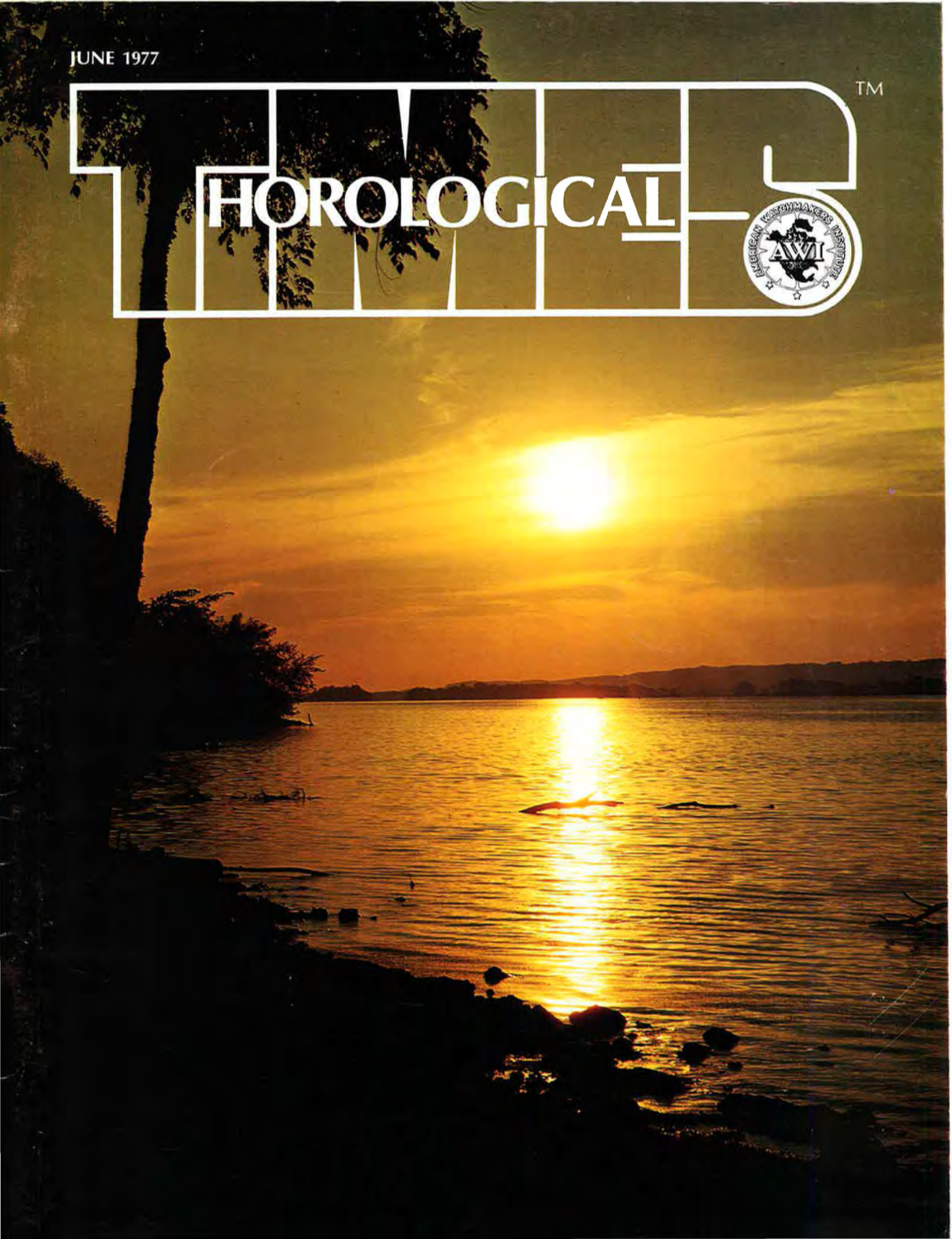
JUNE 1977

HOROLOGICAL TIMES™



Editorial

In the solid state manufacturing field, there is a relatively high percentage of rejects of modules. The unpassable percentage may be somewhere around 10%. A very small amount of that percentage is those which are scrapped because of unrepairable defects or damage. In that category are chipped ICs and broken leads.

But the greatest percentage of these complete modules that do not pass quality control actually do operate. They were rejected because of high current drain or an imbalance of light intensity of the display. The number of these modules stored by the manufacturer is considerable. And each time the maker gazes at the stock pile of workable, but not-so-good modules, he dreams of turning the ceramic and plastic into green. With a little help from another, here's how one might do it.

A one-time-around opportunist purchases a number of low cost cases and the reject modules, cases them, and sells them "unbranded" to jewelers and jeweler-watchmakers. The suggested retail mark-up is inviting to the retailer. The woe that follows is not. Uneven readouts and continual battery changing rouse the ire in most customers.

In the mechanical timekeeping field, we all too well remember the pin-lever "Omega" and "Longume." In the adolescent years of solid state, their unbranded counterpart is here.

ABOUT THE COVER

Depicted on the cover of the June issue is a beautiful sunset on the Mississippi River.

LETTERS to the Editor

I am a member of AWI and, of course, subscribe to HOROLOGICAL TIMES which I enjoy very much. Each month after I have read the TIMES, I find myself feeling a renewed stimulation in the horological area.

Newton R. Watts
Chatham, New York

We congratulate AWI on the wonderful work they have done and continue to do in this magazine for the benefit of their members and the trade.

The Horologists' Loupe
The Horological Society of New York, Inc.

I wish to state that at last there exists a GOOD journal devoted to the HOROLOGIST rather than to the MERCHANDISER as "that other magazine" presently is. I have been for several years complaining about the lack of technical articles. The new TIMES that you are producing is truly EXCELLENT. Please never change it to a merchandiser. There are plenty of other good ones in that area already—do continue to be technical—we do need it.

Roy H. Niegel
Cupertino, California

Am enclosing $2.00 to help on postage on the best magazine I have ever seen of its kind.

Gordon C. Laskey
Fowlerville, Michigan

The AWI Magazine was nice, the HOROLOGICAL TIMES I enjoy more, including the ads. Good work!

Frank DeVito
Brooklyn, New York

I would like to take this opportunity to extend my heartiest congratulations and worthy praise to the Editors and Staff responsible for the apparent success of the HOROLOGICAL TIMES. This is a priceless informative publication for the Watchmaker/Jeweler, Watch and Jewelry industry. My warmest best wishes for continual success.

Jack Schecter
Seiko Time Corporation
Manager, Technical Services

Dear Mr. Tigner:

This is just to tell you I think that Inside the Clock Shop is the first article I've read that tells it like it is. Keep up the good work.

Tim Murphy
San Antonio, Texas

NEW — READY FOR YOU AT

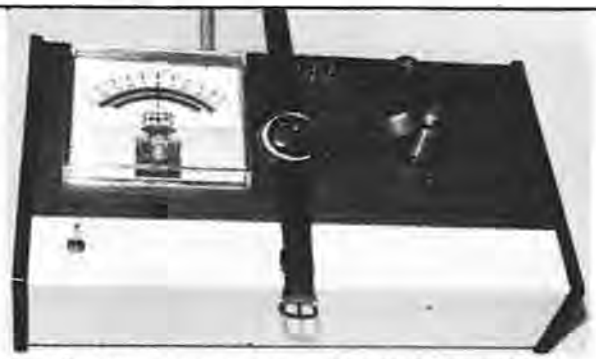
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The President's Message

by James H. Broughton

At the annual meeting on June 25-26, 1977, the American Watchmakers Institute will have completed another successful year. The bench course workshops have been in great demand, the Horological Times has made its debut, many new slide programs have been completed, the Solid State Directory has been mailed to all members who requested it. These are just some of the projects that have been completed this year. Many more could be added to this list.

To me as a watch repairman, we are in a very exciting period of time, also a very challenging one. The innovations that the electronic world is throwing at us at a very fast pace keep everyone on their toes. During the next few years, it would be difficult to try and second guess what will come next. One basic thing the watchmaker can rely on: the American Watchmakers Institute will leave no stone unturned in getting this information to its membership as it becomes available. This has been a proven thing in the past and will be the main goal for the future.

The American Watchmakers Institute has several members who travel throughout the United States, conducting bench courses or seminars. These AWI representatives at times may enter a city as total strangers. This situation usually will not last very long. The friendly watchmakers in the area see to that. They know how to make a stranger feel welcome.

I have received requests from several of the AWI instructors and those members who conduct seminars to relate to you their appreciation for your friendship and thoughtfulness. We appreciate every ounce of effort you have put forth, gosh you shouldn't have done it, but for God's sake don't stop.

Some writers can take the simplest of everyday words and make a monumental phrase. Who wrote the following words, I don't know, but he or she has done just that.

There are big ships
and there are small ships
but there is no ship
like Friendship.

For those people who have gone out of their way to befriend the AWI representatives that come to your area (you each know who you are), we the AWI representatives say, "Thanks!"

Some time ago I was visiting the AWI Office and Museum. While admiring the Museum and expressing my admiration, someone in back of me said they were not happy with the museum as it was. I turned around quickly to defend the museum and came face to face with Orville and Jo Hagans. We all know Orville has the title of Curator for the Museum and Jo has the title of Assistant to the Curator. These two people will not be satisfied with the AWI Museum until it is considered the finest of its kind in the country or maybe the world. No one knows what their final accomplishment will be, except they themselves.

In their conversation about the Museum, Orville and Jo sound like engineers who build our interstate highways. Plans are made to build highways, and construction work is started. Before construction is completed, the engineers decide the highway is out of date, but it still has to be completed. Orville and Jo will decide on a project for the Museum and before they have it completed, they are dissatisfied, but are fully aware that their first project has to be final before going on to the next one, which they will already have outlined.

I have often wondered why they made Orville the Curator of the Museum and Jo his Assistant. I have witnessed both of them working on the Library and Museum and believe me, they work hours I never dreamed of. I believe Jo may work a couple of hours longer than Orville, only because Orville is often in a meeting concerning other AWI business. I suppose that is why Jo is the Assistant—she works more hours than the Curator.

While in your own minds, Orville and Jo Hagans, I know you are not yet satisfied with your accomplishments with the Museum and Library, the members of AWI are satisfied that we have the best possible Curator and Assistant to the Curator working for the AWI Museum and Library. Congratulations on a job well done.

Those of you who are planning on attending the Annual Meeting in June, I hope for your own piece of mind that you have made your room reservations. If not, do so at once. For those of you who are thinking that maybe you will go this year, I urge you to plan to attend, and leave the maybe out. You won't be sorry. You will see the inner workings of AWI and meet the most dedicated people, AWI members.

See you June 25-26.

NAWCC COLORADO CENTENNIAL CHAPTER NO. 100

The National Association of Watch and Clock Collectors, Inc., is growing. On March 31, Chapter No. 100 was chartered. By a stroke of luck and patient planning on the part of NAWCC members in the Centennial State of Colorado, the new chapter will be known as the Colorado Centennial Chapter No. 100. The new chapter primarily will serve the southern part of the state. Presently, meetings are held in member's homes; however, a more suitable place for slide shows, exhibits, etc., will soon be needed. The last meeting was especially enjoyable



L. to R.: E. H. Osburn, G. Hurst, O. R. Hagans, W. J. Brown, J. T. Neal (President), G. Howard, B. Sanders, P.B. Wood.

as the charter had just been received and all members signed it as charter members. Each meeting has been quite successful, with members who wish to do so showing and describing some items from their collections. A short, quick auction of items donated to the chapter provides needed funds. This practice was started by Colorado Chapter No. 21 and is something other chapters might try. Several members from Chapter No. 21 have been attending the meetings and have been very helpful in getting the new chapter organized. Refreshments at this meeting included a cake with the new chapter logo.

When troubles come, wise men take to the work; weak men take to the woods.

THREE SEMINARS TO PRECEDE RJA'S JULY SHOW

Three important seminars will precede RJA's July show, and jewelers planning trips to New York City at that time should consider these programs as an important part of their schedule.

Jewelers' Circular-Keystone is planning two programs for jewelers. On Tuesday and Wednesday, July 19 and 20, the first two-day seminar will deal with Inventory Control and Management. On Thursday and Friday, July 21 and 22, the second two-day program will be devoted to Techniques for Producing More Sales.

Both of these seminars will take place at the Warwick Hotel. Anyone interested should contact Tony De Masi at Jewelers' Circular-Keystone, Chilton Way, Radnor Way, Pennsylvania 19089.

Modern Jeweler is planning a three-day Jewelry Store Management Workshop starting on Wednesday, July 20. The concentrated course is designed to broaden the knowledge of active managers and/or owners of retail jewelry stores. Jewelers who attend may expect to go home with a workable plan to increase sales by 25% and net profits by 50%.

The course will take place at the New York Sheraton Hotel. Attendance will be limited to 30 persons. Anyone interested should contact Modern Jeweler, 15 West 10th St., Kansas City, Missouri 64105.

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In the Spotlight

by Orville R. Hagans

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FROM THE ORVILLE R. HAGANS MANUSCRIPT AND PHOTO LIBRARY

WORLD TIME COMPUTER

AWI Museum is the proud possessor of a fabulous World Time Computer, invented by AWI member Albert L. Odmark of Seattle, Washington, who gave the electronic clock to our Museum. The World Time Computer is a 24-hour digital clock which will also compute and display the time of any city in the world relative to the operator's location. The clock's accuracy is approximately three seconds per year.

Pressing any of the 12 city keys on the front panel, or inserting a three-letter code into the top alpha keyboard will cause the computer to operate. The time for the selected city will be computed relative to the operator's location on a red display directly below the normal local time green display. The red display is dark until the computer is used and returns to a blank condition 25 seconds after it appears.

When the Date Line becomes a factor in the computation, a +1 or -1 will also be displayed signifying that one day should be added to or subtracted from the date at the operator's location.

The World Time Computer incorporates the facility for switching those cities in North America, United Kingdom, and a few selected ones in other places which observe Daylight Saving Time. A two-position switch, when operated, causes the computer to recognize this change for the major cities which make this change.

Imagine, if you can, how an instrument 8 in. x 10 in. x 4 in. could manage a memory bank of over 1,000 cities throughout the world!

The designer made individual cases to suit the purchaser—wood, leather, or whatever was desired. One, which went to the South Pacific, was covered in Tapa cloth. For the instrument given to the Museum, Mr. Odmark designed and had made an attractive plexiglass case so as to expose to full view the maze of components and wiring.

The computer was designed for use by governments, banking institutions and businesses who were constantly in need of time lapse in order to expedite business contacts. Recently King Hussein of Jordan purchased one.

Internal rechargeable batteries are provided as carryover during main power outage conditions. These batteries will maintain the timekeeping function for power outages up to five hours. The displays will not operate during the condition. When power is reapplied during the five-hour period, the displays will again operate and the correct, uninterrupted, time will be displayed. The selected city location will also be retained in the memory.

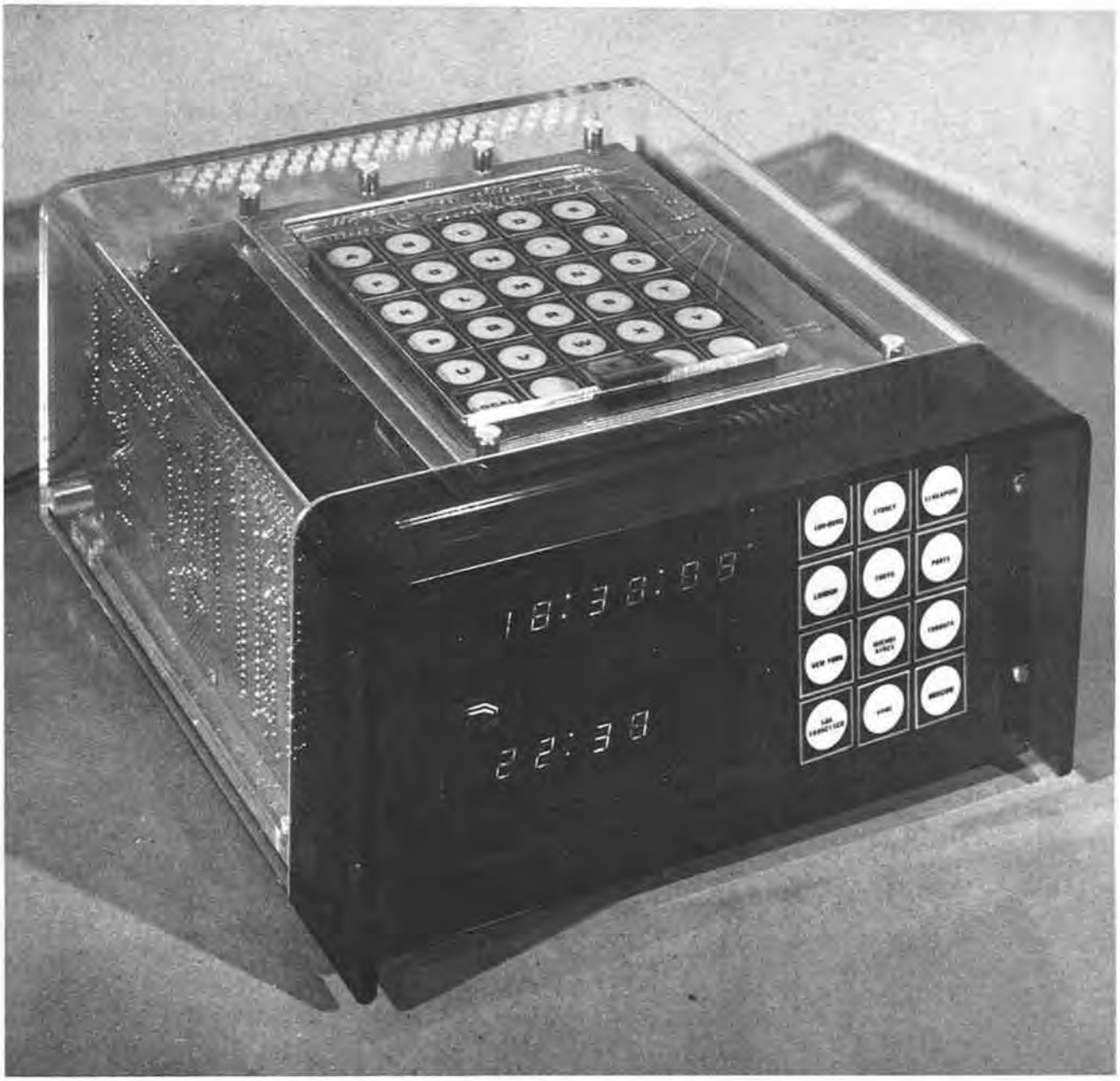
Should the power outage exceed five hours and the battery supply deteriorate to a point where timekeeping or selected city retention is affected, a magnetic memory will be activated so that when main power is reapplied the green colons on the display will flash. This indicates that the clock is not showing correct time and that it must be reset and a new entry of selected city location made. Setting the clock to time will cause the colons to glow steadily.

I was very curious about this World Time Computer when our good friend George Lewis of Seattle, Washington, told me about it and arranged a telephone interview with Albert Odmark, who incidentally has known me for the past thirty years and had visited both of my museums. He was extremely willing to give an instrument to AWI Museum.

From conversation and his present stationery using the title, "Antiquarian Horologist," and indicating his interest and present activities were antique clocks, watches, sundials, barometers, and scientific instruments, I became more interested in his background and what brought about the creation of "World Time Computer."

Here are excerpts from his letter to me in answer to my request for background material.

"I was an electronics engineer for most of my life and also being interested in horology, I thought it would be interesting



World Time Computer Invented by AWI Member Albert L. Odmark

to put together a unit which would be capable of great accuracy as well as being able to indicate the time practically any place in the world. All prior attempts at World Time indication were done either with multiple dials, which, of course, severely limited the number of locations you could show, or else, they used a world map. These had the disadvantage that you had to know where in the world your desired place was located, find it on the map, trace up to the border of the map to find by how many hours the time lagged or led Greenwich, and then compute the time mentally. This was fine for a few of the larger cities, but what did you do if you were interested in South Georgia Island or Kasur, West Pakistan, neither of which probably appeared on your map.

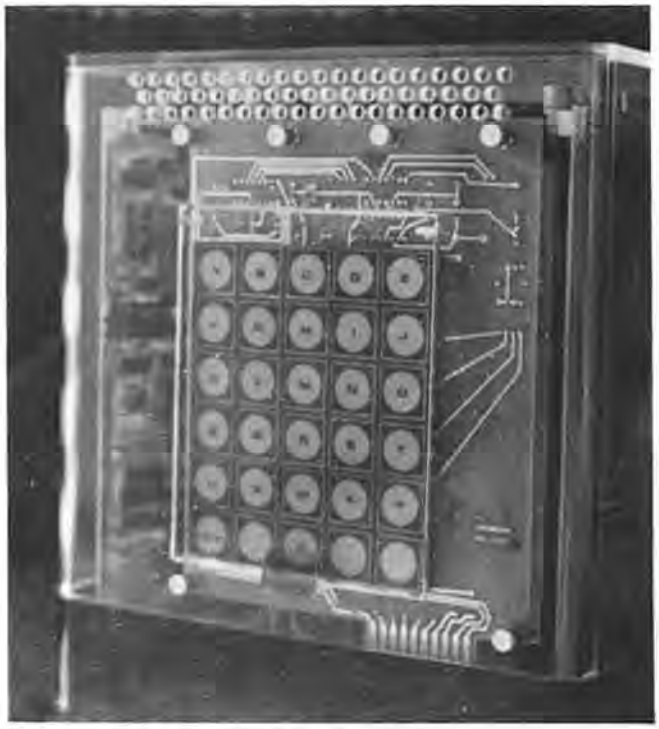
The obvious solution was to use a computer with a relatively large memory to do the computing for you. Hence an Intel Micro-Processor of the 8000 Series was selected and nearly 200 time zone codes fed into it. Actually there are only about 43 time zones in the world (not 24 as most people assume), but here a little sleight of hand was used. People would be less



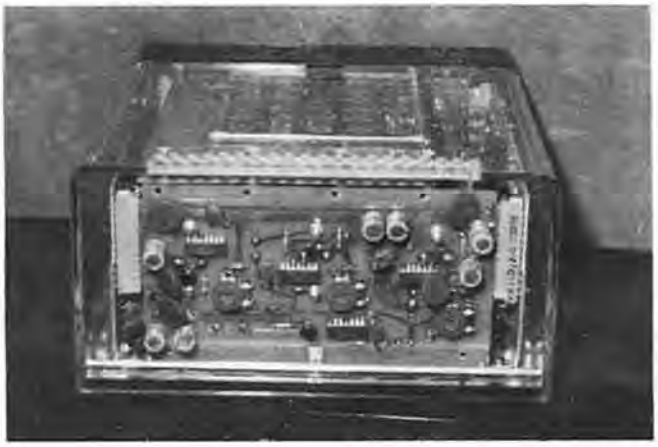
Time Zone Index Code Book

impressed if they were told this was a Time Zone computer than if they felt it actually computed time for individual locations. Hence in the U.S. Eastern Time Zone, for example, instead of using a single three letter code for every city in that zone from Montreal to Miami, some half a dozen codes were used. So, where the code for Montreal is shown as TOR (for Toronto), the codes NYC, MIA, and WAS all give you the same information.

