate with test prongs for silver and 10, 14, and 18 kt. gold; bottles with applicators for test acids and solutions; vial of testing salts; and instructions for using the test kit. The simple, economically priced metal test kit is currently available at your jewelers' supply house.

## SUEDE POUCHES AVAILABLE FROM SWEST

Swest Inc., is introducing a new line of suede pouches used for storing or packaging jewelry. The attractive pouches with drawstrings for closing are a simple and elegant way to display and package jewelry, and they are very economical. The pouches are offered in four different colors and two sizes, and come with white packing boxes.

For a brochure describing these pouches with prices and order form, contact Swest, Inc., 10803 Composite Drive, Dallas, TX, 75220; 1725 Victory Blvd. Glendale, CA 91201.

## CITIZEN QUARTZ LADIES' DIGITAL CHRONOGRAPH

The Citizen Quartz Ladies' digital chronograph is the world's first 1/100 second stopwatch in a woman's timepiece. It features a timer which registers both lap and total time elapsed as well as an extra digital time function for overseas travel. It is powered by a single battery cell which lasts up to two full years.

## NEW SHORT-FORM PRODUCT GUIDE FROM INTERSIL

Intersil, Inc. has published a new 30-page condensed product guide which describes the company's broad line of analog, digital, horological, and microprocessor integrated circuit products.

Devices in the new catalog are fabricated with CMOS/LSI, MOS/LSI, and bipolar LSI, in addition to a proprietary process relating to vertical MOS power FETs. Also included are data acquisition components and systems; memories, microprocessors, and development systems; multiplexers and switches; and discrete MOS and bipolar transistors.

Applications include data processing and industrial control systems; computers and computer-related equipment; portable and fixed instrumentation; data acquisition and conversion; and RF and telecommunications.

## ENERGY SAVERS FROM BULOVA

The quartz movements in these attractive new clocks from Bulova operate accurately for a year on one low-cost "C" cell battery. Clear numerals are legible from far away. Both model C-4002 in Natural Pine and Model C-4003 in Warm Pine are 9" square. Suggested retail price is $29.95. Additional information is available from: National Sales Manager, Bulova Watch Company, Inc., Bulova Park, Flushing, NY 11370. Phone (212) 335-6000.

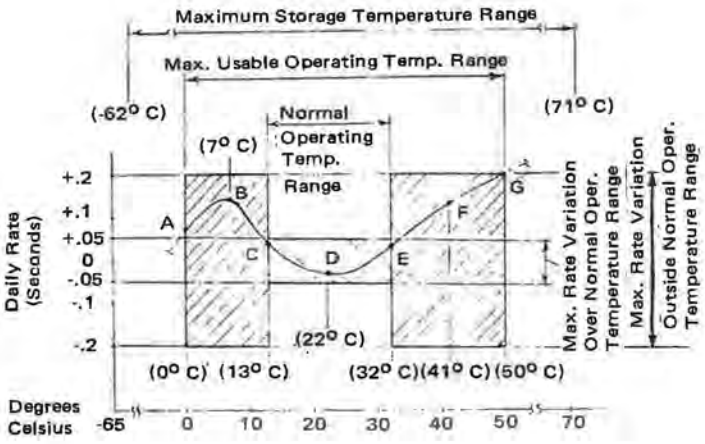
## NEW BROCHURE ON MINI ELECTROPLATING EQUIPMENT

A new Brochure from Technic Inc describes table-top electroplating equipment for jewelry manufacturers. The free-standing three and five-tank Mini-Plating plants and Technic-Lab table top units provide an economical in-house plating capacity for small volume jewelry makers. Larger manufacturers who normally have plating work done by outside contractors will find the units useful for sample making and for filling in orders that cannot be completed from inventory.

Copies may be obtained by writing to Technic Inc., P.O. Box 965, Providence, RI 02901.

