

MAY 1981

JOURNAL OF HOROLOGICAL SCIENCE

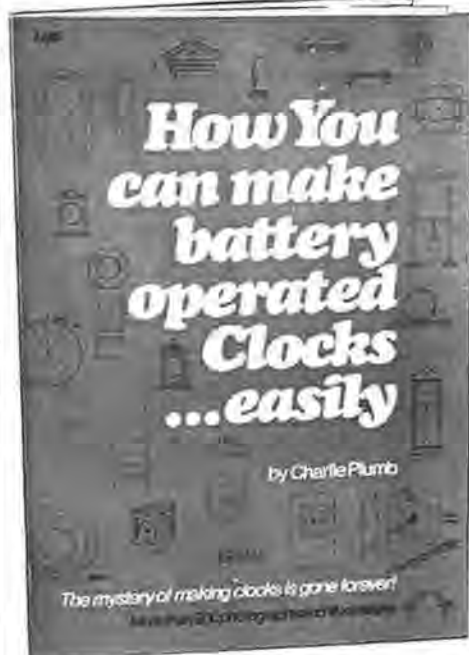


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ABOUT THE AUTHOR

Charlie Plumb is a successful Graphic Designer. He first became interested in battery operated clock movements a few years ago while handling a graphic assignment for a large distributor of clock movements. As he tells it, he fumbled his way through the first few clocks without any information to guide him. Combining his design and shop skills, his inventive imagination, and a variety of materials, he has produced many unusual and attractive clocks ... they form the basis for this clear, concise and well-illustrated book. The author has an uncanny ability to find simple solutions to difficult problems. We highly recommend this book loaded with exceptional clockmaking ideas.

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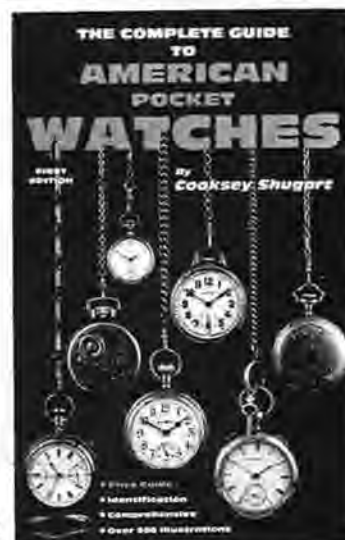
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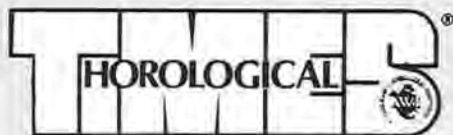


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According to a very reliable source, 23.7% of older cannon pinions must be tightened on their posts when a watch is overhauled. We all agree that this percentage figure is correct, because when we first started in the watchmaking profession, 23 or 24 customers out of 100 would come back to us, complaining that the second hand worked fine, but the other two didn't turn right.

Industry was quick to respond to this service problem. They reduced the size of the cannon or friction pinion, and sometimes even hid it between the plates of the movement. The watchmaker had to respond with increased repair prices, and the consumer bore the brunt of industry's indifference.

But now we get to a replay of the previous cannon pinion action. This happens to be the step motor caper. Just about every manufacturer manages to place the step motor wheel under a common bridge with the other train wheels. The result is that the train must be "dumped," because the magnetized step motor collects steel fragments that must be removed in order for the movement to perform properly. Increased labor time for the watchmaker means increased repair prices for the consumer.

Now then, if you were a manufacturer, wouldn't you design a quartz step motor with a separate bridge for the step motor? And wouldn't you present your product to the jeweler-watchmaker with the point that it is easily serviced because the step motor alone can be removed and then the train can be ultrasonically cleaned without danger of flux particles remaining in the movement? Sure you would, even if the product cost a few pennies more.

They won't.