So, the idea was mine. I guess that in electronics you cannot claim to be the inventor of anything these days, but I laid out the specifications and had three electronics engineers, a circuit designer, a computer engineer, and a mechanical/electronics designer, do the design work and build the units. We started out to build 100 units as that was the smallest quantity for which we could get a price break in buying electronic components. It was decided that we would use green LEDs for local time and red ones for "foreign" time. Here a problem arose. The red LEDs had been designed over ten years ago for military applications and were quite reliable. (We began on this project in 1970.) With green LEDs, however, it was another matter. These were just being developed and their quality control and reliability were atrocious. In one lot of 500 green ones we had to reject 99% of them. Reasons for rejections were variations in color intensity, too dim a light, and just plain failure of individual bars on the light. Even at that we had to check the lights individually and color match them. And almost invariably one or more bars would fail entirely in a few hours or few days. The situation was so bad with one supplier that we had to go to another. Since the wiring for this other brand was different it was necessary to scrap our front circuit board and make a new one. All these trials and tribulations caused the units to be nearly two years late in reaching the market.



Top View



Back View

Another thing that threw us into a tizzy. As you will note from the literature, the unit has a switch which takes care of Daylight Time. We were fortunate at the time of design that all the cities observing Daylight Time were located in the Northern Hemisphere and with very few exceptions, they all began and stopped observing it at about the same time. This enabled us to put all cities (codes, actually) which might be subject to time change together in the memory and the process



Right Side View

went something like this. You put in a code and the computer asked itself "Is this a code subject to Daylight Time?" It thus went through a "yes"–"no" search at this point. If the answer was "yes," it then looked to see if the switch was in the Standard or Daylight position and gave you the time accordingly. Well, just as we were beginning to have these for sale the energy crisis hit and Congress began fussing around with an extended period of Daylight Time (which would no longer correspond with the European practice) and even with all year Daylight Time. We held things off the market another six months while we devised computer changes to take care of this situation, but as you will recall, the situation was so confusing, changing with every press report from Washington, that we decided to go ahead anyway.

Anyway, it was a technically satisfying experience and I am glad I did it." □

BURGLARY IN LA

On April 4, 1977, the Broadway Department Store was burglarized. Among the items stolen were two watch cases without movements. One was a mans yellow 14K Elgin case with about 2½ carats of diamonds in the bezel. The other was a mans yellow 14K Omega Seamaster case. The thief may attempt to have movements fitted to the cases. Contact Mr. Randy Auslander at 1-800-537-0260.

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SWISS STUDY ELECTRONICS

The Swiss Credit Bank of Zurich reports that watchmakers in Switzerland, faced with increasing competition in the electronic sector from U.S., Japanese, and West German sources, as well as a depressed home market, are reacting in characteristic fashion.

In its annual review of the economy, the Bank's bulletin observes that the industry, while restricting investment in production plant, is spending more on research and development.

Contributor Dr. P. Renggli, chairman of the ASUAG group–which is said to be the only Swiss concern making complete electronic timepieces–reports that 60% of his company's investment for 1977 will go into electronics development.

After a second year of declining exports, the Swiss watch industry's hopes for recovery are pinned to increased sales from product improvement, low domestic inflation (less than 1%) and the stability of the Swiss franc, the Bank's report concludes.

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COMMON SENSE ESCAPEMENT CHECKING

by Robert A. Nelson
CMW

Escapements are the most mysterious and misunderstood part of a watch. Knowing the theory, angles, parts, and nomenclature of an escapement does not always mean knowing how to quickly diagnose and correct an error which may cause a problem. Some errors are very obvious, such as a tooth dropping on the impulse surface of a pallet jewel instead of on the locking surface; others are more difficult to recognize but seriously affect the operation of the watch. Many books and articles on escapements treat the most frequent and serious problems rather lightly while dwelling on those which seldom occur and are not too serious if they do. *Common Sense Escapement Checking* means that errors which are most frequent, and that most seriously affect the operation of the watch, should be checked first.

Some escapement checks should be made on every complete repair job, as they require only seconds and can make the difference between a very satisfactory job and one which will leave the customer dissatisfied. Relying solely on the timing machine to indicate if there is an escapement problem can be misleading. Some escapement errors which will cause problems under certain conditions will not show up on a timing machine record. Neither is it safe to assume that because the watch ran before, the escapement must be satisfactory.

There are several clues that should alert the watchmaker to possible escapement problems, such as motion (amplitude) dropping off excessively in one position; watches that "knock" in certain positions; the watch that "never has run right since it was new"; the watch which loses time occasionally; the watch which comes in for repair but is clean and running; the watch which comes back taking very poor motion a month or two after it has been cleaned; position errors in time not due to balance poise and a watch which makes a wavering line on the timing machine.

This, and future articles called *Common Sense Escapement Checking,* will show practical checks which can be made to detect errors that most commonly cause problems.

"Slide" is one of the more controversial functions of an escapement. Usually treated lightly by escapement writers, it is an extremely important function. It should be said that the *results* of slide are extremely important because slide in itself, that is the sliding of the pallet jewel deeper into the escape tooth after drop lock, means absolutely nothing.

The purpose of slide has been stated as "allowing more space between the guard pin and the safety roller," or "allowing freedom for the roller jewel to pass the corner of the fork slot," or "to allow for uneven length of escape wheel teeth." These are all *results* of slide and not slide in itself, which contributes to the confusion. Common sense escapement checking calls for checking for errors where they are, not checking for one function, such as slide, assuming that all the results will then automatically be correct. This misconception can cause problems and it is no more difficult to do it the common sense way.

The results of slide at the horn and balance end of the fork can be better checked there than by checking slide;

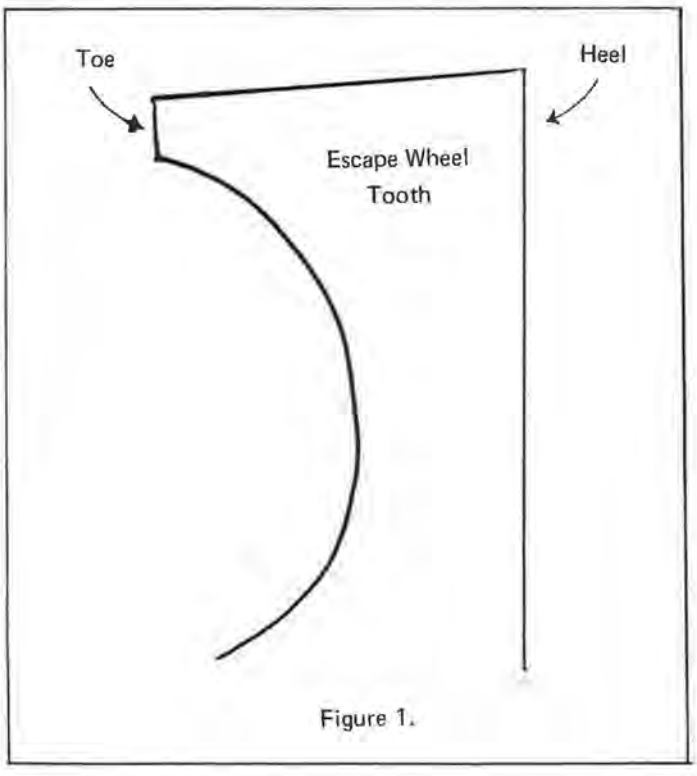


Figure 1.

these will be covered in a later article. In fact, these checks can be made without an escape wheel in the watch, and without an escape wheel there can be no slide.

The most important purpose of slide is to permit the impulsing pallet jewel to drop free from the escape wheel tooth before the fork strikes the banking pin. This freedom has been named *toe clearance* as it is measured at the "toe" of the escape wheel tooth. (See Figure 1.) Some European writers reverse the "toe" and "heel," saying the toe should precede the heel. We, however, are using the most common terminology, as illustrated.

Some readers will say that *toe clearance* is the same as *drop.* This is not true, as drop is the space left by travel of the escape wheel *after* the fork has been stopped by the banking pin. Study Figure 2 to see the difference between

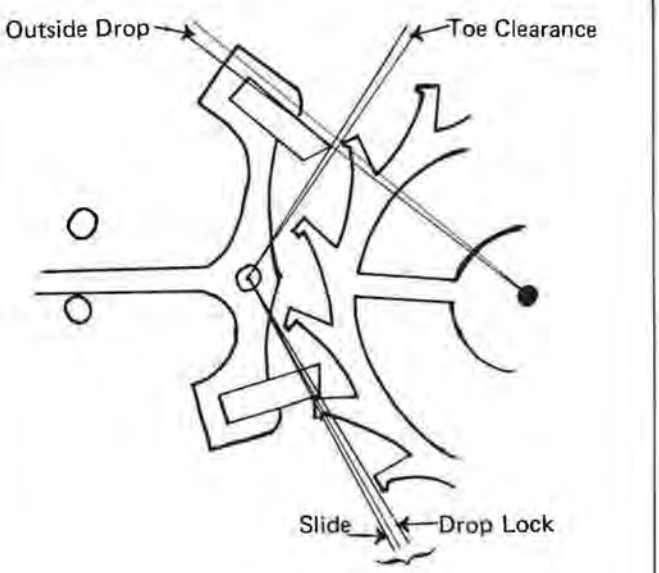


Figure 2.

drop and toe clearance, and also the relationship between slide and toe clearance.

While there is a relationship between slide and toe clearance, experience has shown that even if there is slide there is not always sufficient toe clearance. Watches may run poorly if there is not sufficient clearance at this point. Warm temperatures will cause the steel escape wheel to expand, reducing the clearance so the fork strikes the banking pin at the same time the tooth is about to drop from the jewel. Some teeth may be slightly longer, or the wheel slightly out of round, causing the problem on some teeth only. (Some writers have said this is the purpose of slide but they have not told the Watchmaker exactly where the problem occurs.) As lubricants change consistency with age, or become slightly adhesive, problems can develop if there is not sufficient clearance.

Common sense says it is easier and better to check this clearance at the point it occurs than to check for slide assuming this will give clearance. To check for toe clearance, have power on the train, hold the watch on edge so gravity holds the fork against the banking pin. With a small tool, back the escape wheel so the tooth passes the let-off corner of the jewel as seen in Figure 3. Check the toe clearance which must

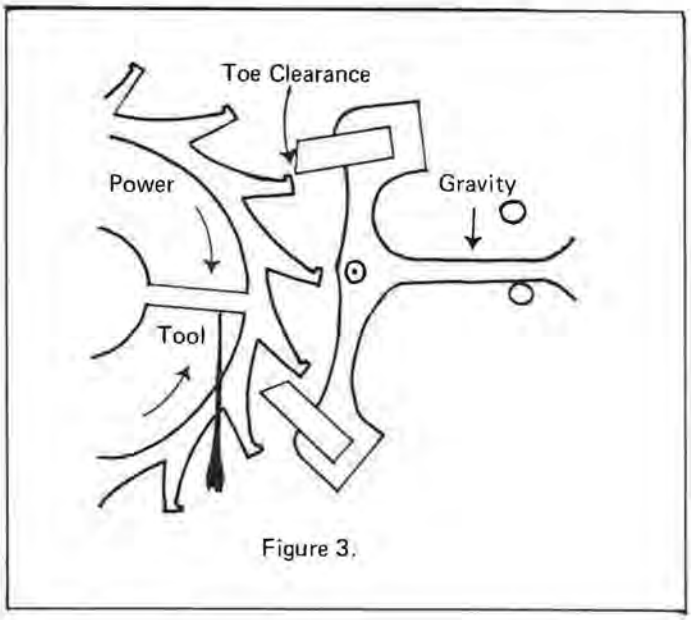


Figure 3.

be a definite space. It must not be so close that it could touch the tooth. As a guide, the space should be about equal to the amount of slide that would be set if that method were used, or about one half of drop lock.

Now turn the watch over so the fork drops against the other banking pin and repeat the test on the other pallet jewel as shown in Figure 4.

If clearance is not sufficient a few other observations

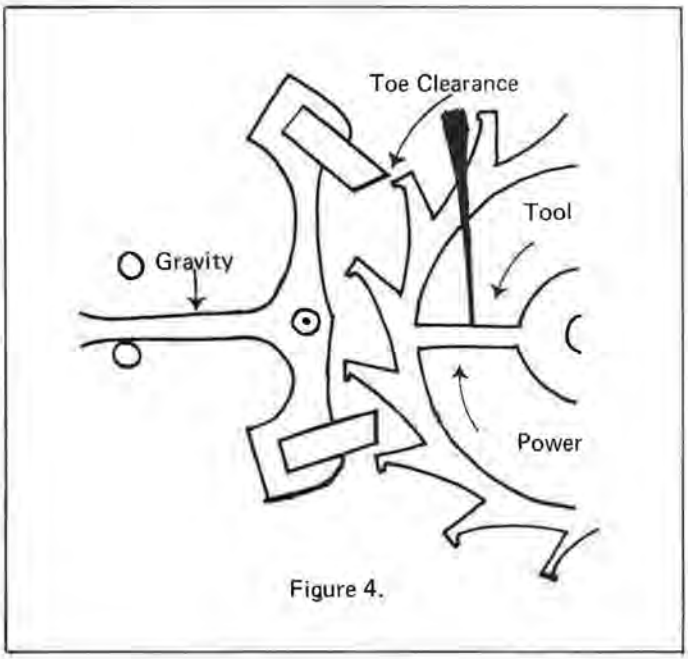


Figure 4.

(continued on page 48)

escapement module barrel arbor pendulum balance staff quartz crystal verge chimes main wheel ratio hairspring potence push button crystal capacitor crown diode stepping motor fuzee mainspring transistor frequency lathe condenser staking tool capacitor trimmer suspension spring light emitting diode detached lever repeater

liquid crystal loupe tweezers attraction friction buff amplitude poise endshake resistor analogue stop works gear lubrication calendar torque



Questions and Answers

by Henry B. Fried

CMW CMC FBHI

BOB WEIGHT

Q. I have a slight problem with a clock. I have the pendulum, but no bob. I should like to know if there is a formula to execute the proper weight of the pendulum bob?

Michael Maxwell
Miami Springs, Florida

A. There are fancy, mind-boggling formulas for arriving at the proper weight of a pendulum bob, but the empirical method (hit and miss) is faster and in most cases just as accurate.

You didn't tell me the type of clock. For example, for some Viennese one day clocks a very light, pendulum bob is needed. For crystal regulators, a heavier bob would be required; for English skeleton and bracket clocks, as a rule a still heavier bob is in order. For American older kitchen or shelf clocks a medium bob is better. I don't know the type of clock you are working upon but why not try a heavy bob and lighten it until you have the desired motion required whether it is a recoil (large motion required) or a dead-beat (less motion better in this case); short pendulums should swing wider while very long ones keep better time with smaller motion arcs. So you see, it depends on the clock. If you care, give us more details and we'll give you more too.

Hairspring Vibrating

Q. I have had trouble getting two different springers to fit non-magnetic hairsprings when vibrating.

Do you know of anyone who routinely uses alloy springs? I'm getting tired of the hassle.

David C. Hipolito
Point Richmond, California

A. It is difficult to understand the difficulty in having hairspring "vibrators" who couldn't supply you with "non-magnetic" hairsprings, since practically all hairsprings today are of the alloy type which is for all purposes "non-magnetic." Incidentally, the term is not used anymore. It is anti-magnetic. As we said almost all springs used by the "springers" are alloy of invar, glucidor, etc., which do not retain magnetism unless the magnetizing influence is so great that the residual ferrous parts of the alloy are affected. This does happen once in a while but for the most part, resist magnetism quite well.

Anyway, try the following and specify non-magnetic alloy springs be used: J. A. Poltock, 83 Nassau Street, New York, New York 10038; W. E. Benjamin Co.,387 Washington Street, Room 811, Boston, Massachusetts 02106; Hairspring Vibrating Co., 1179½ Roosevelt Avenue, Cartaret, New Jersey 07008.

Slow Atmos–Escapement Flutter

Q. I have two problems: first, an Atmos clock, Heritage model, brought in for repair (never ran since it was purchased 19 years ago). I cleaned and oiled it (oiled only the two large wheels), made some adjustments to the escapement and it runs very well (motion about 340 degrees), but it runs slow about 1 hour 20 minutes per day. Where do I look for the trouble?

Second: A 400 day clock, plate no. 1351 in Terwilliger's book. I overhauled it, and installed new Susp. Spr. .0032 Horolovar spring. The escapement flutters. I moved the fork as high as possible, and set the escapement as deep as possible, but it still flutters. The motion is very poor–about 90 degrees.

What do I do next?

M. Edward Bloomer
New Hartford, New York

A. Ref the Atmos "Heritage," it seems like this one was a "dog" of a timepiece since purchased 19 years ago. We might assume that the original trouble was also excessive loss of time, the latter caused by something mechanical and never corrected. With the excellent motion you have one must assume that both the mainspring and the train are free. One thing is left: the balance. It is suggested that you check the weights and studs under the balance. They must be changed in pairs. Looks like your balance is too heavy. Material can be obtained from Jaeger-LeCoultre, Longines-Wittnauer World H.Q., New Rochelle, New York 10802.

In the 400 day clock, of course, the escapement must always be "safe." If the fork is too high the clock will stop.

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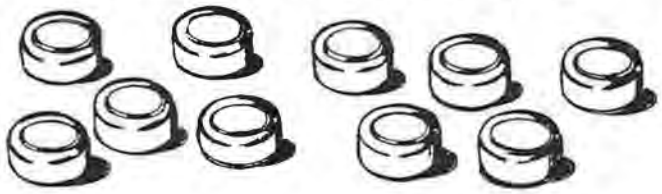
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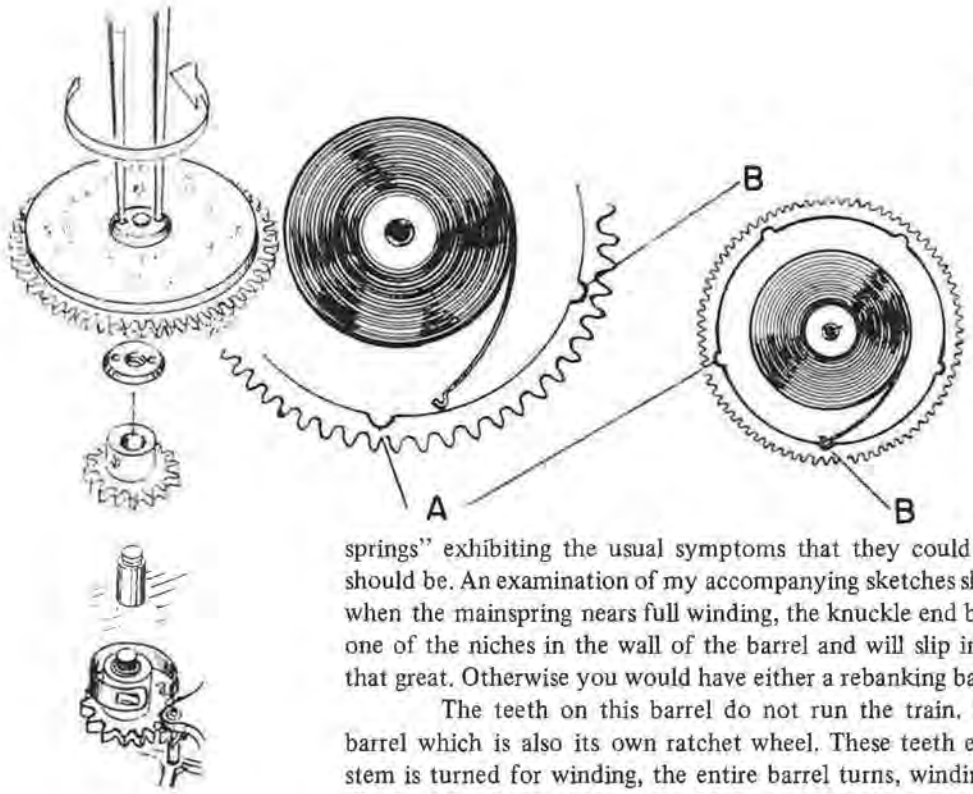
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Schild 8 Day Pocket



Several requests have been received for information on the Schild & Co. eight day pocket watch.