## THE SHIP'S CHRONOMETER

*(Continued from page 55)*




NOTES:

1. Curve shown is typical crystal frequency response over the temperature range indicated.
2. Points identified are check points at the temperatures indicated and will not necessarily result in rate variations of either the magnitude or sign shown. Daily rates at the temperature points indicated shall, however, fall within the shaded area for the temperature range under consideration.
3. Temperatures at these points shall be maintained during tests within plus/minus 1.4° C of those shown.
4. The storage temperature range is shown for reference only.
5. Equivalent Farenheit degrees for significant temperature points are -62° C, -79.6°F; 0°C, 32° F; 7° C, 44.6° F; 13° C, 55.4° F; 22° C, 71.6° F; 32° C, 89.6° F; 41° C, 105.8° F; 50° C, 122° F; and 71° C, 159.8° F.

Figure 3. Military Specification MIL-C-24523 (SHIPS) for Quartz Crystal Chronometer

square signal waves. This was then amplified and fed into twin output sockets where it could be used to drive low voltage synchronous motors.

It was powered by 14 volts a.c. power supply with a maximum current consumption of 1.5 amps when driving one motor. The power passed through a diode which prevented the possibility of damage to the transistors in the event that the polarity of the power supply was reversed.

Thus, two low voltage 50 c/s synchronous motors could be driven by the electronic unit. This device had multi-purpose use and when used as a chronometer, the output speed was changed to 1 r.p.m., and was fitted with a sweep-second hand, hour, and minute hands. If desired, it could be fitted with a set of contacts and used as a break-circuit chronometer.

The accuracy of this instrument was guaranteed to be within one part of $10^6$, or approximately one second in 11½ days. However, tests showed that in most instances, the accuracy was considerably better.

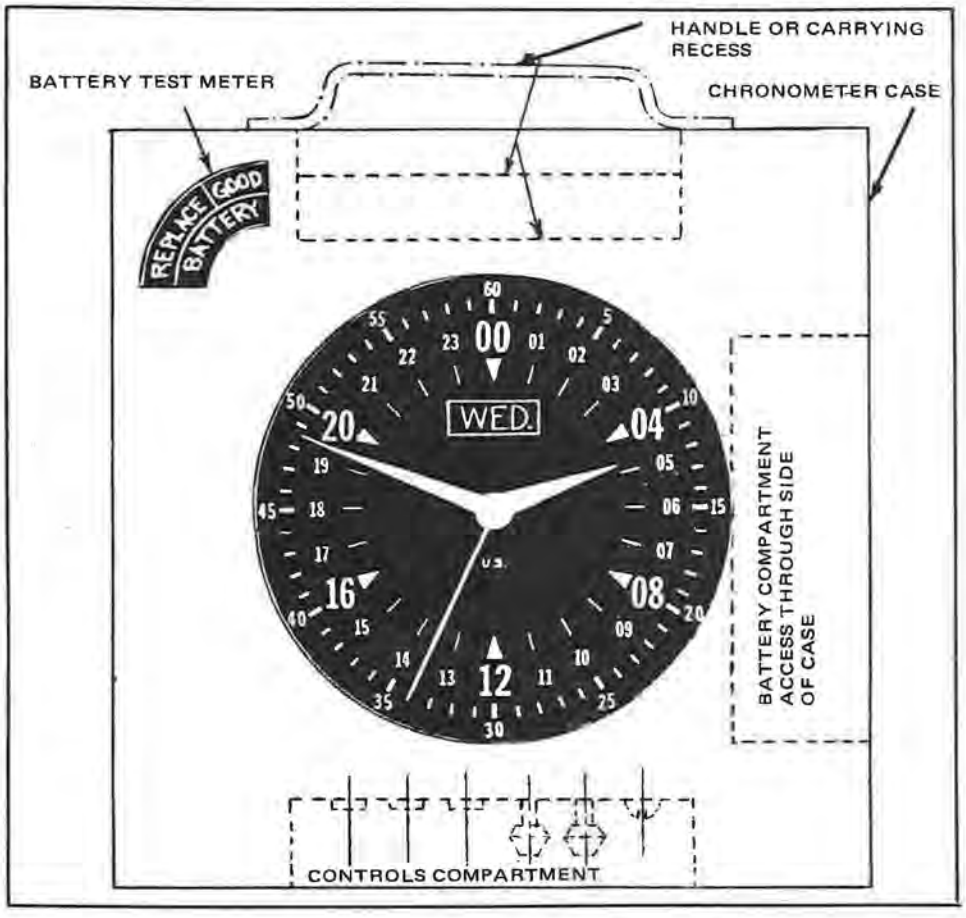
The electronic battery-operated timepiece has no doubt affected all of us in this era because of its dependability and accuracy. Because of the impact that this revolutionary new timepiece with a heart of stone has had technologically, various governmental agencies have moved to rewrite some of their timepieces' specifications. Although there were a number of horological innovations occurring in the development of the detent chronometer during the early 1930's, the Navy never saw fit to revise its specification 18C7c, dated February 2, 1931, for the marine chronometer. If it had not been for a waiver, the Hamilton chronometer would have never met Navy specifications.