On the Front

CHERRY BLOSSOMS, as featured on our May cover, are a breathtaking springtime attraction in many areas of the country. In our nation's capitol, thousands of people flock to see the trees in blossom along the Potomac River. Around 900 of the flowering Oriental cherry trees were given as a gift to the people of Washington by the people of Tokyo in 1912. These were planted on both sides of the Potomac River in Potomac Park, which also houses the Jefferson and Lincoln Memorials.

Quality Clock Movements

Quartz Alarm Ultra Thin

425

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



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450 Quartz

\$5.25 In Quantity



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

Extreme accuracy is now available at very moderate cost for customers that demand precise time keeping. Quality features such as high quartz oscillation of 4,194,304 MHz. Assures reliable time keeping as well as accuracy. The small dimensions are ideal for all jobs. Fully warranted for one year.

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

600 Quartz Insert Movement Complete W/ Dial - Hands

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



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

ALMOST AS SMALL AS A WATCH!

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

475

Tiny Quartz



\$5.25 In Quantity

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650 Quartz Insert Movement Only

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

500 Quartz Pendulum

\$9.25 In Quantity



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

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

575

Quartz Striking
Pendulum

8 1/4" x 5 1/8"

\$22.00 In Quantity



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

- Chimes on half hour—Counts on hour
- Accurate to ± 10 seconds per month
- Runs for 2 years on "D" alkaline cell
- Chimes can be silenced by pushing lever
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PRESENT AND FUTURE FINANCES

May 1st is the beginning of a new fiscal year for the American Watchmakers Institute. A recent independent audit of the AWI books found them to be in good order. In fact, the auditors complimented AWI, calling it, "a well-organized and efficient operation." This is due in large measure to the expertise of Michael P. Danner, Administrative Director, and Marvin E. Whitney, Treasurer. I guess you would expect this from a former savings and loan manager and a *cum laude* graduate, which Mike and Marv happen to be.

Just as you are feeling the continued pressures of unchecked inflation in your business and personal lives, this same pressure is bearing down on the AWI operation. In order that we may have an up-to-the-minute picture of AWI's financial position, the Board of Directors has instructed our Treasurer, Marv Whitney, to prepare financial analyses at more frequent intervals than in previous years. In these difficult



Joe Crooks

times, we have found these additional reports to be very beneficial.

We have experienced some financial relief based on our policy to broaden the base of AWI's income source designed to relieve the burden of total dependence on members' dues for operational monies. Harold Herman, Editor, and Maury Norrell, Managing Editor, of AWI's *Horological Times*, have strength-

ened the financial position of this publication with increased circulation and advertising during this fiscal year.

Another major thrust has been launched to generate additional income through increased activity in the publishing field. On April 1st, we began to make delivery of the new *Questions and Answers of and for the Clockmaking Profession*. This book, authored by three outstanding contemporary horologists, Joseph G. Baier, Ph.D., CMW, James L. Tigner, CMC, and Marvin E. Whitney, CMW, CMC, brought the following comment from Henry B. Fried: "The authors and editors have done their homework on this three-year effort. It is authoritative and can be highly recommended as one of the best books on clockmaking, equally useful to the professional clockmaker and the novice." The book is now available at a price of \$10.95.

Several other works, soon to be

(Continued on page 45)

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Our Readers Write

THE CALL OF DUTY

In reference to your comments on import duties in the March editorial, I would like to add that the American Watch Association, of which Helbros Watches is a member, takes an active part in duty discussions.

Your readership should be told that a reduction in duty of watch parts has taken place, and by the year 1984, will have been reduced to approximately 11%, or half of the 1979 duty. Balance wheels, plates, jewels, etc. will also have duties substantially reduced, although the cost of parts may go up as everything else does.

Ralph Kalichman
Director of Operations
Helbros Watches, Inc.

Editor's Reply—My March editorial was prompted by information I had received from the WMJA. I was unaware that

action was being taken to alleviate the duty by 1984. That is progress, but I'm sure all concerned would like to see faster action. However, that does not diminish the positive action taken by the American Watch Association. Congratulations to you, to Bert Lowe, and the others involved.