The Schild & Co. eight day pocket watch is the one whose dial side shows the exposed balance wheel and escapement. The dial appears in the upper half of the watch's front. The movement side is covered with a large, movement-sized barrel which houses the six foot plus mainspring. Naturally it takes a long time to wind this up and some watchmakers would write in from time to time that new watches had "broken mainsprings" exhibiting the usual symptoms that they could be wound endlessly. Actually, this is as it should be. An examination of my accompanying sketches should make this clear. However, as designed, when the mainspring nears full winding, the knuckle end bend of the mainspring will be pulled out of one of the niches in the wall of the barrel and will slip into the next niche where the tension is not that great. Otherwise you would have either a rebanking balance or broken barrel teeth.

The teeth on this barrel do not run the train. Rather, these teeth are merely part of the barrel which is also its own ratchet wheel. These teeth enmesh with the winding pinion. When the stem is turned for winding, the entire barrel turns, winding the mainspring around the barrel arbor. The barrel arbor is brass, resembling a very large strong hour wheel. The barrel arbor has a hollow center and rides on the steel post. The upper end of this fixed steel post emerges through the brass barrel arbor (toothed) and its threaded end has the steel, threaded cap which is screwed onto this post. The steel cap has two holes into which a spanner tool with two strong prongs can be fitted and turned in the screwing direction to be removed. Then the barrel can be removed but not before you release the mainspring. Otherwise, as noted earlier, the barrel will take off on its own, drag-racing off the movement and across the floor.

To release the power, control the crown and move aside the click at the barrel's edge which appears like a large setting lever but whose nose is between two barrel teeth. Let it down gently, please.

The barrel otherwise in a going watch remains motionless. The wound mainspring powers the barrel arbor whose strong, large teeth enmesh with the strong pinion of the eight day train wheel and through that, the rest of the train and eventually the escapement. Shown here in exploded view is the nut, below, the barrel arbor with part of the mainspring attached, with also serves as the main driving pinion or wheel and that turns the pinion on the eight-day wheel, also shown in the exploded view.

If set too low it will badly "flutter" (as you say) and skip teeth. These are the common rules. However, if your clock also has poor motion, it is suggested that you take another look at the mainspring. 400-day clock springs that have been left in barrels, for years in many cases, without being removed, will cause poor motion and stoppage. Take your spring out, clean it, and re-supple by stretching it out lengthwise (except for the first 2 or 3 coils), relube with a suitable clock grease and replace in barrel. Otherwise, change the spring for a new one, i.e., if the original is unsatisfactory in some other respect.

(Answer provided by Sean C. (Pat) Monk)

Dudley Watch

Q. I have a Dudley Masonic watch, Serial No. 620, with a 14K white gold hinged, as well as glass back covers. The winding wheel protrudes through the plate (perpendicular to the stem) in a manner I have not seen on other watches. Was this a Dudley design or did he use parts from another watch company for this feature? In general, what would be the source for replacement parts for this and other series of move-

(continued on page 15)

ments? I have read that there were three production series, and that each had differences as to source of parts used by the manufacturer.

Lastly, do you have any knowledge or opinion on the rarity of this watch, and of similar movements in other series?

I am enclosing an SASE for mailing your reply.

J.M. Streckenbach
Seattle, Washington

A. Your Dudley Masonic watch was the first series and this was designed so that the winding pinion emerged a little through the back plate. Later models were covered.

Of course the plates and bridges were purely Dudley designed and die-struck. Crown, ratchet and intermediate wheel of your model also were pure Dudley. Hour, minute, and center wheel were Waltham, mostly the 1894-1897 Waltham models. The first intermediate wheel also was Dudley but the second intermediate wheel was Hamilton 914 which was altered slightly by opening the center hole just a little. The balance was Waltham using its double roller, as was the hairspring. A 12 size Hamilton mainspring was used and the set lever spring was 914 Hamilton as was the clutch lever spring. The click and click spring were Dudley design. The clutch lever and setting lever were Hamilton 914. The pallet bridge was an altered Waltham. Likewise the cannon pinion was Waltham. Other Waltham parts were winding-setting arbor, pallet arbor, winding pinion, pallet, hands. All screws were Hamilton 12 size but heads were of special lengths and blued. Barrel bridge screws were 185 H plate screws. Other Dudley-made parts were barrel arbor, clutch pinion, barrel (spring).

This watch is considered rare now although when I was a young watchmaker I used to help Menche and Kolton put together the plates and wheels to make up watches in my moonlighting from my job during the day. Menche and Kolton bought out the Dudley company and up to about three years ago, Mr. Menche who died then, still was filing and fitting up the last remaining pieces into one watch. The machinery of the factory or what was left of it was strewn in the hallway of the maiden lane offices, much to the annoyance of the building superintendent. Mr. Menche, later, when running out of parts, would order replacements from Switzerland. I also remember that for my company (the old K.I. Importing Corporation), I bought also from the X–L Watch Co. (Menche and Kilton's trade name) whole sets of escapements including balance which we sold to fit Hamilton's and fitted these for just a few cents more without any trouble at all but with tremendous profit for my boss.

ESA 9200

Q. I have an ESA 9200 movement which is causing me a problem. I went through the movement completely.

The original problem was an irregular motion of the balance and of course a very slow rate as the click wheel and train would not advance at an even rate.

The problem, as you already guessed, is still present. The watch will function if the cell is in one exact position and any touching to change this position causes the irregular motion again. The position I am talking about is without any pressure and no fixing clamp in position.

Is there an answer or list of possible causes that you have at your finger tips? Also the stop and go of the click wheel is seen in the train and second hand.

Richard Radcliffe
Westland, Michigan

A. Your question was concerning an ESA 9200 with irregular balance wheel motion. You say the balance wheel will work fine if the cell is in one position and without the cell strap in place. Any change of cell position will cause the balance to start irregular motion again.

Sounds as if the trouble may be in your insulator, which should be underneath the ground strap. This insulator is a very important part of this watch. If this insulator looks as if it is old and discolored, shows any signs of being cracked or has a hole in it be sure to replace with a new one. This could very easily be your problem.

A coil with a resistance of more than 5000 ohms can cause an irregular motion of the balance wheel, although it will not affect the cell.

I have enclosed a Technical Communication for the ESA 9200 for your use. I have circled the insulator in the parts list.

If I can be of further assistance please contact me.

(Answer provided by James Broughton.)

Horse Shoe

Q. The figure below of a winding plate has two horsehoes interlaced, with the serial number shown. Can you tell me approximately how old, and who in Switzerland made it?

Anton's Watch Shop
Hialeah, Florida



A. A search through my old trademark books finds this listed in the 1913 edition of the Jewelers' Circyla as that of "Horse Show" under a group of marks belong to the Vacheron and Constantin group of agencies and that of the Lombard Watch Company.

Since you reproduced the trademark and the single winding (crown wheel) bridge, why didn't you continue and do the rest? Then I could have positively identified the exact factory upon which the Lombard people drew for this watch movement. However, I think I've identified this correctly.

(continued on page 49)



Essence of Clock Repair

by Sean C. "Pat" Monk
CMW

THE ANTIQUE ENGLISH 30-HOUR LONGCASE

Part XXIII (Circa 1775)

The movement we have chosen is by Thomas Lister of Halifax, Yorkshire, England, the heart of the English woolen industry. Thomas Lister (1745-1814) was the son of Thomas, Sr., himself a noted clockmaker.

The clock is of the 30-hour variety which was very common in England 200 years ago. It is surprising, then, that it is still functional, although the original cord (fine-textured rope) is no longer part of our clock. Our movement is operating with a steel-link chain and working quite well considering the latter had to be so linked to negotiate the spare (only seven) pointed teeth on the two great wheel ratchets.

The operation of the clock is controlled by a single 12-lb. lead weight, suspended by a pulley. The chain (originally cord or rope) forms a continuous loop over both the going and strike great wheels (main wheels), with a small lead weight at one free end. The latter acts to take up the slack.

We have, in the past, tried to replace the original cord or rope with a variety of materials which, hopefully, would successfully hold on to the ratchet teeth. This has been unsuccessful. There may well be some who will inform us that there is some successful material that can be used to replace the 200-year-old stuff. Aspiring, energetic, and resourceful clockmen who have (like us) had to deal with this problem are most welcome to inform us. We have had lots of practical experience, but we do not have *all* the answers.

Therefore, inasmuch as we do not have the original cord that dug into the spiked teeth of both ratchets, there is some disadvantage to our chain. It does, however, manage to clear the teeth successfully, but the disadvantage is that it must be lubricated: something not generally done or advised with chain clocks. The lube we used, however, was applied to the spiked teeth only and very liberally applied. What we did achieve was the elimination of "bounce" that occurred on the dry teeth. The lube we used is a commercial substance called *Lubriplate*, which can be obtained from auto supply stores. We have also found this lube to be useful in other clock repair services where a nonflowing lubricant is necessary, e.g., lube of the Jefferson "Golden Hour" gearing.

Back to the clock itself. The humorist might, at first, be surprised to find that there is no center arbor. At first, he'll probably scratch the back of his neck and wonder what the cannon pinion and the hour wheel are supported by. Taking a closer look he will, indeed, see that the cannon pinion and the hour wheel are still there. However, after the dial has been removed, he will find that these two vital components are supported on a separate arbor, the latter being supported on the front plate, in the dead center, with the dial-hole acting (somewhat) as a bushing for the hour-wheel tube. Don't be alarmed: it simplifies both the clock and the repair thereof.

Attached to the hour wheel and fixed securely to it is a pin which trips both the moon and the date-calendar. The two operating wheels for these components are mounted at the back of the clock dial: the moon upper and the date-calendar lower.



Figure 1.

The going train consists of a main, or great wheel (next to the back plate) which carries its ratchet wheel having seven spiked teeth. The great wheel is mounted on a strong steel arbor running between the clock plates. On the front plate, this arbor also supports the minute wheel and its pinion. (Lower left in Figure 1). A large second strike wheel meshes with the great wheel and, as there is no center wheel, there is no third wheel. The second wheel meshes directly to the escape wheel pinion–an unusual arrangement.

The steel anchor (pallet) is of the most effective "recoil" type, previously discussed in these articles. The escape wheel comprises 40 teeth, with a span of 10 teeth between the pallets.

The strike train consists of a main, or great wheel (behind the front plate in Figure 2) which is also the pin wheel, carrying the hammer-strike pins. The strike great wheel meshes with the

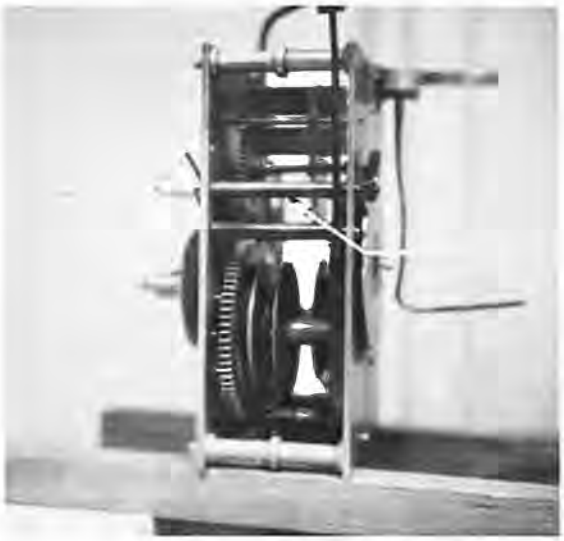


Figure 2.

second strike wheel. The latter carries the hammer lift-pin, for the hour strike. The second strike wheel meshes with the third strike wheel. The latter meshes with the fan pinion.

In Figure 1 we show the front plate with the hour and minute wheel in normal position. The cannon pinion passes through the hour wheel with its pinion (behind the hour wheel) meshing with the minute wheel. Attached to the back of the cannon pinion is a pear-shaped cam, or lift piece. The latter moves to lift the steel lifting piece. The latter is shown very clearly in Figure 1. The hole in the front plate, approximately in the center of Figure 1, permits a locking piece, or locking plate, to protrude behind the front plate. When this locking piece is raised by the action of the pear-shaped cam on the cannon pinion, via the steel lifting piece, a steel hook against one of the pins on the pin (hammer) wheel, frees the latter. At the same time as the lifting piece frees the hook, it rocks its arbor "a" (Figure 2) which, in turn, executes two operations: (1) it rocks a lever immediately behind the rear plate, which frees a pin on the second strike wheel, freeing the wheel, and (2) it releases the hour count wheel locking piece (b) (Figure 3). The count wheel is then free to turn the cor-



Figure 3.

rect number of hours being executed until the locking piece drops into its appropriate slot in the count wheel.

The hammer shown in the upper left of Figure 3 strikes against a steel gong attached to a post at the top of the front clock plate. The hammer is kicked by a lever working in conjunction with the pin wheel. The hammer itself is tensioned against a strong steel spring, set against its arm.

Other factors ... the ratchet wheels are fairly small in diameter, the seven teeth on each being spaced approximately ¾ inch apart. The diameter of the original cord (rope) would have been approximately ¼ inch. Effective length of the pendulum (from the point of suspension to the center of gravity of the bob) is a fairly standard approximate 40 inches. The dial, on which the maker's name (Thos. Lister, Halifax) is hand-engraved, is at the top. The dial is of brass, the chapter-ring silver-plated on brass. □

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Understanding Electronic Timekeeping

By Tom M. Hyltin

EE

Part 6

SERVICING THE DIGITAL ELECTRONIC WATCH

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Courage, Judgment, Discretion

Many people have been down this path before—the path of being in rapidly changing technology. The village blacksmith who was asked to see if he could repair his first automobile, the radio service technician brought his first television set, the television technician who understood tubes and was brought his first all-solid state television set. There are two things that the watchmaker looking at a digital electronic watch must accept. The first is that he is not confident in his ability to diagnose the problem and make the necessary repairs; secondly, he will make errors—probably many errors—in gaining confidence in his ability.

Courage

To the experienced watchmaker, the digital electronic module is an alien jungle. The first venture into this jungle is an act of courage. The purpose of this section is to explain what we, as a digital watch manufacturer, know and don't know that would be of benefit to the watchmaker on this venture.

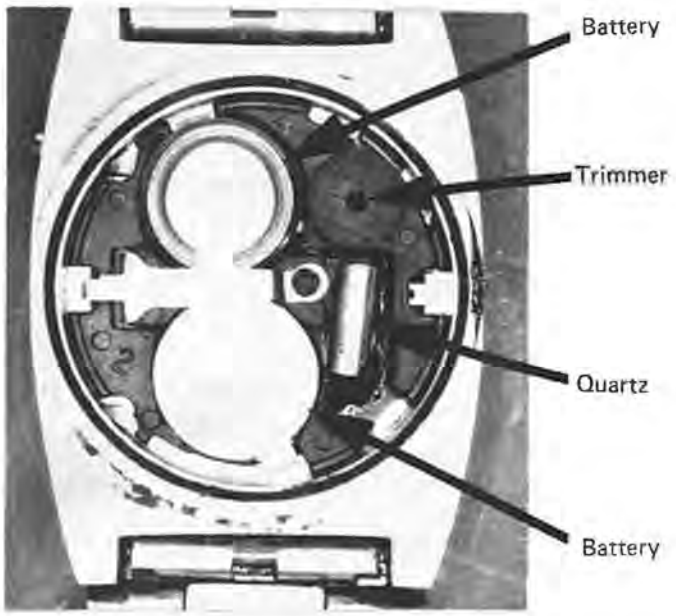


Figure 1. Back View of LED Watch.

Backs and bracelets of digital electronic watches are attached as they are in mechanical watches. Bracelets are generally put on with spring bars, and backs are either screwed or snapped. They can be removed with a back knife or a back wrench as appropriate.

With the back of the watch exposed, this is your opportunity to identify some of the components discussed in earlier sections of this series. The LED shown in Figure 1 clearly shows the location of the two batteries and the tubular quartz crystal. The small rubber plug identified in Figure 1 covers the access to the trimmer, and this plug can be simply removed with tweezers for timekeeping adjustment on the watch. It is especially important to note the orientation of the batteries. The battery toward the top of the photograph is mounted with its small end outward, and the battery below it is mounted with its small end inserted first. It is important to maintain proper orientation of the batteries anytime battery replacement is made.

According to one LED manufacturer, 56% of the return for repairs involve replacement of the batteries as the only repair. Therefore, the first attempt to repair should be by first removing the batteries. Before inserting new batteries, inspect the contacts and make sure they are clean and properly shaped for contacting the battery. When inserting new batteries, be sure—again—that they are inserted with proper orientation.

Some electronic watches require the case back to be on to complete the electrical circuit, so loosely place the case back on the back of the watch and test for operation. If the watch operates, you've got it made (and it will in 56% of the instances). You can then replace the back and present it to a satisfied customer.

Prior to discussing what happens if battery replacement does not fix the problem, let us also examine the open back on a liquid crystal display watch, as shown in Figure 2. Again, in this one we see the center location of the battery, the quartz located above the battery, and the trimmer located

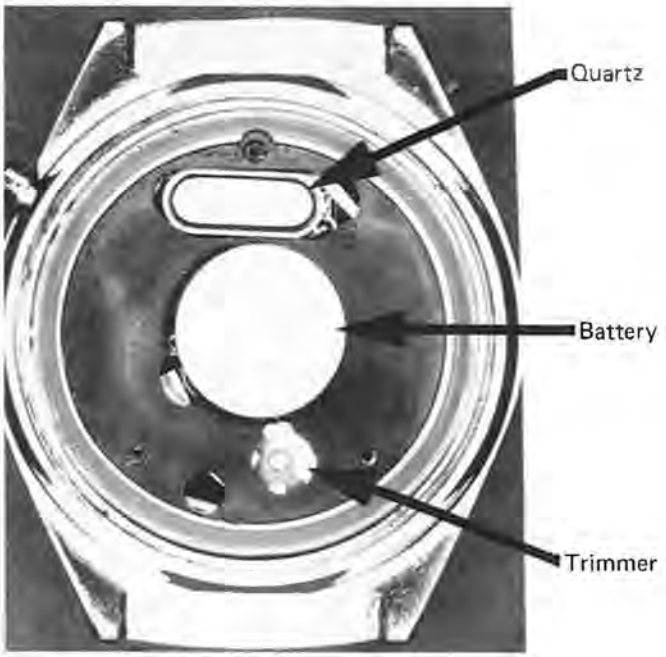


Figure 2. Back View of LCD Watch.

opposite from the quartz, or just below the batrery.

Many of the watches that are returned to the manufacturer following battery replacement are simply in need of being "set up." When a battery is completely run down or when the battery is removed from the watch, all power is removed from the integrated circuit. When a new battery is inserted in the watch, the integrated circuit "turns on," and not necessarily in ways that make either sense or complete characters. It is also possible for the display to remain blank upon insertion of a new battery. All of these conditions can be fixed by going into the set sequence of the watch, as specified in the instruction booklet that comes with the watch. This allows the IC to "purify itself" and get rid of nonsensical numbers that might occur when power is applied.

If none of these techniques puts the watch back into satisfactory operating condition, then what to do next? There must be enough information available for an analysis of the future action.

Judgment

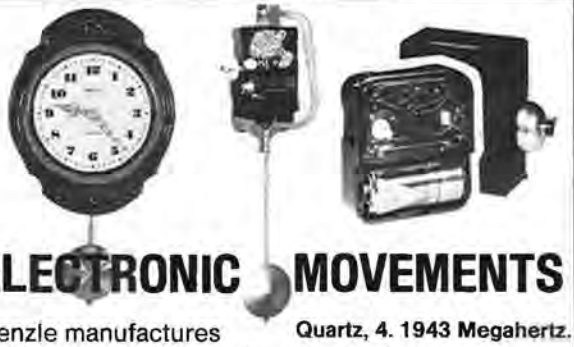
If the watch doesn't work with new batteries and clean battery contacts, what do you do then? The best answer to this question comes from looking at the reasons for returns, as collected by various watch manufacturers. These figures do not include case and bracelet problems, nor do they include the battery problems. Let us first consider the failure of LED watches. Numbers have been obtained from one manufacturer who uses nothing but packaged displays and packaged ICs, and another manufacturer who only uses chip components. This information in no way compares the reliability of the two different assembly methods, but only the frequency of failure for various types of problems.

Table I gives the failure rate for modules built with chip ICs and chip LEDs. The largest cause of problems was the loss of a bonding wire to the IC or bad battery contacts that resulted in the complete non-operation of the module. Next was loss of contact to one or more segments of the display,

Table I. LED Module with Chip IC & LED Displays

Non-operating (contacts or bad bond to IC)	30.4%
Display Problems (bad bond to display or IC)	27.3%
Setting or Alternate Mode Problems (bad contacts or bonding to IC)	10.7%
Other (cracked substrate, bad quartz, etc.)	31.6%
TOTAL	100 %

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generally due to loss of a bonding wire to that segment. A lesser problem was a loss of contact to the various push buttons that made it impossible to call the date or put it into the set mode. The "other" classification includes cracked or broken substrates, and bad quartz.

Table II gives a comparable list of problems for a module that uses a packaged display and a packaged IC. Some

Table II. LED Module with Packaged IC and Display

Display Problems (loss of contact in packaged displays)	55%
Switch Problems (contact to switches, etc.)	16%
Bad IC or Quartz	3%
Other (opens or shorts in circuit board, etc.)	26%
TOTAL	100%

failure in the display accounts for over half the problems of this type of LED watch. Failures involving switches and contacts are the next in line, and failures involving quartz and the integrated circuit are an almost insignificant 3%. The "miscellaneous" classification includes such items as bad contacts, bad printed circuit boards, and similar other problems.

Looking down this list, it is obvious that to make a significant amount of repair on the module, a repairman would need either semiconductor bonding equipment or replacement displays for the modules he works on.