However, the Navy has shown greater vision since the development of the quartz timepiece and has written a new specification #MIL-C-24523(SHIPS) dated 10 September 1975 for chronometer, quartz crystal, battery powered. See Figure 3.

The specification #MIL-C-24523 (SHIPS) states:

General: The quartz chronometer shall measure and display UTC time on a 24-hour dial. The chronometer shall indicate the day of the week and the hours, minutes, and seconds by means of a dial and three concentric hands. [See Figure 4.] The chronometer shall be powered by self-contained cells and shall be furnished in an 8 in. x 8 in. x 7 in. deep case suitable for direct installation in shipboard chronometer lockers or chart tables without gimbals. The dial shall be designed so it is fully visible through a viewing glass in the chronometer locker. The chronometer

Figure 4. Chronometer Arrangement



shall be capable of operating at an inclination of 60° and shall be designed to have minimum operating life of five years without maintenance other than battery replacement.

**Power**: The chronometer shall be powered by self-contained cells and be designed to operate for a minimum of one year on a single set of batteries. A built-in battery test meter, operated by means of a push button, shall be located in a recessed control compartment at the bottom of the case. The battery compartment shall be located on the side of the chronometer case and isolated so the movement is not exposed when the batteries are being changed. The chronometer shall continue to operate and keep the correct time for at least five minutes while the batteries are being replaced. The chronometer shall be designed to accommodate the gradual voltage drop during the life of the batteries by which it is powered while maintaining an accuracy of ±0.2 seconds.

**Time Generator**: The basic element for the time generator shall be a quartz crystal oscillator. The quartz crystal shall be temperature compensated (requiring no heating element) and be hermetically sealed in an evacuated envelope.

**Setting**: A two-position setting mechanism shall be provided to set the three hands. One position of the mechanism shall allow the minutes and hours to be set without any movement of the second hand. To synchronize, two electrical push buttons shall be provided for making time corrections without upsetting the synchronization of the minute and second hands.

**Case**: The case shall be of a rigid thermosetting black acetal plastic material and suitable for storage in chronometer lockers and chart tables. A recessed control compartment at the bottom of the case shall contain the battery test push button, the setting stem, the synchronization buttons, the day-of-week indicator change stem, and the long-term drift adjustment. The case shall have a finger recess, may have a carrying handle to facilitate carrying the chronometer, and shall be water tight.

**Long-term Drift**: A calibrated adjustment capability shall be provided to adjust for aging of the crystal. Crystals shall be aged prior to use. Changes of rate due to temperature cycling shall be less than ten per cent of the daily rate at constant temperature.

**Accuracy**: The daily rate shall not exceed 0.05 seconds in the normal operating temperature range 13° C, (55.4° F); 22° C (71.6° F); 32° C (89.6° F); and no more than 0.2 seconds in the maximum usable temperature rate of 0° C (32° F), and 50° C (122° F). The deviation of the daily rates at any temperature shall be no greater than 0.02 seconds.