ANOTHER CALL

I just wanted to write and tell you of the response to an inquiry I made to AWI regarding American-made watches. On March 22, I received a phone call from Mr. Jerry Jaeger of Sheboygan, Wisconsin, who is one of AWI's directors. We talked at length about the non-availability of watches made in the U.S., and the reasons for this situation. I enjoyed talking to Mr. Jaeger. He answered all my questions and we had a nice conversation. I appreciate your referring my inquiry to him.

John Gredler
Janesville, Wisconsin

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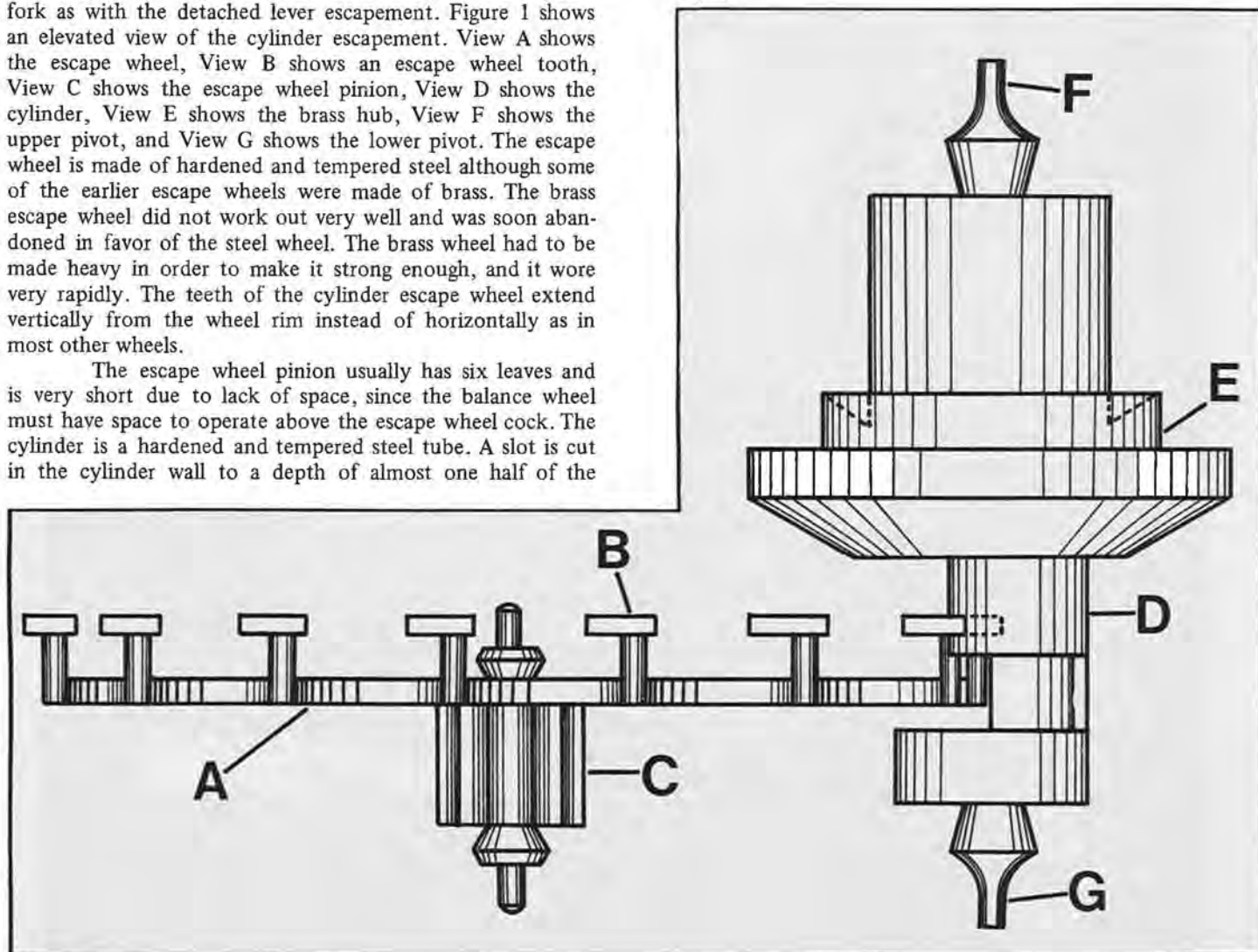
The cylinder escapement was invented in 1695 by Thomas Tompion, Edward Barlow, and William Houghton. This escapement was improved by George Graham in 1720. Although the cylinder escapement is not manufactured any more, there are many valuable antique watches and clocks that have cylinder escapements. These watches and clocks need restoration from time to time; therefore, there is a need for the watchmaker and clockmaker to learn about these escapements and how to restore them.