The situation is similar with LCD watches, as shown in Table III. The most failure prone component is the light bulb which illuminates the display at night, causing over one-third of the problems. Next in line are connection problems to the display, followed by quartz problems, and either broken or bad displays. The "other" classification includes

Table III. LCD Module Failures

Replace	35.2%
Bad Contact to Display	20.8%
Replace Quartz	14.5%
Replace Display	8.3%
Other	21.2%
TOTAL	100%

failures in spring contacts and bad mounting of chip capacitors.

The liquid crystal displays on liquid crystal display watches are generally replaceable (watches having the IC mounted directly on the display are an exception to this), and therefore the liquid crystal tends toward being more repairable than the LED watches. A skilled technician could repair most of the group having display connection problems, without even parts replacement in many cases. Going beyond this, however, to replacing the light bulb or the quartz requires extensive disassembly of the module and an unreasonably large parts inventory.

The big question comes up: why don't manufacturers make digital modules that are completely repairable? There are two answers to this question, and they both require some explanation. When television set manufacturers first began manufacturing solid state televisions, many of them used sockets for plug-in transistors and integrated circuits, similar to techniques used with vacuum tubes. They found that the failure and repair problems due to the sockets were more of a problem than the failure of the transistors and integrated circuits. In terms of a watch, the construction of a watch would be compromised by the addition of the many connections necessary to make the various parts of a watch easily replaceable.

The second reason is even more subtle than the first. A car engine, for example (and a watch) is a mechanical device and is subject to mechanical wear. You can expect a car engine to wear a certain amount and certain components would have to be replaced every 100,000 miles. The same is true in a mechanical watch. An electronic watch is a different animal. Nothing moves–there are no parts to wear out. Most of the things that fail are "failures waiting to happen," resulting from manufacturing problems–either of the components or of the completed module. There are some exceptions to this, of course, and these include damage to the watch by abuse, plus the fact that certain springs and push buttons on the watch are subject to wear. The result is that the failure of a digital electronic watch module is much more probable during the first year than it is for the next nine years. By the time a digital watch has reached the end of its warranty period, it should be an extremely reliable product.

Discretion

Discretion is a developed sense of knowing when to press on ahead and when to go into "strategic retreat." In the digital watch repair business, discretion is knowing when to press forward and effect a repair and when to zip it up and return it to the manufacturer. This discretion is developed from doing it wrong a couple of times and thereby developing judgment. Even assuming there is no repair of the module of digital electronic wristwatches, what does this leave for the watchmaker? At the present time, case related problems, battery replacements, and minor timing corrections account for more than 60% of the problems on both the LED and the LCD that were sampled. The watchmaker is completely capable and uniquely equipped to deal with these problems, and of course, the watchmaker is going to make some repair of the modules–

those repairs that involve loose contacts, corroded battery springs or dirty push button contacts can be solved with some judicious bending and the use of common solvents. As manufacturers improve obvious reliability problems–the problems on displays and bonding with LEDs, and the problems with light bulbs and display connections on the LCDs–then the battery, timing, and case related problems will get to be an even larger percentage of the digital electronic watches brought in for the watchmaker to service.

What about the possibilities of a module replacement program? Some watch or module manufacturers have suggested replacing defective modules and having their dealers stock replacement modules. This program has met with some limited success, but as the number of modules grows to include the multiple time zone, Chronograph, 4 and 6 digit, etc., the number of modules that must be stocked becomes very large and it becomes impractical to keep those at more than just a few locations. This is compounded by the fact that there is not now, and will not be for many years to come, any standardization of size between brands. So, the answer to the module changeability problem is that if it makes sense for you with your volume of business to stock a few modules from companies that offer a module replacement program, then by all means do so. It will not be an overall solution, though.

There are certain modules that you, the watchmaker, should never try to service beyond changing batteries and adjusting timekeeping. These are the LCD modules containing tritium illumination for the displays. All liquid crystal watches containing tritium are marked on the back with the symbol ^{3}H, which is the chemical symbol for tritium. At the present time, manufacturers of the tritium illuminated module are prohibited from shipping uncased modules by regulations of the federal government. They are also required to manufacture modules that will not come out when the case is opened to replace batteries. It is not that the government believes that handling one watch module represents a significant health hazard, even if the tubes containing the tritium are broken; it is that they desire that any such breakage due to mishandling be done by the manufacturer where it is less likely to occur and reporting procedures are in place. To repeat, it is completely safe to replace the battery and make timekeeping adjustments on tritium watches, but it is strongly recommended not to try and remove the module from the case.

Discretion on the part of the watchmaker and what he tries to do in digital electronic watches does not mean that the watchmaker should ignore this potentially lucrative field. It means that he should not expect to be able to repair as high a percentage right now of the digital watches brought in as he repairs the mechanical watches that are brought in for service. The average equipped watchmaker can now repair over 60% of the digital watches that are brought in. As module reliability is improved, this number will go to 70%, even without the equipment that it requires for module repair. This is not all bad.

The final installment on test equipment and service procedures will come next month.

□

WATCH REPAIR GUARANTEE CARD

Mr. David P. Choate of Choate Jewelry in Logan, Utah shows the repair card given to each customer. He feels that a six-month warranty is a fair period of time on a watch repair. He explains the reasons on the reverse of the card.


Choate Jewelry

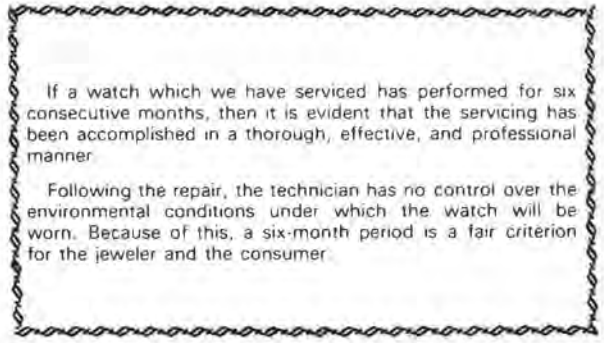
WATCH REPAIR WARRANTY

Your watch has been expertly repaired and serviced using modern equipment and genuine materials. It is warranted to be in good running condition (consistent with its design and capabilities) for *six months* from the date of completion except for broken or worn parts, or damage from rust. We do not guarantee any watch waterproof.

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Registry No. _____ Date _____

Front


If a watch which we have serviced has performed for six consecutive months, then it is evident that the servicing has been accomplished in a thorough, effective, and professional manner.

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Back

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Inside the Clock Shop

with James L. Tigner

HOLE CLOSING AND BUSHING

In our opening article on clock cleaning we tested all pivot holes for wear before the clock was disassembled. Those needing attention were marked either for closing or bushing. Now that our clock is apart and cleaned, with pivots polished (if and as needed), we can direct our attention to the worn holes.

Figure 1 shows the typical egg shape developed by most worn pivot holes, although some retain their roundness

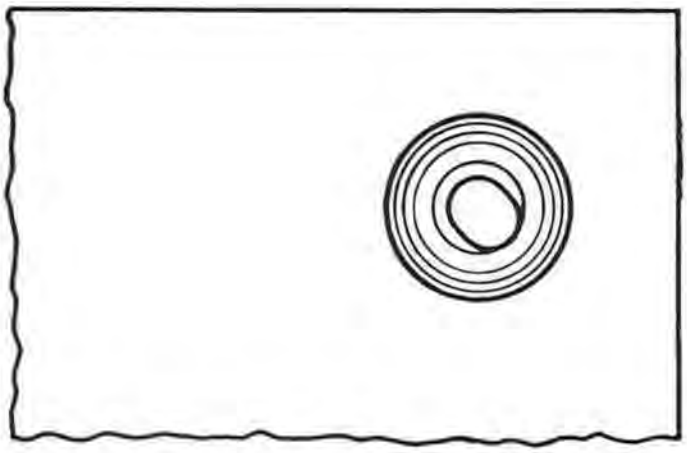


Figure 1

quite closely and simply become enlarged. Any hole as elongated as the one shown should be bushed, whether or not it was earlier marked for this repair.

Greatly enlarged holes should also be bushed. If the enlargement isn't really excessive, or if the holes have just begun to take on an egg shape, they can be successfully closed, which takes less time than bushing.

Purists, of course, commonly frown on hole-closing. Their argument usually runs that it's unsightly and accomplishes only a short-lived cure—an argument pretty hard to beat if the work is done with a prick punch.

But let's examine what can be done with the type of punch shown in Figure 2. It has a spring-loaded center that



Figure 2

positions the punch directly over the hole, making it possible to punch a concentric ring in the plate, closing in the metal evenly all around the hole. These punches are listed in all the catalogs and are not too expensive. They come in graduated sizes in sets of seven, boxed in handy little hardwood containers.

If you punch the hole only on one side of the plate, the argument can still be made that the hole is closed only partway through the plate, thus forming a bearing surface insufficient for a lasting job. Closing the hole from both sides is the answer to the argument.

In fact, if the plates are thin, as in American mass-produced clocks, and in a great many modern imports, punching from both sides closes the hole all the way through the plate. After punching, whether from one or both sides of the plate, the hole must, of course, be opened up with a cutting broach until it will just accept the pivot. Close inspection with a loupe should show the walls of the hole closed for the full thickness of the plate. If they aren't, punch from both sides again, broach out, and re-examine.

When the walls of the hole are clean and shiny all the way through, chamfer a small oil sink, burnish the hole from both sides with a round, oiled broach, peg out, and you are finished. Holes closed in this way do not affect the end shake, and are every bit as good, and will last just as long, as a bushing. Care should be exercised, however, to select the right size punch. The hole walls should be no thicker than necessary for adequate strength. Selecting a punch too large will not only make it difficult to close the hole, but will mean that when the closed hole eventually wears out, someone will have the job of fitting an *oversize* bushing. We all know how we cuss when the other fellow's work makes ours more difficult.

The Bergeon and KWM bushing tools have pretty well revolutionized the task of bushing clock plates, at least as far

as production shops go. Because of the growing interest shown in these fine tools by smaller shops that would like to increase their production, it might be useful to talk a little about them before taking up the traditional hand-turned method, for those who aren't into clocks all that much. The investment, which includes a full assortment of bushings, is currently in the neighborhood of $500.00, I believe—although there are places that will discount their prices.

As to whether the KWM or the Bergeon is the better tool, Jesse Coleman used to say that whichever one you own is better. I don't believe you can go wrong with either.

I happen to own and use a Bergeon, but here are some considerations to help you make your own choice. The KWM has two distinct advantages: namely, its staking frame has a deeper throat than the Bergeon's and will bush to the center of clock plates up to 8½ inches wide, as against the Bergeon's capacity of just under 7 inches; and the KWM has a considerably large assortment of bushings, which usually means a more precisely fitted bushing without alteration.

Some clockmakers will also consider it an advantage that KWM offers a hand reamer set and a number of small assortments of bushings, which can be used without the expensive staking frame. However, a word of caution. Unless the hand reamer is kept constantly square with the plate, never wavering or tilting, it may cut an oversize hole, and the prefabricated bushing drop out. One clockmaker who uses this hand tool tells me he can't make a bushing stick without soldering it.

One of the things I like about the Bergeon tool is that it can be operated with one hand instead of two, as required by the KWM. This allows me to dispense with the time-consuming centering and clamping procedures for which both tools are designed and fitted. The plate is simply held in place over the anvil by the left hand, while the right hand turns the reamer wheel. I find that after a little experience, hole centers can be maintained in this way just as well, if not better, than by the centering and clamping devices, which take a lot more time.

Another point in favor of the Bergeon tool is that Bergeon also offers a hole closing and staking set, which can be used independently or in the frame of the bushing tool. It's the only clock staking set on the market that I know of, and comes in mighty handy when you have a wheel to be staked, a heavy riveting job to be done, a large hole to be closed, etc.

So you see there's lots to be said for either tool. However, there really isn't an awful lot to be gained from either of these tools if, after pressing in a bushing, you have to open up its hole, cut down its height, and chamfer an oil sink. For that reason, if you can possibly swing it, I would suggest that whichever tool you favor, buy their complete assortment of bushings, 60 sizes for the Bergeon, 146 for the KWM.

Now to the traditional hand-turned and riveted method. I used it for years before getting the Bergeon tool, and know master clockmakers who have no intention of ever switching to prefabricated bushings. They say that an experi-

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The gauge is used to determine the correct KWM bushing, and the size of the reamer to use. Center and ream out old bushing and press in new KWM bushing. The new bushing fits the pivot correctly and the wheel will have the correct endshake.

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enced craftsman can turn and rivet a bushing just about as fast as one can be fitted with a bushing tool. They add that a hand-turned, riveted bushing can hardly be detected, particularly in fine clocks with deep oil sinks, whereas the prefabricated type shows up conspicuously.

In broaching out a pivot hole there are a couple of tricks to aid in maintaining the original hole center. One is to open up the hole concentric with the oil sink, whose concentricity can almost always be relied on. The cutting broach is nudged one way or the other by the left thumb to bring it into line. If there is no oil sink, and the original hole has been worn egg-shaped, use a small, round file to file the unworn side of the hole so that it balances the worn side. The cutting broach will then maintain the original center of the hole, for all practical purposes.

Open up the hole from the inside of the plate, taking care to hold the broach always perpendicular to the plate, as in Figure 3. From time to time sight the broach from an edge of the plate, and then again from another edge 90° away. Enlarge the hole so that the walls of the bushing, when inserted, will have sufficient bearing strength but no more. Keeping the hole small saves time, offers less likelihood of drifting off center, and makes a neater, less conspicuous bushing.

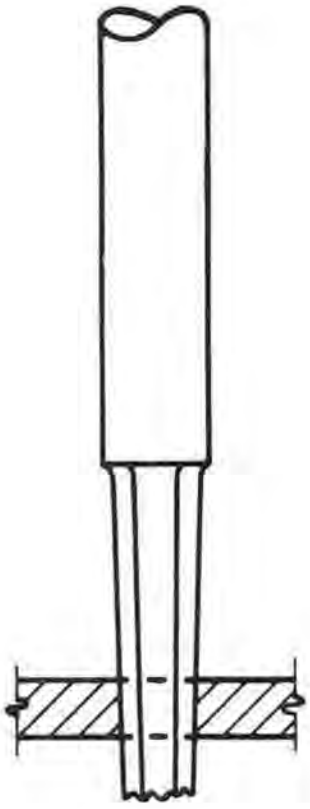


Figure 3

When the old hole has been broached out to the correct size, lightly chamfer the *outside* edge. A sharp drill held in a pin vise does a good job. The chamfering is to provide space for the bushing to spread itself when riveted. No chamfering or riveting is needed on the inside of the plate since the taper of the broached hole plus the matching taper of the bushing (to be made) will prevent the bushing from moving toward the outside fo the plate.

The secret of a fast, neat job of riveting a bushing in its hole is to cut the bushing at exactly the right length. To aid in this I make a simple gage from a piece of small diameter brass wire. Chuck it in the lathe, and turn a shoulder on it just longer (0.2 mm to 0.3 mm) than the thickness of the clock plate. That's the gage.

Now chuck up a piece of brass bushing wire the next size larger than our broached-out hole, letting it extend about ¼ inch beyond the chuck. Both the bushing wire and the small diameter solid brass wire used for the gage are listed in all the catalogs and come in assortments.

Make sure the bushing wire runs true. Turn the wire in the chuck, rest a piece of pegwood on the T-rest, and hold the end against the wire, or do whatever is needed; but the bushing wire must run true, or the hole through it will no longer be centered when we turn the end of the wire to size.

The wire should be turned to a slight taper, about the same as the taper of the broach used in opening the old hole. Test it for fit every now and then by holding the hole up to the wire, the *inside* of the plate toward the wire, of course. Usually the test can be made without removing the wire from the chuck, but if it can't, make certain the wire again runs true when re-chucked. When the wire will pass half-way through its hole without forcing, it is the correct size.

The holes in bushing wire are usually much smaller than pivot size, so, while the bushing is in the lathe, I find it helpful to drill the hole nearly to size. A good tailstock is

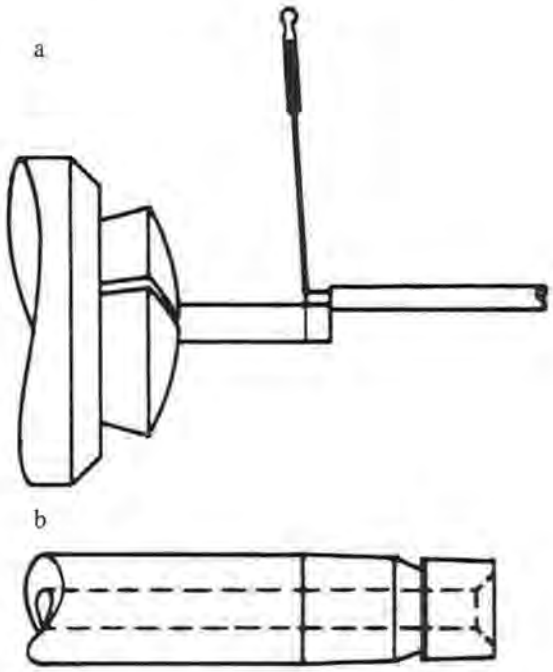


Figure 4

handy for this, but the drill can just as well be held by hand in a pin vise.

Again, while the bushing is in the lathe, it's much easier to turn an oil sink than it is to chamfer one after the bushing has been riveted in place. Turning an oil sink now will furthermore make the riveting job easier. Make the oil sink quite deep, since its depth will be reduced somewhat when riveted.

Figure 4(a) shows how the gage we made is used in marking the height of the bushing. A razor blade held as shown scribes a fine, clean cut-off line. Figure 4(b) is an enlargement showing the slight taper of the bushing, the drilled hole, the oil sink, and a cut made with a graver to receive the saw blade. Notice that the graver cut doesn't quite touch the fine cut-off line.

With the lathe running in reverse, a jewelers saw is now used to part off the bushing. The left hand is cupped under the bushing to catch it as it drops–which might save hunting around on the floor for it.

Pick up the bushing with a sharpened piece of pegwood inserted in the hole from the sawed end. Chuck it up once more, and when certain that it runs true, face off the sawed end right to the fine cut-off line. The bushing should now be exactly the right height and ready for driving into its hole. Again using the sharpened pegwood, remove it from the chuck.

The bushing is best driven in with a flat-faced punch and hollow stump, as shown in Figure 5(a)–from the inside

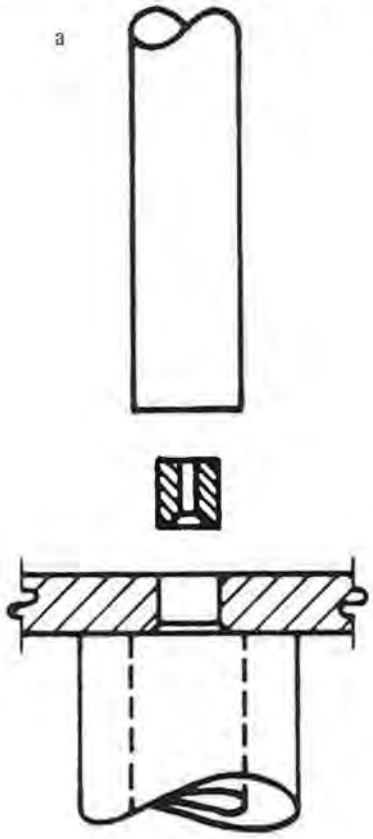


Figure 5

(continued on page 48)



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To hold the plate, fit a perforated stake into the hole in the base of the staking tool. Select the size according to the plate in question. The work may be centered in relation to the opposite hole.



Fit the plate between the 2 dogs, slide the driving-broach with the fixed centering punch in the staking tool, find the exact location of the original hole, and then finally tigthen the dogs.



Place the lower plate between the 2 dogs, center it and tighten up.



Fit to the reaming-broach the reamer corresponding to the bushing that is to be fitted. Slowly turn the hand-wheel. Raise the reamer from time to time to remove the burr.



The upper plate is fixed to the lower one.



Fit to the driving-broach a punch one size larger than the bushing to be fitted. Drive in the bushing, using a brass hammer if available. To drive in the bushing, fix only the upper plate into the staking-tool.

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Part 12

Wheel Drive Gearing

Last month the epicycloidal curvature was discussed. Now the hypocycloid will be introduced. Briefly, the hypocycloid is a line described by a point on the edge of a circle as the circle is rolled without slippage inside another circle. (See Figure 60.) The circle that is rolled is called the generating circle. For gearing purposes, the circle in which the generating circle is rolled is the pitch circle.

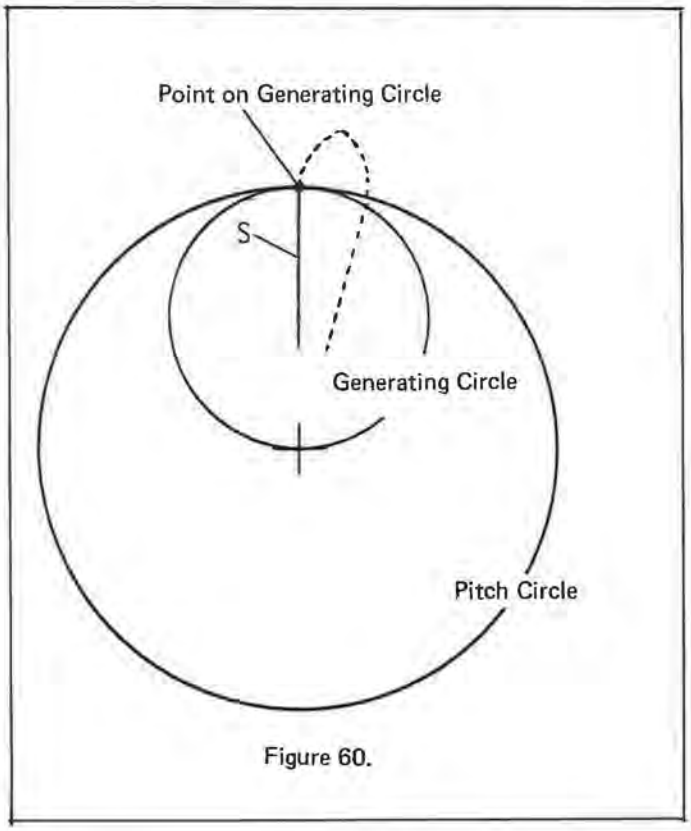


Figure 60.