**Test**: In addition to the accuracy and temperature test, the chronometer shall be subjected to the following tests: shock, vibration, magnetism, humidity, salt fog, fungus, inclination, reliability, and water tightness.

Next month, more on the quartz chronometer.

# Book Review/Joseph G. Baier, Ph.D.

**Beginners Guide to Antique Watches.** *Carl and Maria-Luise Sifakis. Drake Publishers Inc., New York/London, 1978. 128 pages, 6 x 9 in., soft cover.*

This is another book for the watch collector, and from the title, the authors recognize that the fascinating field of collecting is attracting more and more converts.

The subject is first approached historically. Then the authors present a survey, starting with simpler watches and progressing to the more complex and unique. This certainly offers the collector the opportunity to recognize a "find" in his search for more outstanding watches. With a warning, the collector is also given an idea of what can be expected in terms of present values, softened by the now increasing values of all timepieces as an inducement to collecting.

Three sections, comprising 45 pages, include outstanding watches with a brief description of each, including an "Author's Fair Price Estimate." Much more space, however, is given to the descriptions. The general content of the chapter on "America, and Other Late Comers in Watches" gives a good account of a variety of watches.

There is also a chapter on "Tales of Famous Watches" which adds another dimension to this book. There are the "comic" watches, pictorial watches, and the Washington-Lafayette watch, to mention a few. The last chapter is entitled, "Should You Invest in Antique Watches?" The answer, of course, is yes.

**English Lantern Clocks.** *F. H. J. Hana (Translation by E. J. Tyler). Blandford Press, Poole, Dorset, England, 1979. 159 pages, 7½ x 10 in.*

This is an outstanding book on English lantern clocks. After the first 27 or so pages which deal with descriptions of these clocks, the remaining pages include about 148 photographs of lantern clocks, parts of lantern clocks, hands, fret work, dials, bells, escapements, etc., all of which will be most meaningful to the collector.

The book describes the origin and development of lantern clocks. The writer opens with a chapter informing the collector how to "get hold of these clocks" through consulting horological journal advertisements, locating dealers, and seeking private citizen sources, while warning of possible fraudulent practices among certain sellers. A knowledge of hand and fret types, among other details presented in the book, will assist to this end.

This book was originally published in the Netherlands; the author is a Dutch horologist who has written previously in the field with articles in antiques journals, including a study of weight-driven clocks. To one interested in English lantern clocks, this book will be extremely valuable; to the general horologist, even one with limited horological interests, this book will still be a valuable source of information.

## PRESIDENT'S MESSAGE

*(Continued from page 4)*

Board of Directors, and the AWI administration alone; but, with the help of the members, guilds, state associations, and affiliated chapters, much can be accomplished.

There is great strength in *unity* with *number*! I would like to solicit your help and suggest you make yourself a solemn pledge not to give up until you obtain at least one new AWI member this year—even if you must pay the stubborn craftsman's first year dues to show him how the AWI is helping the watchmaking profession.

I am deeply humble and highly complimented to have the opportunity to be associated with such a knowledgeable group of watchmakers in the U.S. We have the *unity*, and only your help can more than double the *number* of members to make this organization the strongest association of watchmakers in the world. Take that pledge—Sell AWI.

Again, I solicit your help with any suggestions you may have and urge you not to hesitate to write or call me about your wishes. I shall strive to serve you to the best of my ability. Together we can make the wheels turn and the Quartz Hum.

# Research and Education Council Meets

**By Milton C. Stevens**

Eighteen watchrepair instructors who teach in AWI Research & Education Council member schools attended an in-service workshop, held June 24-26 in Burlingame, California. This in-service workshop is sponsored annually by the American Watchmakers Institute as part of the Institute's continuing efforts to up-grade the profession and bring the latest technology to instructors who teach horology.