If the diameter of the generating circle is one-half the diameter (the radius) of the pitch circle, as shown in Figure 60, then the line described by a point on the edge of the generating circle, as the circle is rolled, will be a radial (straight) line "s" as shown. This radial line will form one side of the flank of a pinion leaf. The dotted line has been added to show the completed shape of the pinion leaf.

If the generating circle is smaller than one-half the diameter of the pitch circle (see Figure 61), point "p" on the edge of the generating circle will describe a hypocycloid curvature "s" as shown.

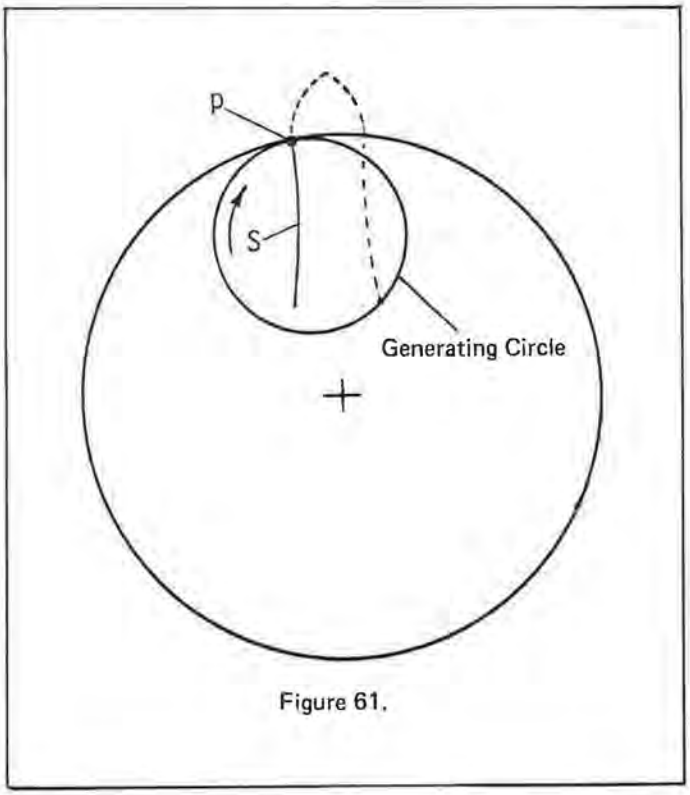


Figure 61.

If the generating circle is greater than one-half the diameter of the pitch circle (see Figure 62), a point on the edge of the generating circle will describe a hypocycloid curvature "s," as shown.

Notice the difference in the hypocycloids "s" shown

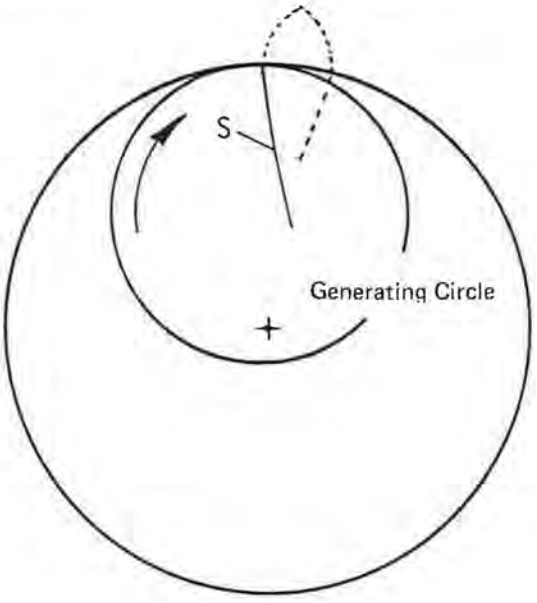


Figure 62.

in Figures 60, 61, and 62. The shape of the hypocycloid is determined by the size of the generating circle in relation to the size of the circle in which it is rolled.

In wheel drive gearing the dedendum of pinion leaves is hypocycloidal (usually radial) and the addendum of the wheel teeth is epcycloidal. As the wheel drives the pinion, the epicycloidal tooth face will act upon the hypocycloidal pinion flank. This contact of epicycloid and hypocycloid produces the desirable characteristics of good horological gear design.

For *mating gears, the same size generating circle* must

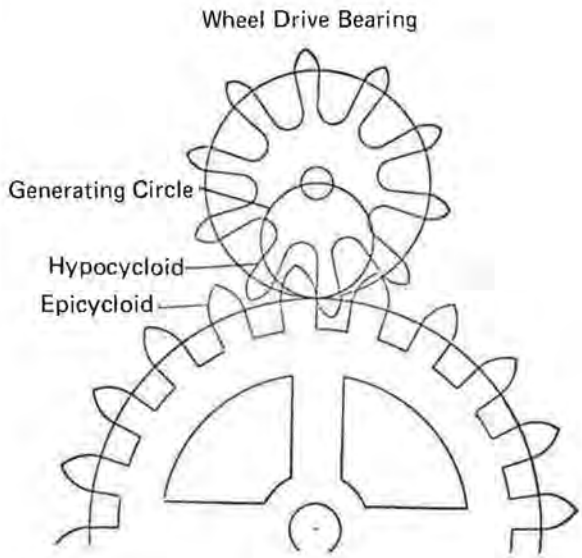


Figure 63.

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be used to generate the hypocycloidal flank of the pinion leaves as is used to generate the epicycloidal face of the wheel teeth.

For example, in Figure 63, the diameter of the generating circle has been selected to be one-half the pitch diameter of the pinion. Thus, the hypocycloidal pinion leaf flank is radial. The *same* diameter generating circle is rolled on the outside of the pitch circle of the wheel to produce the epicycloidal curvature for the addendum of the wheel teeth. (In drafting gears one does not literally roll a circle inside or outside another circle. Certain drafting techniques are employed to produce the epicycloid and hypocycloid. Those interested in learning these techniques may do so by following a special, prepared procedure which will be sent upon request. A large, self-addressed, stamped envelope should be supplied.)

At this point only the shape of the pinion leaf dedendum (hypocycloid) and the wheel teeth addendum (epicycloid) have been discussed. Before proceeding with a further analysis of gear teeth design, an examination of the approach angle and the angle of recession may be helpful.

Figure 64 shows a tooth "b" at the instant it has come into contact with leaf "a" of a pinion. The contact is made six degrees before the line of centers. (The angle is measured using the pinion center as the apex.) This six degrees is the approach angle.

Also shown is tooth "c" at the point it loses contact with the pinion leaf "e"' (i.e., tooth "b" contacting leaf "a," results in the separation of tooth "c" and leaf "e.") This takes place 30 degrees past the line of centers. The 30 degrees is the angle of recession.

The angle of *action* is 36 degrees (6 degrees angle of approach plus 30 degrees angle of recession equals 36 degrees.)

One might wonder why there is such a small angle of

(continued on page 30)

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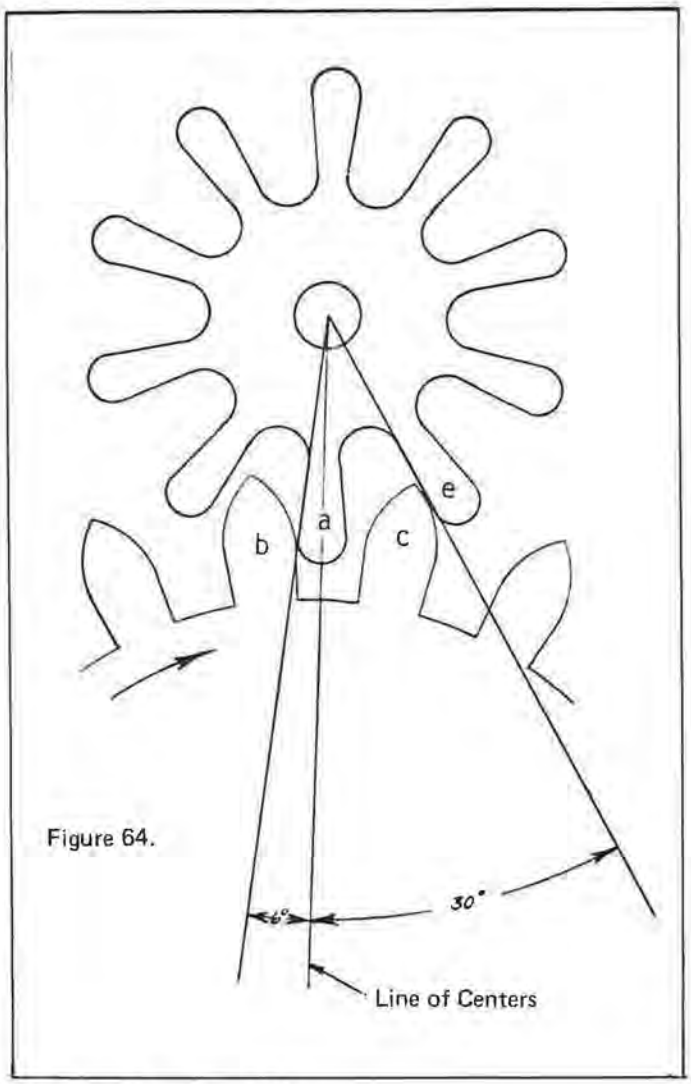


Figure 64.

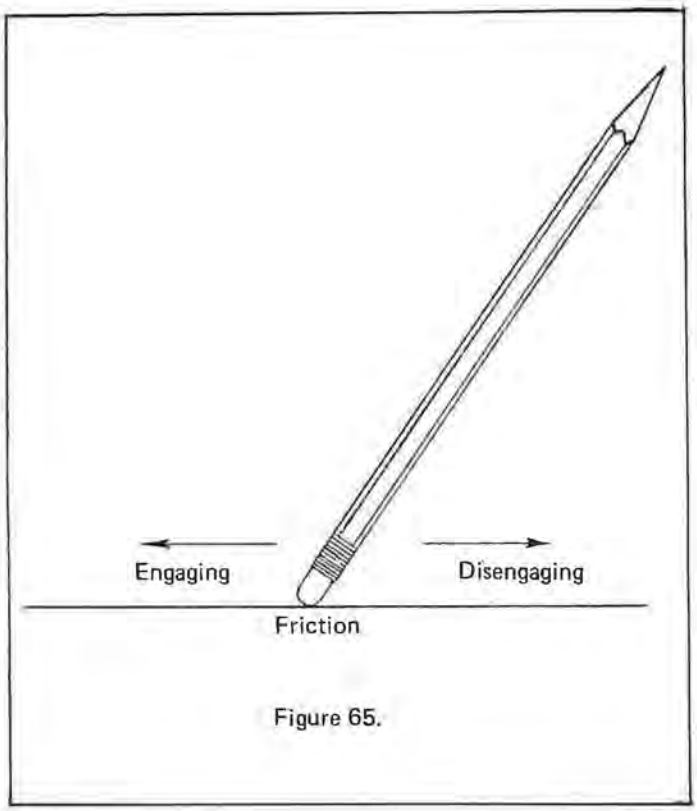


Figure 65.

(continued from page 27)

approach (6 degrees) as compared to the large angle of recession (30 degrees). This is by design and there is good rationale for having as small an angle of approach as possible. In the angle of approach there is greater friction than there is in the angle of recession. That is, the tooth-leaf contact, during the angle of approach, produces *engaging* friction, while in the angle of recession, *disengaging* friction results.

Disengaging friction is by far more desirable than engaging friction and is the reason why the angle of approach is kept to a minimum.

A good demonstration that clearly emphasizes the difference between engaging and disengaging friction is accomplished with the use of an ordinary lead pencil. While holding the pencil as shown in Figure 65, with the eraser end in contact with a flat surface, the pencil is pushed forward and drawn backward. The pencil will move with less resistance to the right (disengaging friction) than it will to the left (engaging friction).

Since the angle of approach represents engaging friction, how does one keep it to a minimum?

First, the number of leaves in the pinion plays an important part in this respect. For example, a 10-leaf pinion must have an angle of action of at least 36 degrees (360 degrees divided by 10 equals 36 degrees). This angle of action may divide as previously shown, with 6 degrees in the angle of approach and 30 degrees in the angle of recession.

If a 6-leaf pinion is used, the angle of action is 60 degrees (360 degrees divided by 6 equals 60 degrees). The large angle of action (60 degrees) may require that the angle of approach be 20 degrees, and the angle of recession about 40 degrees. This is normally considered to be rather poor gearing, and in designing, pinions with a low number of leaves should be avoided whenever possible.

By contrast, consideration of a 12-leaf pinion will reveal that the angle of action is only 30 degrees (360 degrees divided by 12 equals 30 degrees). This small angle of action (30 degrees) makes it possible for the angle of approach to be zero. Thus, the entire 30 degree tooth-leaf contact may occur after the line of centers (i.e., in the angle of recession)—very desirable gearing.

During the angle of approach it is the wheel tooth flank that acts upon the pinion leaf face. (See Figure 66A.) During the angle of recession it is the wheel tooth face that acts upon the pinion leaf flank. (See Figure 66B.)

In gearing such as just described (12-leaf pinion), in which there is a zero-degree angle of approach, the only contact of tooth with leaf is that of the tooth face acting upon the leaf flank. Thus, the entire tooth-leaf contact is that of the epicycloid curvature acting upon the hypocycloid, such as shown in Figure 66B.

In such cases, where there is little or no angle of approach, the addendum of the pinion leaf is of minor importance and is usually made in the shape of a half round. It fol-

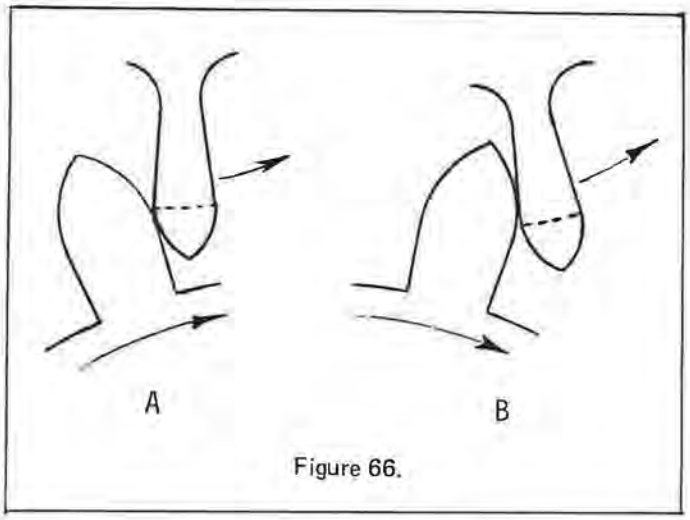


Figure 66.

lows that the greater the angle of approach, the greater the importance of the pinion leaf addendum. (Remember, only during the angle of approach does the *face* (addendum) of the pinion leaf make contact with a tooth.)

In practice, pinions of ten leaves or more have an addendum radius that is one-half the width of a leaf (i.e., half round). (See Figure 67A.) For eight and nine leaves, the pinion

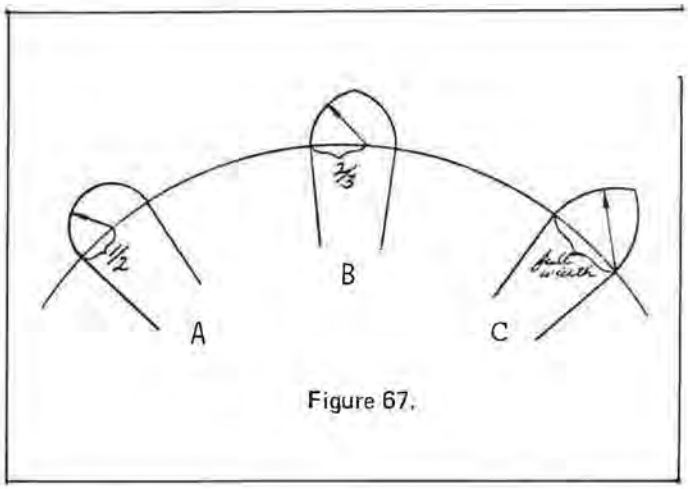


Figure 67.

leaf addendum radius is two-thirds the width of a leaf, as shown in Figure 67B.

In pinions having six or seven leaves, the pinion leaf addendum radius is the full width of a leaf, as shown in Figure 67C.

These differences in shape of the pinion leaf addenda are necessary only because the approach angle varies in accordance with the number of leaves in the pinions. As pointed out in previous articles, the objective is to have the direction of force pass through the pitch point for all positions of a tooth acting upon a leaf. The profiles of pinion leaf addenda A, B, and C just described come very close to satisfying this objective during the angle of approach. Likewise, in the angle of recession the epicycloid tooth face acting upon the hypocycloid pinion leaf flank meets the requirements of good horological gear design.

All questions and comments should be addressed to Mr. William O. Smith, Jr., Director of Horology, Parkland College, 2400 West Bradley, Champaign, Illinois 61820.

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A VISIT WITH GRAEME HALL, NEW ZEALAND

by

Maclay Lyon

Graeme Hall is a watchmaker-jeweler living and working about 8,000 miles from Cincinnati, yet is a member of the American Watchmakers Institute.

You can say that Hall is a kiwi without making him angry. The kiwi is a shy, flightless bird that looks a bit like a coconut with legs. It lives in earth burrows during the day, comes out after dark to feed on insects, and has the distinction of being the only bird that has nostrils at the end of its beak. The kiwi is also the national bird of New Zealand. Graeme Hall is a New Zealander. New Zealanders often refer to themselves as kiwis.

Hall has a store in an attractive suburb of Auckland known as Manurewa (pronounced Man-your-ee-wah). My wife and I were on a whirlwind tour of the Orient and South Pacific in March of this year. Auckland was one of our stops so we looked up Mr. Hall, whose name had been given to us by Hal Herman, your HOROLOGICAL TIMES editor.

To refresh your geography, New Zealand lies about 1,700 miles to the east of Australia and slightly to the south, across the Tasman Sea. March in New Zealand is early autumn. The climate is much like Southern California, but greener. Breathtaking mountain scenery, seascapes, and a spectacular thermal area like our Yellowstone are tourist attractions. Fruit, grain, beef and dairy farming are the mainstay of the country's economy, with materials for clothing and shelter following in importance. We were surprised to learn that New Zealand has exported corn to the United States. In fact, New Zealand exports to just about every trading nation in the world, and although New Zealand's production is largely agricultural, 80% of New Zealanders now live in cities. New Zealand is about the size of Great Britain but has a population only about one-twentieth the size of England's.



Graeme Hall at the bench in his Manurewa, New Zealand store.

It was raining hard the morning that we were to visit Graeme Hall. Manurewa is 16 miles south of downtown Auckland. We had intended to take a bus, but then realized that we wouldn't know how to find the store after leaving the bus. We dickered with a taxi driver (no tipping in New Zealand) and found that he could take us to the door of Graeme Hall Ltd., Watch and Jewellery Centre, without upsetting the balance of trade unduly. So we had a dry trip and the dubious benefit of the cabbie's comments on the state of the economy; the visit of Queen Elizabeth II; the recent cricket tests (matches) between England and Australia, handily won by Australia; and the "worthlessness" of New Zealand's native population, the Maoris.

We drew up before Hall's store on the Great South Road and saw a neat retail establishment in an area of small shops and many homes. It was 9 o'clock in the morning and the store had just opened. Hall greeted us at the door. Like his store, he is neat—a dark-haired, slender young man with a quiet, direct manner. We took a quick look at the store, then went back to Hall's watchmaking department to talk while Hall's salesperson, Mrs. Corbett, took my wife in tow.

The watchmaking department in Hall's store is spacious, well-lighted, equipped with both ultrasonic cleaning equipment and electronic timing equipment. It had probably been tidied up a bit for our visit. Its orderliness was almost unbelievable. Located at the rear of the store, the bench commands a view of the entire retailing area.

Hall told us that he sends some of his watch repairs to a trade shop and does as much himself as his management and selling duties allow. Machine engraving, fitting of bracelets and other jewelry store chores he does himself on the spot. He



Looking toward the back of Graeme Hall's store. That's Hall, one of his part-time salespersons, Mrs. Corbett, and Win Lyon. The display case at left divided the store in two lengthwise, nearly doubling display in the available space.

has two part-time employees. He buys the services of a professional window display artist, believing that good window display is the best advertising he can do. Media advertising is a problem since there are no local newspapers or shoppers. He regards the cost of using Auckland newspaper, radio, or television as excessive, since the area he serves is concentrated within a few square miles of the store.

We asked Hall how he felt about taking the risks involved in owning a small business in a country that we would regard as at least partially socialistic, with very heavy taxes on profits. His answer was that while taxes are heavy in New Zealand, business competition is not nearly so fierce as it is in the U.S. If a man does his job well, he has every reason to expect a good and secure living and the independence that goes with self-employment.

Hall certainly appears to be doing well. He owns his store; works five days a week; has a new British-made station wagon that cost him $6,000 NZ (the New Zealand dollar was worth about $.95 U.S. at the time of this writing), what Americans would think of as a pleasant middle-income home; a charming wife; four children, and assorted rolling stock that includes bicycles. He has completed the GIA colored stone course and is about halfway through the GIA diamond course. He is 36 years old.

To us drop-in visitors, New Zealand's economy appeared to be in a healthy condition despite a 16% inflation rate. The price of milk had recently doubled, and the cost of bread was up 50%. This has caused some belt tightening, of course, yet the standard of living appeared to be high. There were cranes on the skylines of the cities, and one saw along the motorways numerous homes under construction. Lots of cars are on the steets and highways, many of them old, and understandably so. We saw a used car dealer's ad in the Auckland newspaper that offered a 1973 Chevrolet for $12,999.90. Hall's $6,000 station wagon included about $3,000 in taxes, he told us.

This might be the place to bring out a fact of merchandising life in New Zealand that Hall told us about. Under New Zealand's form of government, with cradle to grave welfare and health services, there are no really poor people and there are few, if any, really rich people. Taxes that make ours seem penny ante assure that.

The effect of this no-rich, no-poor situation is a squeezing of the society toward the middle. A middle class living on fairly equal terms, then, is characteristic of New Zealand. To the visitor, and to some New Zealand youth, to judge by magazine commentary, this makes for a rather staid, commonplace environment without the excitement, flash and brilliance of great cities in other lands. But it also means that New Zealand cities are peaceful, clean, orderly, and comparatively crime-free. To a jeweler it means that high styles and delicate fashioning of such things as dinner rings, pendants, necklaces, pins, etc., are not wanted. New Zealand



Intensive use of window display shows in this picture of the outside of Graeme Hall's store.

women buy substantial jewelry with sturdy mountings and conservative designs.

The same conservatism is apparent in watch selection. Watchmakers and jewelers like watches that are locally assembled, have easily serviced movements and no-nonsense designs. Their customers go along with these standards. Watches of the Citizen Watch Company, Japan, for example, have been gaining in New Zealand sales, Hall said, because Citizen offers simple, serviceable, easily assembled movements. Quartz crystal watches, Hall believes, are about a year to 18 months behind the American market in consumer acceptance. The LED models are still leading the LCDs in sales but he believes that the LCD will eventually be the preferred type.

Britain's influence in New Zealand, Hall thinks, is waning. There are two reasons. One is Britain's inclination toward Europe as a result of joining the Common Market. This

suggests to distant members of the Commonwealth a subtle diminution of Britain's interest in them. Another reason, Hall thinks, is the growing trading strength of such Far Eastern centers as Hong Kong, Singapore, Japan. (The Watchmakers of Switzerland have a considerable establishment in Hong Kong.)

Queen Elizabeth's visit to Australia and New Zealand undoubtedly generated a lot of excitement and rekindled feelings of loyalty to dear old England. But the queen has gone home, and the everyday ties of trade are found to be still binding. Hall said that he and other watchmakers look to the United States and Switzerland as well as to the Far Eastern centers for products, materials, supplies, and technical assistance. The New Zealand apprenticeship program, for instance, is essentially a partnership between the New Zealand government and the Watchmakers of Switzerland organization. The 5-year program, less 6 months if adequate school training can be demonstrated, involves in-store bench training supplemented by Swiss seminars. Attendance at the Ebauches courses is compulsory by government order.

You might expect some resentment of a government that orders attendance at seminars as a condition of apprenticeship. But the people we talked with in New Zealand seemed to feel comfortable about their government. They show little interest in politics, and one seldom encountered a New Zealander who could tell you the difference between the two major parties. (Not so different from us, maybe?) But there seemed to be no suspicion of the government such as we have experienced. Perhaps history and topography have the answer to this. This is a young country. Older countries have long memories of tyranny and oppression to which New Zealand has never been subjected. At the same time, the small population spread over a thousand miles of often difficult terrain with scattered towns and isolated farmsteads could never have been developed without a strong central government doing the planning and obtaining the foreign capital. The acceptance of government control seems to have been a natural consequence of this basic set of circumstances.

It was mentioned earlier that Graeme Hall works five days a week. Being self-employed, he works 8-to 12-hour days. But the five-day week is universal in New Zealand, and businesses are generally not open in the evenings. After closing time on Friday, virtually all shops and restaurants are locked up until Monday morning. Saturday and Sunday are for family and recreation. Hall and his family bicycle together. They go to the beaches. (Christmas is a major summer holiday.) There are innumerable sports attractions, both spectator and participant: cricket, soccer, rugby, horseracing, tennis, golf, swimming, sailing. There is very little moonlighting, Hall said, despite the long weekends and 8-hour days. People are contented with things as they are.

New Zealand does have a problem with its native population, the Maoris, who are a Polynesian people. Like our Indians, the Maoris have had a difficult time adjusting to an urban, cash economy. Alcoholism is one result. Graeme Hall said that although he has no personal dislike of Maoris, he would not employ a Maori in his store because his customers would object.

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At the time of this writing–late March–the new Zealand dollar was worth approximately $.95.

Like us with our Indians, the New Zealanders have used many Maori place names, and tourism depends considerably upon Maori dances, folklore and handicrafts. But their presence in New Zealand society seems to be an embarrassment, and many New Zealanders secretly wish that the Maoris were confined to museums.

Graeme Hall grew up in a central New Zealand farming region with the Maori place name of Otorohanga, about 100 miles south of Auckland. His parents operated a 106-acre dairy farm. They are now retired and living in Auckland. Hall went to school in Otorohanga, a town of about 2,000. At the age of 16, he had completed his primary and secondary education. He entered a five-year apprenticeship with an Otorohanga jeweler-watchmaker, F.J. Stevens, Ltd. We asked Hall why he chose horology for life's work. He replied that he wanted to be able to own a business in a field that offered both security and independence. He seems to be reaching this goal.

Graeme Hall is not only a member of AWI, he is also a member of the Retail Jewelers of America, and, of course, of the Jewelers' Association of New Zealand, and the New Zealand Horological Institute. He pays $20 a year for his membership in NZHI, and $61 to the JANZ. The fee of the latter is determined by size of store. Wholesalers and manufacturers also belong to the associations and in this way provide some support. A jewelers' guild is the educational arm of the JANZ and is made somewhat elite by requiring that the member be an active retail jeweler with ten or more years of qualification in one specialty.

We asked Hall how he thought a watchmaker's earnings compared with those of electricians, plumbers, and TV repairmen. It was his opinon that all the skilled tradesmen earned about the same. He was kind enough to photocopy a watch repair price list which he though was fairly representative. (See box.) Hall himself limits guarantees on overhauls to three months on non-water-resistant watches, six months on water-resistant. (New Zealanders are great swimming, sailing fans.) Hall rarely sees a pin lever Timex because the duty on such a watch makes it noncompetitive in New Zealand.

Hall's long range goal is to be an excellent jeweler but to retain his watchmaking skills for the security that lies in diversity. As mentioned earlier, he is taking GIA courses and, to his knowledge, is only the second New Zealand jeweler to be enrolled in GIA work.

Knowing that Hall had recently completed GIA's colored stone course, we asked him about the hundreds of black opals we had been seeing throughout the South Pacific not only in jewelry stores but in tourist souvenir places, side street stands and drugstores. You could buy one unmounted for as little as $6 U.S. We had read that black opals are a rarity. Hall said that what we had been seeing were most likely doublets and triplets. "The stone cutters start with a base of common opal," he said. "On this, like jam on toast, they spread a thin layer of a black substance. They top this with a wafer-thin slice of gem-quality opal, usually a translucent white variety with flecks of blue, green, and red in it. The black background shows through the translucent parts of the opal slice and you have what passes for a black opal." The best of these, Hall said, will have a transparent top layer of quartz for protection. So that was it. Reminded us again that there's no such thing as a free lunch.

After an hour's visit with Graeme Hall in his store, we drove with him to his home in Manurewa where we met his wife, his parents, and two of his four children. Mrs. Hall had made some things for us to have with our tea that were both a visual and taste delight. After an all-too-short visit, the Halls drove us back to our hotel in Auckland through a pelting rain, just in time to join our tour group for the next dash to the next place. □



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APPRENTICE WATCHMAKER GETS SWISS SCHOLARSHIP

Joseph L. Cerullo, 19, Cranford, N.J., is one of three U.S. students to receive this year's advanced training scholarship awarded by the Watchmakers of Switzerland Technical and Educational Program. He is now studying at the School of Watchmaking, Neuchatel, Switzerland.

Cerullo holds titles of graduate watchmaker, certified Accutron technician and certified watchmaker from the American Watchmakers Institute. He is secretary of the New Jersey Watchmakers Association.



A Cranford resident for the past 10 years, Cerullo is a Chicago native. He graduated from Cranford High School in June 1975 and entered the Bulova School of Watchmaking, Woodside, Queens, N.Y. in September 1975. In June 1976, he graduated from the Bulova School as one of the top five students in the history of the school. Bulova School recommended Cerullo for the WOSTEP scholarship. He started the six-month-long Swiss course January 14.

The young watchmaker received his initial apprentice training with Jerry Kemmerer, owner and operator of The Ticker Shop, Cranford. Kemmerer recommended Cerullo to the Bulova School.

Cerullo lives with his parents, Louis C. and Ruth E. Cerullo. The Cerullos operate Cerigraf, Inc., a screen print supply firm in the Down Neck section of Newark, N.J.

TRI-STATE SEMINAR

On May 1, 1977, watchmakers and jewelers from Ohio, Indiana, and Kentucky gathered to receive a most interesting and informative program. Mr. Tony Riggio began the proceedings with a slide presentation on "Electricity for Watchmakers." Following this, AWI Past President Ewell Hartman presented the advantages and methods of using certain tools and equipment not often seen in the watchmakers shop. After lunch, Mr. Ken Dewitt of Integrated Display Systems lectured on the solid state timepiece from the power source through the final display. Then Paul Fisk, the Virginia clock repair expert, gave a slide presentation on hints and methods of repair and restoration.



L to R: Ewell Hartman, Tony Riggio, Ken Dewitt, and Paul Fisk.

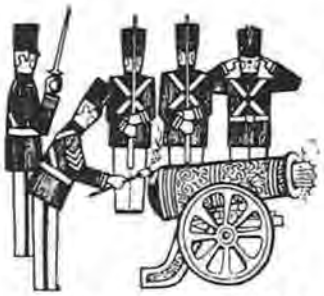
RJA MOVING TO NEW YORK CITY

Retail Jewelers of America, Inc., the national association representing more than 10,000 jewelers across the country, will move its headquarters to New York City, it has been announced by Board Chairman Michael D. Roman.

By June 1, the entire staff will be working out of the association's new offices in the Time & Life Building, Rockefeller Center, 1271 Avenue of the Americas, New York, New York 10020.

"New York City is still the center of the jewelry industry," states Roman. "And RJA belongs in that center. We'll be in closer communications with the entire industry.... and better able to serve our members ... and more accessible to them than ever before."

RJA's offices will be located directly across from the Permanent International Jewelry Exhibit, which RJA co-owns with Manufacturing Jewelers & Silversmiths of America, Inc.



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AWI NEWS

By Milton C. Stevens

EXECUTIVE SECRETARY

The American Watchmakers Institute's battery project was conceived by Henry Fried, AWI's technical director, and past president. During the recycling program's brief existence, AWI has recycled close to 2,000 pounds of batteries. I'm sure that most of you are aware that almost anyone can accumulate these used cells and turn them into cash. We are grateful to the hundreds of watchmakers across the country, and a number of cooperating watch material dealer firms, who have saved their used batteries for the benefit of AWI's Education, Library, and Museum Trust.

The AWI ELM Trust (as we call it) is a non-profit, charitable trust which has been awarded an IRS 501 (c) (3) exemption. This means that any contributions to this trust are tax deductible. Not one cent of ELM Trust money is used for administrative costs.

During the brief period of operation, we have been able to make loans to seven students in various schools of watchmaking. Five of them have already completed their training and are in the process of repaying their student loans.

When Jess Coleman, the dean of American clockmakers, died, AWI was able to arrange for the purchase of his entire library through funds derived from the sale of used watch batteries. We have only one more payment to make and the entire library will belong to us. Funds derived from the sale of watch batteries have enabled us to purchase many new volumes for the lending library. Because of this, a member doesn't have to wait three or four weeks before he can borrow a book that will help him with a particular technical problem. Battery sales have provided, and continue to provide, funds for the clerical help which is necessary to properly index and cross-reference library files for the maximum utilization.

Last March, when AWI moved into its new headquarters office, we were able to realize the dream of many horologists–that was the establishment of a horological museum dedicated to preserving our heritage and historical past. Orville Hagans accepted the volunteer job as curator of the museum. Orville is ably assisted by his wife, Jo. They have spent many hours in setting up the display and properly recording all of the AWI collection pieces. While Orville and Jo receive no compensation for their many hours of work, we were able to pay their travel expenses to the museum last year, only because of the funds we had received through the sale of used watch batteries. While our museum has a long way to go, we have the nucleus of a very fine collection. AWI owns the world famous James Ward Packard collection of fine watches. We have many interesting pieces presented by George Gruen and others interested in the establishment of this museum. We have had watchmaker groups, civic and church groups, as well as schools and student organizations visit the museum. One section in particular is being devoted entirely to the history of timekeeping. We are preparing a brochure about the history of timekeeping, which we will make available to the public and to students. The Smithsonian Institution has loaned us a number of interesting pieces, which include two large floor clocks. They are on loan to us until such time as we are able to acquire some large clocks of our own. Battery receipts paid for the installation of a security alarm system. They pay for the monthly monitoring fee of this security system.

For this reason, we are anxious to reach more watchmakers and jewelers with our program. The battery program is very simple. Individual watchmakers and jewelers save and send in used batteries. The Affiliate Chapters of AWI also collect and send in used batteries. A number of material houses have also acted as collectors and forwarded the batteries to us. One house in particular has used a special stuffer which they enclosed with monthly statements. As a result of their efforts, within a three-month period, they turned over 480 pounds of used cells.

Some people have asked, "how can these batteries safely be handled?". We have handled hundreds of pounds of used cells at AWI. There have been reports of cells exploding, and we have seen some evidence of this; however, we have stored these cells in solid corrugated cartons, and while we have heard them pop in a box once in a while, no one in the office has had to duck flying schrapnel. A solid carton with the lid on will be sufficient. The best suggestion we have, and perhaps the most convenient, is for the individual watchmaker or jeweler to have near his bench an empty Coke, Pepsi (or I prefer Budweiser) can. The small opening is convenient to drop used cells in, and they make a perfect storage receptacle in the event one of the used cells should decide to pop. When full, a couple of layers of tape will close the opening so that

HONOR ROLL

We acknowledge the following contributions to the AWI Building Fund.

Contributions to the AWI Building Fund are tax deductible, and will aid in the retirement of our building indebtedness.

Each contribution will be noted by a listing in the Honor Roll column of the HOROLOGICAL TIMES. Contributions of $25.00 or more will be acknowledged on a plaque which will be permanently displayed in the new AWI building.

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it can be sent to AWI.

We send a thank you letter for each contribution of batteries. This is one way we can let the individual watchmaker and jeweler know we appreciate his donation. The letter also lets him know that we really did receive his gift, and it is proof for IRS. For individuals and firms making a substantial donation, we can give them a letter of acknowledgment in which we state a monetary value. This receipt can then be used for a tax credit.

As for shipment to the AWI office, either UPS or Parcel Post will do. We will be more than happy to send you a check for the shipping charges. Just drop us a note and let us know what the charge is. Should you decide to pay for the shipping yourself, you can deduct it as legitimate tax deductible gift. □

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SCHOLASTICALLY SPEAKING

by Gerald G. Jaeger CMW

Chairman, Research and Education Council

The National Roster of Watchmaking Schools, published by AWI, lists 48 schools of horology in the US and Canada. Of these 48 schools, 39 are AWI Research and Education Council members.

My February letter to these 39 member schools of REC indicating that AWI had approximately 300 watch movements, less cases, for distribution invoked a response far beyond my expectations. Of the 39 members schools, 31 responded. The watchmaking student enrollment in the participating schools is slightly over 1900. This would enable us to send one movement for about every 6 students.

Just prior to shipment, Milton Stevens, Executive Secretary of AWI, informed me that there was a possibility that AWI could procure an additional 1000 movements for distribution. This was six weeks ago and at this writing both Mr. Stevens and I both feel confident that we will get these additional movements for distribution. We should have them at AWI Central prior to our June workshop and meeting. My plan is to make the distribution at the June meeting to the instructors in attendance and make a mailing to the balance of the member schools who requested movements after REC in June.

This communication will appear in **Horological Times** just prior to the REC workshops, so I will not go into great detail about the program. I will, however, include a rundown on what will take place at our REC meeting and workshop. This is to inform the AWI membership just what the Research and Education Council of AWI is and the role the members should play in AWI. The member schools of REC look for help and cooperation from all Affiliate Chapters of AWI and I feel we can get it only if the local chapters and associations are working hand in hand with each other and with the schools of horology in their areas.

REC will meet Monday June 20 at Diamond Oaks Campus, Cincinnati. Monday will be set aside for the annual business meeting. The workshops will be held at Diamond Oaks on Tuesday, Wednesday, and Thursday. Watchmakers of Switzerland Information Center Inc. of New York will provide the instruction at these workshops. Mr. Jean-Pierre Savary, President, WOSIC of New York, has made arrangements for Mr. Remy Waelchli of Switzerland and Mr. Francois Giradet of New York and Mr. Alvin Rudnick of New York to present the bench courses and technical lectures.

These technical sessions will deal with the latest innovations in timekeeping now being applied by ESA in Switzerland. The instructors will study the ESA 9362, a new quartz crystal step motor analogue watch, ESA 940111, a new extremely thin quartz crystal step motor analogue watch, ESA 9315, a new solid state liquid crystal digital watch and ESA 942711, a new solid state liquid crystal chronograph.

Our article next month will bring to ~~you~~ some of my thoughts as to how our affiliate chapters and AWI membership can work with REC on improving in our schools for the benefit of both the young people entering our profession and for the journeyman watchmaker.

OKLAHOMA STATE TECH



Gray Lawrence (seated), supervisor of Oklahoma State Tech's watch and jewelry program of study, examines some of the watches recently donated to the department by Loren Grimes of Grimes Jewelry, Arkansas City, Kansas. With Lawrence is Steve Grimes, Loren Grimes' son and a second trimester watch repair student at the Okmulgee technical college. The watches will be disassembled and used as training aids for students enrolled in Tech's watch repair program, one of the largest watch repair programs in the nation. □

JACK SCHECTER VISITS LINDSEY HOPKINS TECHNICAL EDUCATION CENTER

Jack Schecter, Technical Director of Seiko Watch Company, visited the Greater Miami Guild. He conducted lectures and showed films on the Seiko Watch on the afternoon of Tuesday, March 8, 1977.

The Watch Repair class at the Lindsey Hopkins Technical Education Center was shown films of the Seiko Factories in Japan, followed by a lecture on entering the field of Watch Repair. Slides on the Seiko 4606 were then shows, followed by a question and answer session.

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PRESSE INFORMATION
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TECHNICAL BULLETIN

The VAL 7750 Family of Chronographs

Valjoux S.A., of Les Bioux in the Joux Valley, has had its automatic caliber VAL 7750 on the market for two years already.

In passing, it may be recalled that this company belongs to the Fabriques d'Ebauches Reunies (FER), one of the principal groups affiliated to Ebauches S.A. (ESA).

Valjoux S.A. has decided to constitute, on the basis of its automatic caliber, a family of movements intended to replace all the types of wristlet chronographs supplied hitherto, most of which are no longer suited to present-day requirements.

This new chronograph thus offers the advantage of the latest developments made by Ebauches S.A. in connection with mechanical watches with automatic winding.

This important achievement affords a valid solution for the problem of rationalizing the manufacture of such complex products as the chronograph and makes it possible to offer all the technical improvements for the same price as that of the previous models. The fact that the various types of mechanisms and movements have many parts in common makes for a considerable reduction in the stock of components required for servicing, as well as the stock of make-up elements—cases, hands and dials—that can be manufactured on the same basis.

The types now on the market are shown in the table (Figure 1).

The further common characteristics are the following:
- frequency of 4 Hz or 28,800 vibrations per hour;
- "stop-second" device acting on the balance;
- chronograph mechanism with cams and oscillating pinion, operated by means of two push-pieces;
- thirty-minute counter;
- offset second.

The different versions have the following distinctive features:

VAL 7750 automatic. In addition to the twelve-hour counter shown in Figure 1, the movement is fitted with an AS.3 fine-regulation device.

VAL 7755 automatic. The date-indicator is instantaneous, but the regulator with its adjustable stud-support has no AS.3 fine-regulation system.

VAL 7765 manual winding. The date-indicator is instantaneous, but there is no fine-regulation system.

Basic movement

The barrel and the train are maintained by a single combined bridge. The gear teeth are cut with an involute profile, which ensures highly efficient gearing. The equidistant escapement has fixed banking stops, which are cut out of the pallet-bridge plate. The regulator with its adjustable stud-support makes it possible to regulate movements by machine. The standard jeweling (17 jewels) includes shock-absorbers of the press-in type. The winding stem can be extracted when pressure is applied to the setting-lever axle, and the dial feet are secured by means of bolts (ETA system).

Automatic winding (calibers VAL 7750 and 7755)

The oscillating weight turns on a ball bearing; it acts unidirectionally, transmitting its motion to the ratchet-wheel driver by way of a pawl wheel and a reduction wheel.

The use of the dynamic effect of the rotor makes for efficient winding, especially when the movements of the oscillating weight are slight.

Chronograph mechanism

The chronograph mechanism is controlled by two push-pieces situated at 30° on either side of the winding stem. The chronograph hand is started and stopped by means of the upper push-piece and is reset to zero by means of the lower one. If the push-pieces are incorrectly manipulated while the counters are working, the return-to-zero device will remain out of action.