The morning session of REC held June 24th featured George Schlehr, horology instructor at Mountain View College, Dallas, Texas. Mr. Schlehr's presentation dealt with the integration of clock repair into the curriculum of a school of watch repair. Mr. Schlehr, when faced with the problem of continual enrollment, developed an audio-tutorial approach for his classes in horology. By using this technique, students can begin their training at any time during the calendar year; they merely follow the study guide prepared for this purpose. Students listen to lecturers on tape while they look at slides, drawings, or actual watches and clocks. Mr. Schlehr's organization of the course, and the unique approach he has developed for teaching, made a very positive impression on his fellow instructors.

During the afternoon session of June 24, Larry More from the Seiko Watch Company's Western Regional Office presented an outstanding program on procedures for handling the casing and fitting of crystals for some of today's high fashion and advanced technology watches. Mr. More gave practical demonstrations using various tools. Some of the tools can be purchased, while some can be made or fashioned from existing tools. All of the tools and procedures presented by Mr. More were designed to make this increasingly difficult job easier to handle.

Another segment of the June 24 program featured Calvin Sustacheck and Leo Helmprecht of the Bulova Watch Company. Leo Helmprecht outlined the programs Bulova has developed to aid the various watch repair schools to better teach students of horology the techniques of Accutron repair as well as step-motor and LCD watch repair. Calvin Sustacheck reviewed with the instructors the visual aids which Bulova will make available to them for classroom use. Mr. Sustacheck also briefly reviewed repair techniques for some of the newer products recently developed by the Bulova Watch Company. Everyone was anxious to learn more about the status of the revolutionary thermo-battery which has been researched and developed by the Bulova Watch Company. This development will allow future watches to generate electrical energy by changes in body temperature, thus supplying the current needed to run the watch.

On June 25, Francois Giradet from the Watchmakers of Switzerland Information Center provided the instructors with an insight into how the element of styling dictates the manner in which watch movements are designed. Everyone listening to Mr. Giradet's presentation had a better appreciation for the reasons underlying certain approaches taken by the various watch manufacturers. In order to make a watch saleable, it first must be attractive and pleasing to the potential customer. Watch designers are charged with the all-important task of making the product attractive to the consumer. Once this is done, the engineers are required to design watch movements which will be dependable and accurate but, at the same time, fit into the space restrictions set for them by the watch designer.

Mr. Giradet also gave details on the newest methods of manufacturing IC chips using film similar to that used in the photography industry. Concluding his presentation, Mr. Giradet astounded the REC instructors with a display of recently developed watch movements from the Swiss watch industry. One quartz movement that made a special impression on this writer was one which, when placed next to a sharpened lead pencil, occupied about as much space as one-half the tip of the pencil—or was about the size of the button on a man's shirt. Another movement displayed time employing an LCD in the form of conventional watch hands.

Gene Kelton, representing the Citizen Watch Company, discussed recent product developments which the Citizen Watch Company has introduced on the American market. Mr. Kelton went into detail on the following calibres and also allowed each instructor to examine them first hand:

1. Men's dress quartz ultra-thin 79 series, presently found in calibres 7900, 7920, and 7930.
2. Ladies' bracelet quartz thin and compact series. This series consists of calibres 1000, 1100, and 1300.
3. Men's LCD quartz multi alarm "Memo Chime 3." The calibre number on this watch is 9240.
4. Men's quartz Ana-Digi full function, calibre 8920. This is another one of Citizen's unique products which follows the "Digi-Ana," already favorably received on the market.
5. The digital stopwatch calibres LSW 020B and LSW 030B.

Mr. Kelton's technical presentation of these new Citizen products better prepared the horology instructors to present this material to their students upon returning to the classroom.

The final day of the REC program saw the instructors working on questions and answers which can be incorporated into the proposed new AWI book *Questions and Answers for Solid State Watch Repairers*. During their business meeting on the final day, the instructors selected George Schlehr of Mountain View College, Dallas, Texas to serve as their chairman for the next two years. They also selected Thomas Imai, instructor at Spokane Community College, Spokane, Washington to serve as vice-chairman. HT

# MORE SCENES FROM SAN FRANCISCO

**AWI NEWS**

*(Continued from page 40)*

This meeting was chaired by the AWI Affiliate Chapter Director, Robert Bishop. During their meeting, the delegates reported on the activities of their groups during the past year. The reporting was greatly expedited this year because of the standardized report form which was formulated by Chairman Bishop prior to the meeting. In addition to making recommendations to the AWI Board of Directors, the delegates selected Robert Bishop to serve another year as AWI Affiliate Chapter Director and Robert Allis to serve as Vice-Chairman.

Friday evening, the President's reception was held around the theme of the twentieth anniversary of the American Watchmakers Institute. All of the Past Presidents in attendance were introduced, and each gave a brief summary of his tenure in office; these individuals included: Donald Leverenz, Harold Herman, Gerald Jaeger, Henry B. Fried, Ewell D. Hartman, Marvin E. Whitney, Robert A. Nelson, James H. Broughton, Orville R. Hagans, and the soon-to-be Past President, Leslie L. Smith.

During the festivities, a ceremony of the burning of the AWI mortgage was enacted. Robert A. Nelson, who served as President during the acquisition of the AWI building, held the mortgage facsimile, while Orville Hagans, whose book *The Best of J.E. Coleman: Clockmaker* made it possible to retire the mortgage, lit the document. Pictures of the mortgage burning, President's reception, and other scenes from the annual meeting can be found on pages 24, 25, and above. TIMES

# Classified Ads

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## AUGUST

3 - 6—New Orleans Gift & Jewelry Show; Rivergate Convention Center; New Orleans, LA

9 - 10—Gem, Jewelry, & Mineral Festival; Hofstra University, North Campus, Hempstead, NY

9 -11—MS RJA Annual Convention; Biloxi Hilton; Biloxi, MS

9 -11—RJA Central USA; Expo Center; Chicago, IL

10 -12—Tampa Gift, Jewelry & Variety Merchandise Show; Expo Hall, Tampa, FL

10 -13—Minneapolis Gift & Jewelry Show; Radisson Hotel and Radisson Center; Minneapolis, MN

10 -15—225 Fifth Ave. Fall Market; New York, NY

16 -18—Pacific Jewelry Show, Century Plaza Hotel, Los Angeles, CA

16 -20—Tampa Gift, Jewelry & Housewares Show; Curtis Hixon Convention Hall; Tampa, FL

17 -19—Houston Houseware, Gift & Jewelry Show; Albert Thomas Convention Center, Houston, TX

24 -26—St. Louis Gift & Jewelry Show; Cervantes Convention Center; St. Louis, MO

24 -26—Gift, Jewelry & Variety Merchandise Show; Miami Beach Convention Center; Miami Beach, FL

31 - Sept. 4—International Watch, Jewelry & Silver Trades Fair; Earls Court, London, England

31 - Sept. 5—Dallas Fall Gift, Jewelry & Housewares Show; Dallas Market Hall & the Anatole Hotel; Dallas, TX

## SEPTEMBER

4-9—BIJORHCA Jewelry, Silverware, Clock & Watch Fair; Paris, France

6-7—Iowa Retail Jewelers and Watchmaker Association Fall Convention and Trade Show; Airport Inn; Des Moines, Iowa

6-8—Intermountain RJA convention for Utah, Idaho, Nevada, and Wyoming; Park City, UT

6-9—National Merchandise Show; New York City Coliseum, New York, NY

12-14—Tennessee RJA Annual Convention; Music City Rodeway Inn; Nashville, TN

14-16—Phoenix Gift & Jewelry Show; Phoenix Civic Plaza; Phoenix, AZ

20-21—North Dakota Jewelers and Watchmakers Association Convention; Seven Seas Motor Inn; Mandan, ND

## OCTOBER

18-19—Illinois Watchmakers Convention; Regency Hotel; Peoria, IL

31-Nov. 2—Florida State Watchmakers Association; Colonnades Beach Hotel; Palm Beach Shores, Suger Island, FL

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