The mechanism includes self-regulating hammers and only two

eccentrics for regulating the depth of gearing between the oscillating pinion and the chronograph wheel and for adjusting the position of the minute-counter.

The following is a brief description of the functions of this mechanism:

1. Starting. When the first push-piece is pressed, the action of the reverser causes the cams to turn to the right. In turning, the cam simultaneously shifts aside the chronograph-wheel lock and the second and minute hammers, while actuating the lever which throws the oscillating pinion into gear. The chronograph train is then driven.

2. Stopping. When the same push-piece is pressed once more, it causes the cams to turn to the left. The lock moves against the chronograph wheel, while the clutch lever throws the oscillating pinion out of gear. The chronograph train is stopped in the position for reading.

3. Resetting to zero. When the second push-piece, which is unlocked, is pressed, it makes the cams turn still further to the left. They shift the lock aside and make the hammers drop onto the hearts of the minute and second wheels, which are thus reset to zero. The mechanism remains in this position, keeping the hands at zero.

Hour-counter (caliber VAL 7750)

This counter is driven continuously by a set of teeth on the barrel. An intermediate friction spring on the counter-wheel arbor permits stopping and resetting to zero. These two functions are controlled simultaneously with those of the chronograph mechanism described above.

Day-and-date mechanism (caliber VAL 7750)

This calendar mechanism is of simple, standard design. It is however fitted with a rapid-correction system, which comes into action when the hand-setting stem is pulled out to the middle position. The double corrector is mounted on a friction yoke; it drives the date-indicator when the crown is turned to the left and the day disk when the crown is turned to the right. It is impossible to make corrections between 11 p.m. and 1 a.m., but if this is attempted, there is no risk of damaging the mechanism.

Instantaneous date mechanism (calibers VAL 7755 and 7765)

A cam releases the date-indicator and makes it jump forward. The hour wheel causes the date-indicator driving wheel to complete one revolution in 24 hours. The finger of a cam

(continued on page 49)

Ø 30,00 mm				
	6,35	7,90	H mm	CHR
	7765	7755	1 2 3	30 min
		7,90	H mm	CHR
		7750	1 2 3	12 h 30 min

BOOK REVIEW

by Henry Fried

The American Clock—A Comprehensive Pictorial Survey 1723-1900, by William H. Distin and Robert Bishop. New York, E. P. Dutton and Co., Inc., 1976. 11¼ x 8½ inches, 359 pages, 700 black and white illustrations, 75 color plates, $27.50.

Sometimes in reviewing a book, it is good to first examine the credentials of its author. William H. Distin was for fifteen years the Curator of Clocks and Watches at the Greenfield Village and Ford Museum at Dearborn, Michigan. This museum contains one of the most extensive and important collections of American timepieces. Mr. Distin is now Administrative Assistant to the president of the museum, a Fellow of the National Association of Watch and Clock Collectors, and a Past President of the important Great Lakes Chapter of that association. He is considered one of the foremost knowledgeable authorities on American Clocks. Co-author Robert Bishop is Museum Editor at the Greenfield Village-Ford Museum, an associate editor of Antique Monthly, and the author of books on American furniture and folk sculpture, and three books on American quilts.

This is a large, important book which can be divided into five sections. The first is a graphic listing of significant American clocks. A second, important section of sixty-four pages is devoted to a comprehensive listing of 6,153 American clockmakers. A glossary of common terms used in the text makes a shorter third section, followed by a page of selected reference books, and a fine index.

This book does not contain a voluminous text nor does it pretend to be a history of American clockmaking, that having been covered by Palmer, Bailey, Schwartz, etc. Rather, it is a unique volume, picturing and cataloguing a very large number of important, representative and significant clocks, which the collector can use as a pictorial reference for his own collection or new acquisition.

The list of over six thousand American makers can be considered the most updated available lists. The publishers also claim that most of the six hundred-odd clocks illustrated have never before been published, the majority having been photographed in private collections. Over seventy-five of these are in color. Like those in color, the black and white pictures are large and detail-clear.

Types of clocks illustrated are tower, tall case, dwarf floor clocks, bracket clocks, Massachusetts shelf, lighthouse, shelf, calendar, novelty, wall, banjo, and lyre clocks, girandole, New Hampshire mirror, and calendar clocks of all types.

Each clock has a catalogue-type description and each section is arranged in chronological order. However, there are pages of introductory text heading each category. Thus we learn of the origin of tower clocks in America and subsequently about tall-case clocks, their styling, and manufacturing influences, with important makers mentioned.

Close-ups of various musical, astronomical, complicated as well as simple, movements are provided and it is often noted where these examples might be viewed. Examples of Shaker-made clocks, early watchman's clocks, elegant Philadelphia tall clocks, and fine Howard regulators, and some rare clocks from the Du Pont Winterthur Museum are shown. Included are dwarf floor clocks by Bailey, Leach, Wilder, Chandler, Tower, Clagget, and others, which indicate a variety of early sources, and reflect the maker's European origin or influence. A fine Tiffany-made clock, circa 1882, with extra astronomical functions, but with Near-Eastern ornate case decoration and artful details, is pictured from the Metropolitan Museum's collection and is shown in full-page color detail.

Other unusual clocks of good aesthetic design and proportions are also included. Like the photo section of Massachusetts shelf clocks, those of other areas reveal unusual but attractive styles. Clocks with novel and interesting details as well as the familiar acorn, pillar and scroll, double-steeple, beehive, balloon, gesso-finished cases, cast iron and inlaid cases, O.G.'s, two-decker columned clocks, pipe organ shelf clocks and others, make this book almost encyclopedic in its pictorial scope. The popular-names as well as the somewhat obscure makers' products have been pictured among its pages.

Happily, the authors have included the refreshing, although ornate clocks, and the moderately priced

timepieces by E. N. Welch, Ansonia, Ingraham, American, Kroeber, Gilbert, and other clock companies, each represented by example never before photographed, or seen only in reproductions of old catalogues, putting to bed stories one hears that these were artists' dreams that never were in production.

Novelty clocks in the familiar violin form, bottle-shaped, and other form clocks are photographed. Ansonia swingers, a full gamut of blinking eye models, conical pendulum, novelty alarms of many types, the Ignatz original, and small pendulettes too are included.

Various regulators shown include a typical center-seconds Morbier with massive lyre bob and fake gridiron pendulum arrangement, reported as made by Stanislaus Fournier in 1870, when many exact clocks like these were imported from France and marketed by Waterbury and others. Howard gravity escapemented regulators and astronomical clocks are represented here as well. Thus, a listing of all the types would require a small catalogue in itself. *The American Clock* by Distin and Bishop is another major addition and takes it rightful place beside the standard works on American clocks by Palmer, Bailey, Dworetsky, and Dreppard. While each book is about the clocks of this country, each contains an individuality of informational type. This one, though, is the most comprehensive in its actual photographing of existing clocks. Its inclusion of an updated list of American clockmakers is noteworthy; close reading has shown that it has benefited by good editing and organization as well as excellent photography, paper, and binding quality. □

PORTESCAP U.S. ACQUIRES BULOVA WATCHMASTER PRODUCTS DIVISION

Portescap, the internationally known Swiss manufacturer of the Incabloc watch movement shock absorbing system, recently announced the acquisition of the assets of the Watchmaster Products Division of Bulova. The former Bulova operation, including all of its products and personnel, will be absorbed under the Vibrograf Machine Division of the firm's American Subsidiary, Portescap U.S.

According to Robert McClancy, newly appointed vice president and general manager of the new Portescap operation and former manager of the Bulova-run division, "There will be no break in service or product availability to our customers. Our goal is to continue to strive for and achieve excellence in every aspect of our business, maintaining our leadership in technological innovation, dependability of product, and prompt and reliable service."

Vibrograf Machine Division of Portescap U.S. will continue to service all watchmakers and jewelers throughout the United States, including Alaska, Hawaii, and Puerto Rico. Convenient time payment plans, liberal trade-in allowances, and guarantee program will continue to be offered.

The new Portescap Vibrograf Machine Division will be relocated on or about June 1, 1977 to Long Island, N.Y., placing the entire Vibrograf operation under one roof. The Portescap U.S. executive offices are located at 730 Fifth Avenue, New York, New York 10019.

The products available from the Vibrograf Machine Division include: Vibrograf M-80 Digital Quartz Analyzer; Vibrograf B-200A Watch Rate Recorder; GD-47 Vibrograf Gradoscop; VC-10 Automatic Watch Cleaner; Mark II Ultrasonic Cleaning Tanks; Inside Ring Engraver; Model 9020 Monocular Microscope; Accutron Service Kit Model 700; Power Cell Tester; Watch Demagnitizer; Roto Bench Vise System; Gem Set Pliers.

In addition to Robert McClancy, other key management personnel retained include: Joseph Presti, manager of operations; Robert Swensgard, regional sales manager; Donald DeWolf, technical manager, John Hager, repair department supervisor.



Robert McClancy, Vice-President, General Manager of Vibrograf Machine Division of Portescap, U.S.



RHODE ISLAND

At the May 9 meeting, Mr. Martin Sarill, charter member of Massachusetts Watchmakers Association, presented a special program. Registration for the June outing to Howard was finalized at this meeting.

ILLINOIS

The Central Illinois Watchmakers Association met on April 21 with Professor Nick Holonyak, Jr. of the University of Illinois at Urbana-Champaign the featured speaker. Prof. Holonyak is the inventor of the light-emitting diode, made the first semiconductor laser to operate in the visible spectrum and invented the light dimmer switch. He was the first student at UIUC to earn a doctoral degree under Prof. John Bardeen, twice recipient of the Nobel Prize.

OHIO

The Watchmakers Association of Ohio will hold their 31st annual convention on Friday, Saturday, and Sunday, July 29, 30, and 31 in Columbus. The weekend will begin at noon on Friday with registration, hospitality, etc. On Saturday, 2 or 3 slide seminars will be held, in conjunction with a jewelry repair demonstration. Wives are being invited to a bus tour, compliments of WAO on Saturday afternoon, with lunch. Saturday evening will be a dinner with President's Ball, door prizes, and dancing. Sunday will be business meetings for the credit unit and association. More information will be available in next month's issue of HOROLOGICAL TIMES.

WISCONSIN

The Wisconsin Licensed Watchmaker Association held its 42nd Annual Convention on April 23 and 24 in Madison. The first day included a movie by the Citizen Watch Co. of America, followed by a movie with a Bench Tip Slide Presentation narrated by Joe Crooks of Mooresville, North Carolina. A slide presentation on Basic Clock Repair made by James Tigner and Sean (Pat) Monk was also shown. These three presentations were followed by a panel discussion relative to them. Tom Armstrong, Grant Matuska, Ken Froh, and Harold Case were panel members. Jerry Jaeger served as moderator for the event. The afternoon events included a presentation by Mr. John A. Wieber on "Digital Watch Batteries: Power for the New Time." At a second session, James L. Tigner talked on "The Clockmaker's Bread and Butter Escapement." In his talk he covered everyday adjustments and drew a distinction between several different escapements. He also explored isochronal errors and explained the corrections which are necessary in its repair. This was followed by a question and answer period. In the evening, a banquet was held, with Dr. Dan D. Miller serving as guest speaker.

On Sunday, April 24, a business meeting was held, followed by a luncheon. Robert A. Nelson then spoke on "Comon Sense Escapement Checking." Then Dick Straw of the Bulova Watch Company presented the new Bulova Quartz Step Motor 242 and the new Accutron 219 movement.

NEW YORK

On May 2, the Horological Society of New York presented a program on the new Bulova Accutron Caliber 219 and the new Bulova Caliber 242 Stepping Motor. Don DeWolfe, representative of Watchmaster Products gave the first lecture. Mr. Jean Straub, manager of Watch Engineering, Bulova Watch Company, was the second featured speaker.

The Society is maintaining its "Pre-Meeting Services," with a Technical Table and Library set up for the use of members. Books from the library are available to all members in good standing.

CALIFORNIA

The Bay Area Watchmakers Guild will soon be a year old, and now has 132 active members, most of whom belong to the AWI. On June 5, the Guild in cooperation with AWI will conduct bench courses and instruction programs covering the Seiko Quartz Analog movements. Mr. Leslie L. Smith will conduct the bench courses. There will be two slide/lecture programs, presented by Guild Director Mr. Randy Hain. The subject will be "Use of Ohmmeters in Testing and Servicing of Digital Modules." Each program will be followed by a question and answer session from the floor.

The Central California Watchmakers Guild met on May 3 in Fresno. This meeting served to reorganize and plan for a Seiko Bench Course, scheduled for June 6.

NEW JERSEY

At the April 12 meeting, the Watchmakers Association of New Jersey heard Lou Zanoni, President of Zantech Co., Inc. He gave a talk on the LED and LCD watches. With large slides, he pointed out the workings of the digital movement. By tracing from the cell to the display, he demonstrated how the numbers are produced and also explained how to make some

repairs in the watch.

VIRGINIA

The Seiko Quartz workshop was held in Richmond on April 3, with Les Smith conducting the session. Ewell Hartman, past president of AWI, helped individuals in the class with problems they were having. Charles Soukup, 2nd Vice President of HAV, was seminar chairman.

The Potomac Guild met on May 10 in Annandale. The program included a presentation by Dick Ward on the use of the watchmakers lathe. This was second in a series by Mr. Ward. New officers elected for the upcoming year are President, George E. McNeil; Vice President, Ron W. Beavers; Secretary, Francis A. Gallagher; Treasurer, Marvin E. Whitney; Directors, Skee Jenssen and Dan De Wilde; Alternate Directors, Ron Beavers and Alex Tobey.

The Tri-City Triangle Guild met on April 19. At this meeting, nomination and election of officers took place.

COLORADO

On March 27, the Board of Directors held their meeting at the Continental Denver Motor Hotel, and the following members who were elected to the Board were appointed as officers: President, Eldon O. Ramsel; Vice President, Emery Brittenham; Secretary/Treasurer, Larry E. Burnworth. Plans were also made for the fall seminar to be held in September.

TEXAS

The Texas Watchmakers Association held a meeting on April 19, with three featured presentations. Ed Kurt III demonstrated the L&R Greiner Micromat with 5:1 electronic lens. The second part of the program was a swap, trading, and selling of watches, watch movements, watch repair tools, and related equipment. Stanley Donahue showed a crystal inserting machine that solves many of the problems with removing crystals.

FLORIDA

The Greater Miami Watchmakers Guild met on March 8. After the business meeting, President Walter Renzetti turned the meeting over to the Program Co-ordinator Aaron Aronoff who introduced Mr. Jack Schecter, Technical Director of Seiko Watch Company, and Emilio Plana, Sales Representative, and Dennis Maradie, Sales Manager of Seiko, both from the Boca Raton office. Schecter then took over the meeting which was both entertaining and instructive. The Seiko Quartz watch was featured at the evening session and a question and answer period, followed by the demonstration of the Seiko Timer for watches, closed the meeting. □

A definition of TIME . . .

Time is the winding tape of the universe. By it we measure space otherwise illimitable. It is also the fourth dimension. Beyond it lie the Infinite Wisdom that baffles understanding, and the mysteries of eternity that man shall never know.

Time marches with the sun and stars. Like the air, it comes to our service at birth for use during a brief and uncertain period. Unlike the air, it is never renewed. Nor can it be compressed or expanded.

Nothing is so inexorable. Time makes no concessions or compromises. How it may be employed, if employed at all, is a matter of the utmost indifference. Time utters no commands, offers no advice. Only the liveliest conscience is sensitive to the suggestions of its silent passage. With the hours in their stately procession, we may proceed with a purpose to make the most of an opportunity that will never come again, or straggle aimlessly from cradle to grave.

Time is the mark of immortality, and man, in tragic folly, uses it as if a day or a year were but a trifle from an inexhaustible store. He views the brighter prospect of tomorrow while he wastes today, and he never knows that the moment passing unused is a jewel fallen into the sea of the infinite, and gone forever.

By Orville R. Hagans

RJA SUBMITS STATEMENT TO CONNECTICUT GENERAL ASSEMBLY ON BANK SALES OF MERCHANDISE

At the request of the Connecticut Retail Jewelers Association, Retail Jewelers of America, Inc. submitted a statement to the Joint Committee on Banks of the Connecticut General Assembly.

The statement, concerning bank giveaways and sale of merchandise, was submitted by RJA's Board Chairman Michael D. Roman and the Association's Legislative Counsel, Sheldon I. London.

RJA supports legislation which would limit gifts by financial institutions to new office openings and would prohibit the sale of merchandise by banks at any time.

While questioning the legitimacy of a regulated service industry, like banking, to be engaged in merchandise sales activities that have little relevancy to its charterted purpose, RJA also cited the harmful impact on retailers.

COMMON SENSE ESCAPEMENT CHECKING

(continued from page 11)

should be made before deciding how to correct it. If drop lock is slightly deep on both pallet jewels, and if total lock is slightly deep on the jewel where the problem occurs, the jewel should be moved slightly deeper into the fork, thereby creating more toe clearance.

On the other hand, if drop locks are correct, and if total lock is not excessively deep on the erring jewel, the banking should be opened slightly to permit the fork to move farther and thereby creating correct toe clearance.

The toe clearance test can be made with or without the balance in the watch. If a correction is made, it should be followed by some checks at the horn and balance end of the fork to assure that a tooth cannot unlock while the roller jewel is leaving or out of the slot. Next month we will look at some common sense checks at that end.

We wish to acknowledge the contribution of ideas from Mr. Henry B. Olson, watchmaker at Welanders Jewelry in Fergus Falls, Minnesota, for 40 years. The toe clearance check was affectionately called the "Hank Check" by other watchmakers in that shop.

□

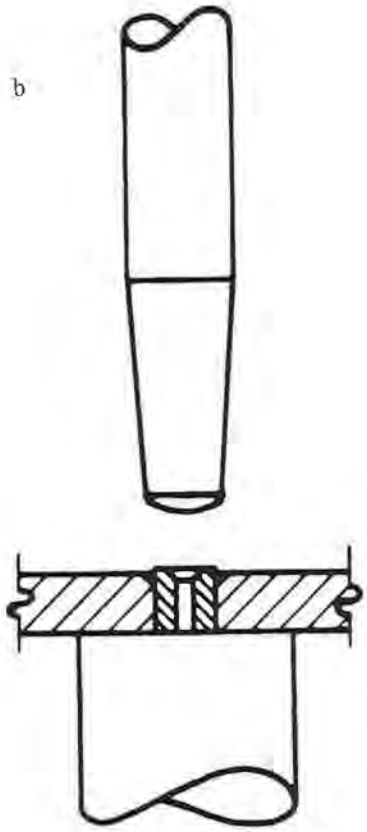


Figure 5

HOLE CLOSING AND BUSHING

(continued from page 25)

of the plate, of course. Instead of the punch, a flat-faced hammer could be used—with care. However, a hollow stump of some sort must be used, since the bushing will extend slightly beyond the outside of the plate, and the oil slick and dimensions will be deformed if driven against a solid anvil. Drive the bushing in until it's flush with the inside of the plate.

Turn the plate over and now rest the bushing on a solid stump, as in Figure 5(b). Selection of the right round-face punch at this point can make the difference between a quick, beautiful riveting job and a botched one. Look a little more closely at Figure 5(b). The diameter of the punch shown is just a bit too small. It should be at least equal to the chamfered area in the plate, and if it were considerably larger it wouldn't hurt a thing. A punch of the dimensions shown is likely to compress the bushing without fully spreading it into the chamfered area. A weak rivet.

I like to rivet with two punches. The first one I turn up in just a few minutes from a piece of ¼-inch drill rod about 3¼ inches long. I long-taper the end to a diameter about twice that of the largest round punch in a watchmaker's staking set. I round the end with a flatter curvature than is used on watchmaker's round punches—more like the one shown in Figure 5(b). A small piece of 4/0 emery paper, with the lathe running at high speed, quickly provides a mirror finish. No hardening is necessary unless the punch is to be used on steel.

One brisk tap with a hammer, and this punch spreads the bushing into the chamfered space. This by itself makes a good, respectable bushing, but I like to follow it up with one more brisk punch from the largest round punch in my watchmaker's staking set. This forms a beautiful, deep, round, polished oil sink.

If you try the watchmaker's punch by itself, before the bushing has been spread into the chamfered area, you may find that the greater curvature of the punch may compress the bushing without spreading it. Of course, if the bushing were made taller, there would be enough metal to spread into the chamfered area, but this requires heavy pounding with a hammer and possible distortion, which I don't like.

To finish the job, open the hole from the inside with a cutting broach until the pivot will just enter. Chamfer both ends of the hole to remove burrs, and finish with a round, oiled broach, burnishing from both sides with considerable

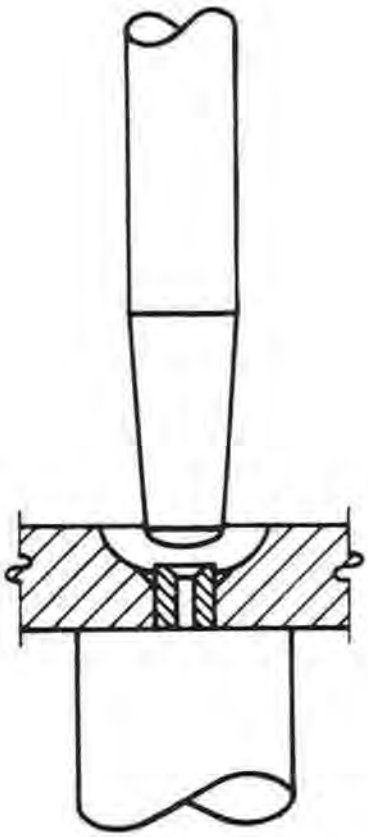


Figure 6

pressure. A light pegging will remove the black, metallic residue left by the burnishing.

Figure 6 is self-explanatory and shows how bushing is done where the plates are thick and the oil sinks large.

Stay with me, and next month we'll have a go at re-pivoting.

□

TECHNICAL BULLETIN

(continued from page 43)

turning freely on the driving-wheel arbor engages in a circular hole in the wheel. Lastly, a yoke working with the cam causes a spring arm to push the date-indicator forward.

This mechanism consists of only four parts. Like the indicator, it is held in position by a plate and three screws. After midnight the yoke rests against the lowest part of the cam and its arm is engaged between two teeth of the indicator. The driving wheel causes the cam to turn as soon as its finger reaches the bottom of the hole.

Following the profile of the cam, the yoke steadily increases its tension; simultaneously, the flexible arm recoils on the indicator to the extent of one tooth, its tension being less than that of the jumper. When it is at maximum tension, the yoke suddenly drops on passing the highest point of the cam, which is pushed forward thanks to its free drive.

The flexible arm of the yoke instantly causes the date-indicator to jump forward one step. The arm remains engaged so as to hold the indicator in position. The date indication can be corrected rapidly without upsetting the time display.

A pinion solid with the setting wheel drives the corrector, which is mounted on a yoke controlled by the hub of the wheel. When the hand-setting stem is in the middle position, the yoke throws the setting wheel into gear with the sliding pinion and the corrector yoke is so positioned that the corrector can act on the indicator teeth. By turning the crown to the left, one can correct the date indication at any time of the day or night. Turning in the opposite direction has no effect, the corrector being withdrawn.

Conclusion

This family of calibers is intended to replace the old chronographs whose construction is obsolete, in view of the mechanism used or of insufficiently accurate timekeeping.

The almost total suppression of devices for regulating the chronograph functions, rapid correction of the calendar, the stop-second system and the adoption of a high frequency correspond to the present requirements and standards of the watch industry.

□

QUESTIONS AND ANSWERS

(continued from page 15)

Cylinder VPH

Q. Sitting in front of me on my bench I have a fine French carriage clock which has raised several questions in my mind about cylinder escapements; this particular clock has a cylinder platform.

How do you calculate the beats per hour of a cylinder escapement clock, particularly one with a contrate wheel, like

a carriage clock?

How are the beats per hour of a cylinder watch calculated?

Given the fact that a cylinder escapement seems to have a much lower number of beats per hour than a lever escapement, how does one go about calculating the fitting of a lever platform to replace a cylinder platform? I am perhaps laboring under the misconception that most lever platforms are made for 18,000 BPH.

In his book, *The Watch Escapement,* Henry B. Fried goes into the problem of working on cylinders, devoting part of the book to it. He mentions several tools as being necessary to work on cylinders, such as special stakes, dies, assortments of cylinder plugs and escape wheels. He goes on to state that these are still available (my copy was published 1974) but I haven't been able to locate any sources for these tools. Could you recommend some sources?

Is there any source of supply for cylinder platforms?

I realize that I have asked quite a mouthful of questions in one letter, but for many young watchmakers like myself (and I suspect a few older ones) the cylinder is Terra Incognita. SASE enclosed.

William Stonehill
Seattle, Washington

A. Cylinder watches and those in carriage clocks have their beat counts determined in the same manner as watches. The contrate wheel is counted just as you would the fourth wheel in a watch. Most or almost all cylinder escapemented carriage clocks have an 18,000 VPH rate.

Substituting a lever escapement platform is no problem since the beat counts are the same.

Tools for the cylinder escapement repair are made by Bergeon and shown in the various catalogues, especially those printed in Germany, Switzerland, and France, where the repairs of these are more readily undertaken and thus, there is a market for these tools. Your jobber, if he is inclined to supply you, can obtain these from his importer supplier.

Sessions Coil- Detex Watchman Clock

Q. We are looking for two items.

1. A field for a Sessions Westminster 20A. Back case plate 4.3 watts, 105-125 volts, model D. There is no identification mark on coil.

2. Balance staff, balance wheel and hairspring for a Detex watchmans clock. Platform is made by Reota watch company, 11 jewel unadjusted. Also paper punch arm.

Can you help us find these items?

S. Darbier
Fairborn, Ohio

A. As you know, Sessions is no longer in business. We have also searched through all our buyers' guides from various countries and fail to come up with a Detex or Reota name. However, upon searching for you in various large city directories, we discovered that the Detex Corporation is situated at 53 Park Place in New York City, New York 10007.

Incidentally, in that city at the very same address there is a well-known supplier and service center of watchman's clocks, The Phelps Time Lock Company. You might write to them should you fail to obtain satisfaction from Detex.

As for the Sessions coil, would suggest that coils used for burglar alarms, or radio or relay might be used. This could be ascertained by one of such servicement. Wish we could help further.

Pallet Pivots Oiled?

Q. A fellow watchmaker, with many years experience, insists that the pallet arbor pivots should never be oiled. I disagree, pointing out to him that if a pivot is dry or lacks lubrication it will heat up and turn black, causing the watch to stop. He could not understand this. Also, I explained to him that all pivots must be lubricated to prevent friction. Who is right?

Eugene Brose
Essex Fells, New Jersey

A. Most present instructions from the watch factories in Japan and Switzerland instruct all in their manuals not to oil the pallet arbor pivots. Their reasons and most logical ones are: the angular movement of the ancre is but 10 to 12° and thus it would take thirty to thirty-six beats to equal one complete revolution of these pivots. Also, it is the terminal pivot in the escapement and thus little torque is exerted here. Another reason is that most watchmakers tend to overoil these when they shouldn't oil them (at all). Thus the excess oil has a negative effect of creating a capillarity that might detract from the pallet action and draw lint, dust, dirt, etc., where it is not wanted. Again, further, experiments in the laboratories of these factories reveal that no oil is better than even wetting these pivots with the end of a oil-wet pegwood.

On the older pocket watches with high arbors the oil did have a value. With thin, smal wrist movements, the oil could run so that it settles between the pallet bridge and pallet frame–no good.

Chronograph Case

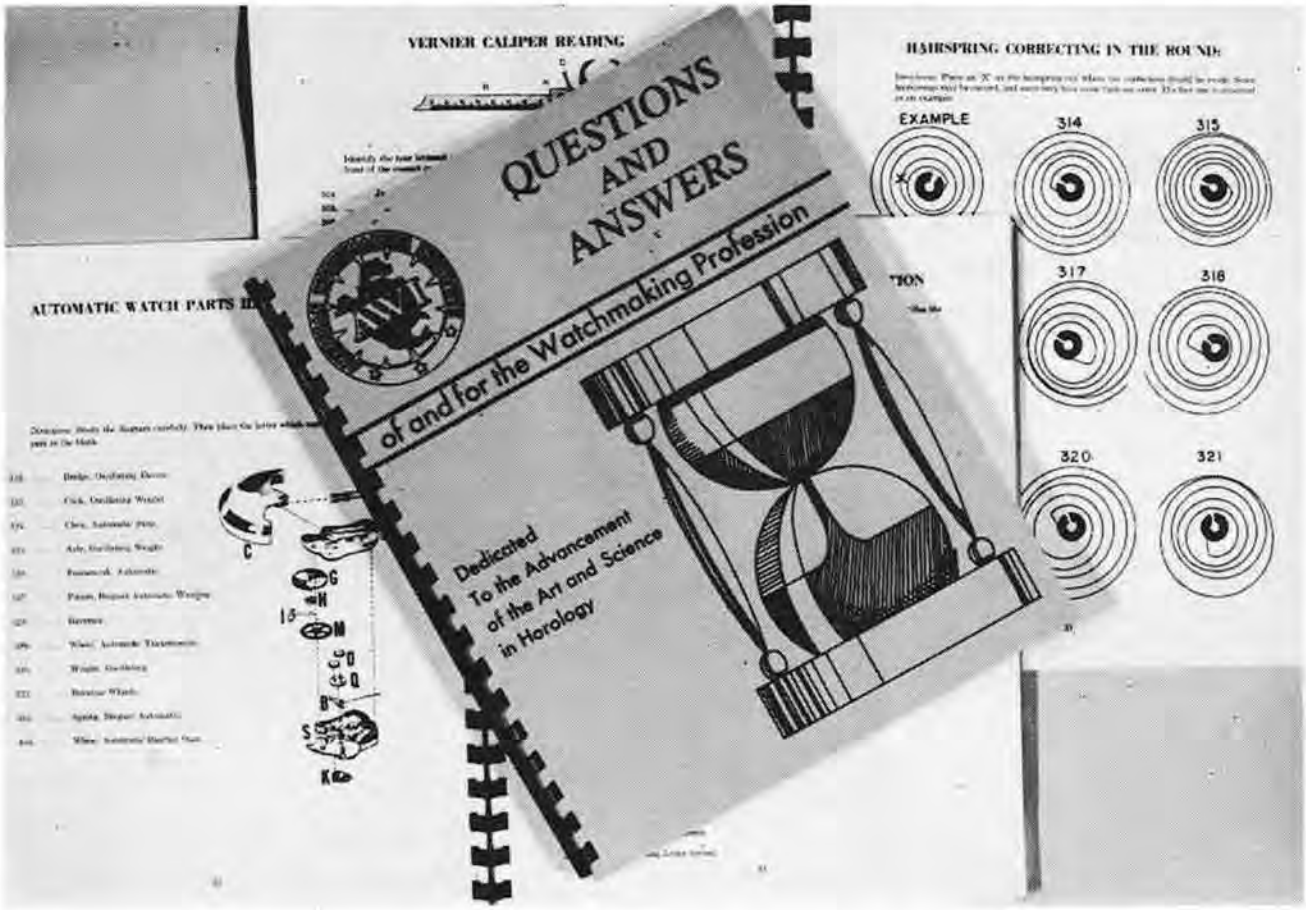
Q. Can you help us locate a waterproof (stainless steel) watch case for Valjoux 7733 chronograph, with two pushers.

Ray O. Fann
Newport, Arkansas

A. For your Valjoux, I would suggest that you contact Mr. Francis J. Sandominghi of one Surrey Court, Monsey, New York 10952. Mr. Sandominghi is probably the finest chronograph repairer in this country and in his stock may have just such a case.

□

Questions and Answers Book Available



The AWI Book "Questions & Answers of and for the Watchmaking Profession" can help you with the answers to questions you have always been meaning to read-up on sometime.
Featured in the book is nomenclature, parts identification along with questions and answers of items which frequently appear on certification or state licensing examinations.
The material presented in this book has been prepared and approved by leading horological educators in the country; namely members of the AWI Research & Education Council.
Order your copy from AWI Central, P.O. Box 11011, Cincinnati, Ohio 45211. Please enclose your check for $4.95 with your order. We cannot accept COD or open account orders.

NEW PRODUCTS

SEIKO INTRODUCES FIRST QUARTZ LC DIGITAL STOPWATCH

The new stainless steel electronic digital stopwatch, model 60267, with blue dial frame and gray dial, records time in hours, minutes, seconds, and 1/100 second, up to ten hours. A standard operation mode measures lap times and 1–2 finishes. A section operation mode measures increments of the complete event. During sectional timing, the total time

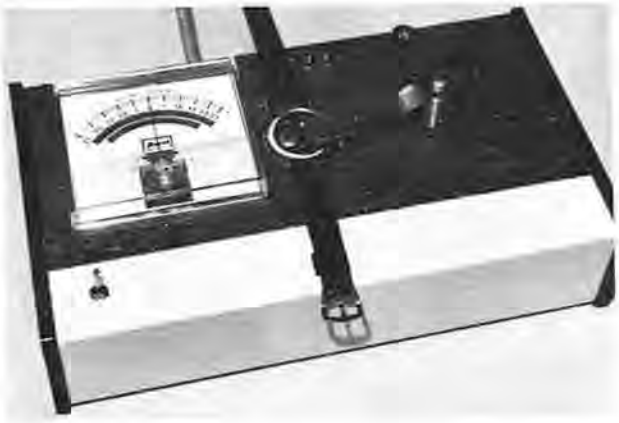


is not displayed, but calculated by adding each sectional time. The stopwatch is also provided with an on-off switch to preserve the life of its battery which has an operational life of over 1,000 hours. A battery life indicator appears with an "X" as a warning when the battery is running low.

The new stopwatch, which will retail at $225, is available through Seiko's nationwide network of distributors.

QUARTZ WATCH CALIBRATOR/TESTER

New, simple to operate, versatile, and low in cost, Intertime Corporation's DWCT Watch Calibrator and Tester regulates



a variety of LED, LC display and quartz analog watches which use crystals operating at 32,768 Hz. The unit has a self-contained voltage source which powers modules being tested. Any shift in the watch crystal frequency is interpreted and displayed on an analog meter as an error in seconds per month. Units are factory-set to within 0.1 ppm and can be adjusted readily to within 0.5 ppm. An operating manual accompanies each Tester. Selling for $399.95, the Intertime DWCT Calibrator and Tester is distributed through Marshall-Swartchild offices in Chicago, Dallas, San Francisco, and Seattle. Additional information may be obtained from the Marshall-Swartchild home office, P.O. Box 726, Chicago, IL 60690.

GIA JOURNAL REPORTS ON TECHNICAL DEVELOPMENTS

GEMS & GEMOLOGY, the quarterly professional journal published by the Gemological Institute of America, reports on new discoveries and technical developments in gem and gemology, plus highlight comments from GIA laboratories in Santa Monica, Los Angeles, and New York.

Scientific articles, written by GIA staff members and other authorities in gemology, are published on diamonds, gemstones, colored stones, and minerals. Technical uses of jewelers' instruments are also described. GEMS & GEMOLOGY, now in its 15th year of publication, has subscribers worldwide.

Professional jewelers and amateur gem enthusiasts can keep up to date with important discoveries, new techniques, and modern technology with a subscription to GIA's official journal.

Annual subscriptions cost $8.50 in the United States



and Canada, or $21.00 for three years. Foreign subscriptions cost $12.50 and $33.00, respectively, for one and three years.

Subscriptions can be ordered by sending a check (U.S.) for the full amount, payable to GIA, 1660 Stewart Street, P.O. Box 22110, Santa Monica, CA 90406 U.S.A.

LED WATCH REPLACEMENT MODULE

LED watch repair problems have been reduced significantly with introduction by Intertime Corporation and distribution by Marshall-Swartchild Company of a new, well-tested "Prepackaged Universal Replacement Module." "Universal" application to any case 25 mm or larger—usually men's watches—is possible through a kit of conductive and nonconductive spacers and rings; custom-fitted, these compensate for variations in case dimensions and tolerances. The module is only ¼-inch thick so that it fits even the so-called "thin" cases. To assure ease of handling and long life, there are no fragile wire bonds in the prepackaged module. All components are soldered on a ceramic base.

The intertime module is completely repairable by removing and replacing components. Once installed in a case, no other movement or module ever will be needed. Intertime provides a three-year guarantee on the modules. Complete, easy-to-follow directions are supplied with each module. Without batteries—available at regular prices—the LED Replacement Modules are priced at $17.50 each from the distributor, Marshall-Swartchild Company, P. O. Box 726, Chicago, IL 60690 or from M-S offices in Chicago, Dallas, San Francisco, and Seattle.



NEW ELECTRONIC CLOCKS

The new collection of electronic brass clocks, which feature soft and pleasant sounding alarms, range in retail price from $65 to $250. Among them are: Model LY032, the classic mantlepiece clock, with 4 columns supporting the brass lintel, which supports the clock itself. Its retail price is $250. Another stunning model is LY034, offered at $110. It has a french provincial looking case with a stunning white dial surrounded by a beaded bezel.



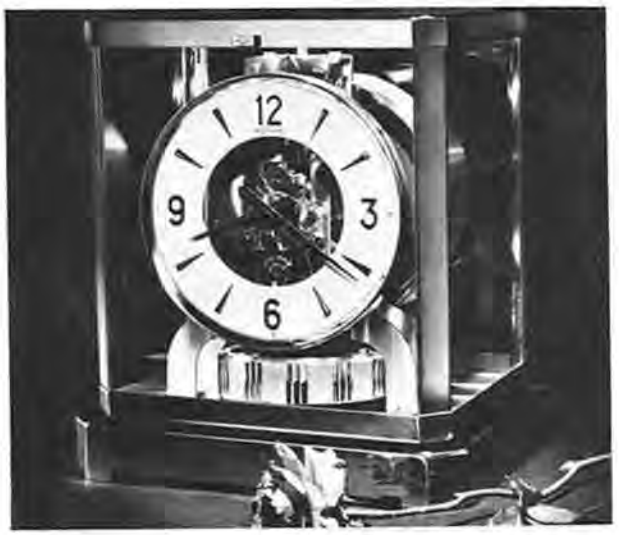
LY032



LY034

ATMOS ANNOUNCES MASSIVE ADVERTISING CAMPAIGN

In a sharp departure from previous seasonal advertising schedules, the Atmos Clock Company, a subsidiary of the Longines-Wittnauer Watch Company, is launching an all year 'round advertising program. Employing print exclusively, Atmos, the world's only clock using minute changes of temperature as a



power source, will be seen in up-scale publications, including House Beautiful, House & Garden, Newsweek, New Yorker, Time, Architectural Digest, and others. Announcing the program, Dave Ellis, Atmos Clock Company Sales Manager, added that "this is the beginning of a concerted and major program, not only this year, but for the foreseeable future." The Atmos Clock Company is sole distributor for Atmos clocks in the United States and Canada.

NEW QUARTZ CLOCKS FROM SEIKO

The new collection of quartz clocks, which have a second hand which moves in step motion at precise one-second intervals, and have anodized aluminum cases, retail from $90 to $145. A square brushed yellow case with a brown dial and white Roman numerals



QZ586G

on an internal minute track, is new model QZ586G. Its retail price is $110. Using a similar shaped case, textured on the outside with a stunning speckled blue enamel dial, is new model QZ588G, at $115.



QZ588G

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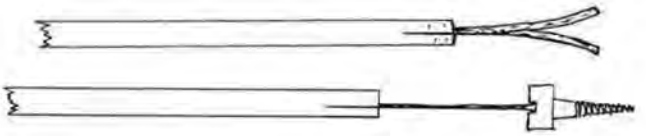
BENCH TIP

(from the New Zealand Horological Journal)

SCREW HOLDER

A member gives us a holder for those wood screws that are difficult to insert into chiming clock cases.

Select a 5 mm diameter steel rod and place it upright in the vice. With a hacksaw, cut a 10 mm deep slot, as if making a slot in the head of a screw. Select a piece of 4 mm wide clock mainspring and cut into two equal lengths about 30 mm. Insert the mainsprings together into the slot in the rod, with bends outwards. Secure with solder or Araldite.



When the two mainspring pieces are pressed together, insert the screw to be held by putting the mainspring ends into the screw slot with the screw held into the holder by the spring tension; place into position in clockcase. This holder is especially useful in guiding brass screws to their home. One must remember that this is not a screwdriver; therefore, do not use as such.

□

Classified

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WANTED TO BUY

FOR SALE

AWI member, Mrs. Thelma Y. (Niki) Bricker finds it necessary because of illness to sell the business she has operated in Bartow, Florida for the past 23 years. This is a small jewelry and watch repair shop with an excellent reputation. Contact her at P.O. Box 1596, Bartow, FL 33830.

The 8-Day Scottish Long Case clock featured in the "Essence of Clock Repair," March and April, 1977, is being offered for sale for $2200 at Sunset Antiques, 12 S. Washington, Oxford, Michigan 48051.

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Fully equipped watch repair shop. Loads of working space, situated in excellent location. Enough space for jewelry-gift shop. Well established. Trying to sell for health reasons. Mr. Mora, Northeast Watch-Craft, 9615 Menaul N.E., Albuquerque, New Mexico 87112. (505) 294-7075.

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SITUATIONS WANTED

This column is free to AWI members. You may use this column every fourth month at no cost. HOROLOGICAL TIMES will also keep your ad confidential, and mail all inquiries directly to you.

Experienced watchmaker and jewelry repairman willing to relocate. Qualifications and resume sent by request. Horological Times, Dept. S601, P.O. Box 11011, Cincinnati, Ohio 45211.

Watchmaker with 18 years experience and formal education seeks employment. Contact Hea-Bok Chang, P.O. Box 77, Showell, MD 21862.

Calendar

JUNE

5—Horological Society of New York; Regular Meeting; New York, New York.

5—Bay Area Watchmakers Guild; Seiko Quartz Analog Seminar and Bench Course; Towne House Hotel, San Francisco, California.

6—Rhode Island Watchmakers Association; Annual Outing; Howard Clock Company; Waltham, Massachusetts.

12—Watchmakers Association of Indiana; Executive Meeting.

14—Watchmakers' Association of New Jersey; Members-only meeting.

15-19—National Association of Watch & Clock Collectors Convention; Chicago, Illinois.

20-23—Research & Education Council of AWI Meeting and In-Service Workshop; Sponsors: Watchmakers of Switzerland Information Center, REC—AWI; Diamond Oaks Campus; Cincinnati, Ohio.

21—Massachusetts Watchmakers Association; Regular Meeting.

24—Affiliate Chapters Meeting—AWI; Greater Cincinnati Airport, Cincinnati, Ohio.

25-26—Board of Directors Meeting—AWI; Greater Cincinnati Airport; Cincinnati, Ohio.

JULY

23-27—RJA 1977 Fall International Jewelry Trade Fair and Convention,; Americana and New York Hilton Hotels; New York, New York.

29-31—Annual Watchmakers Association of Ohio Convention, Marriott Inn, Columbus, Ohio.

AUGUST

13-14—Arkansas Retail Jewelers Association Annual Convention; Americana Hotel; Little Rock, Arkansas.

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An Open Letter To Bulova Watchmaster Customers...

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Robert McClancy
Vice President,
General Manager
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