The cylinder escapement is a dead-beat escapement of the frictional rest type. The teeth of the escape wheel continually rest on the cylinder except for a short time during the drop. This design makes it unnecessary to use a pallet fork as with the detached lever escapement. Figure 1 shows an elevated view of the cylinder escapement. View A shows the escape wheel, View B shows an escape wheel tooth, View C shows the escape wheel pinion, View D shows the cylinder, View E shows the brass hub, View F shows the upper pivot, and View G shows the lower pivot. The escape wheel is made of hardened and tempered steel although some of the earlier escape wheels were made of brass. The brass escape wheel did not work out very well and was soon abandoned in favor of the steel wheel. The brass wheel had to be made heavy in order to make it strong enough, and it wore very rapidly. The teeth of the cylinder escape wheel extend vertically from the wheel rim instead of horizontally as in most other wheels.

The escape wheel pinion usually has six leaves and is very short due to lack of space, since the balance wheel must have space to operate above the escape wheel cock. The cylinder is a hardened and tempered steel tube. A slot is cut in the cylinder wall to a depth of almost one half of the

THE CYLINDER ESCAPEMENT*

Figure 1



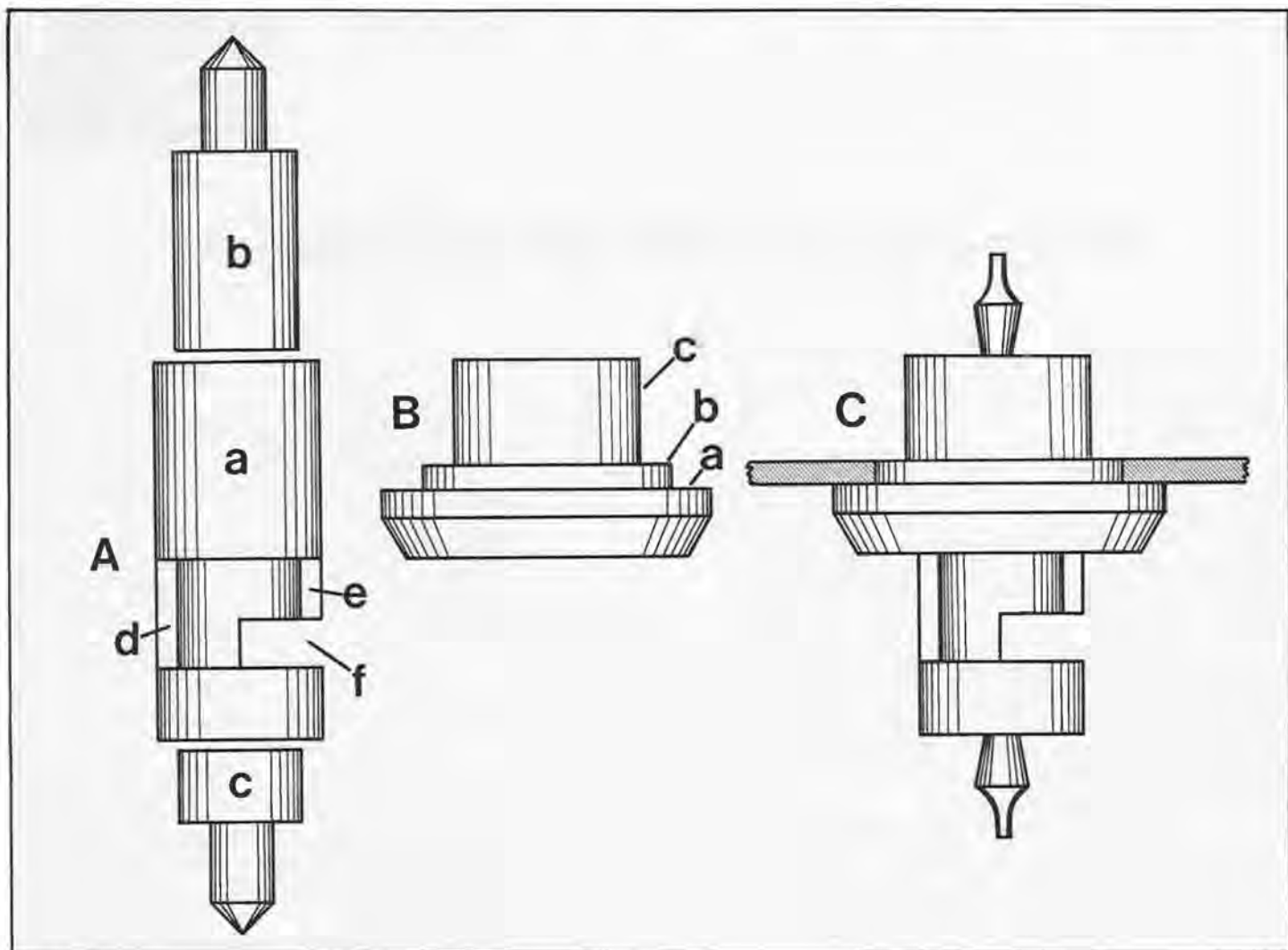


Figure 2

cylinder diameter. This slot allows the escape wheel teeth to act on the outside and inside of the cylinder. An additional slot is cut just below this slot to clear the rim of the escape wheel when the teeth are acting on the inside of the cylinder. This slot must always be wide enough to allow the rim of the wheel to have sufficient clearance. The rim of the wheel should always be centered in this slot. Figure 2 shows the cylinder and its parts. View A shows the cylinder before it is pivoted and fitted to the balance wheel. Part "a" is the cylinder, part "b" is the upper plug, and part "c" is the lower plug. Point "d" is the receiving impulse face and point "e" is the discharging impulse face. Point "f" is the groove that gives clearance for the rim of the escape wheel. The cylinder plugs "b" and "c" are pressed friction-tight into the ends of the cylinder. The pivots are made and finished after the plugs have been inserted into the cylinder. This gives assurance that the pivots will be true with the cylinder. View B, Figure 2 shows the brass hub that is frictioned onto the cylinder to support the balance wheel and hairspring collet. Point "a" is the balance seat. Point "b" is the riveting shoulder, and Point "c" is the hairspring shoulder. View C of Figure 2

shows the cylinder completely assembled to its hub; the balance wheel is staked on and the pivots have been made and finished.

Figure 3 shows the names of the different parts of the escape wheel tooth and cylinder. The escape wheel tooth shown at A has the following parts: Point "a" is the heel of the tooth, "b" is the impulse face, "c" is the toe of the tooth, "d" is the top of the tooth, and "e" is the pillar of the tooth. The cylinder shown in View B has the following parts: Point "f" is the outside wall of the cylinder, "g" is the inside wall, "h" is the receiving impulse face, and "i" is the discharge impulse face.

Figure 4 shows the action of the escape wheel teeth on the cylinder. Let us assume that an escape wheel tooth has just locked up on the outside of the cylinder as at "a," Figure 4. The balance wheel continues to travel in the direction of the arrow. The escape wheel tooth continues to slide on the outside of the cylinder, as in View "b," until the balance wheel reaches the extent of its swing. Then the balance wheel reverses in the direction of the arrow in View "c." When the

(Continued on page 54)



Lever Clock Without Hairspring

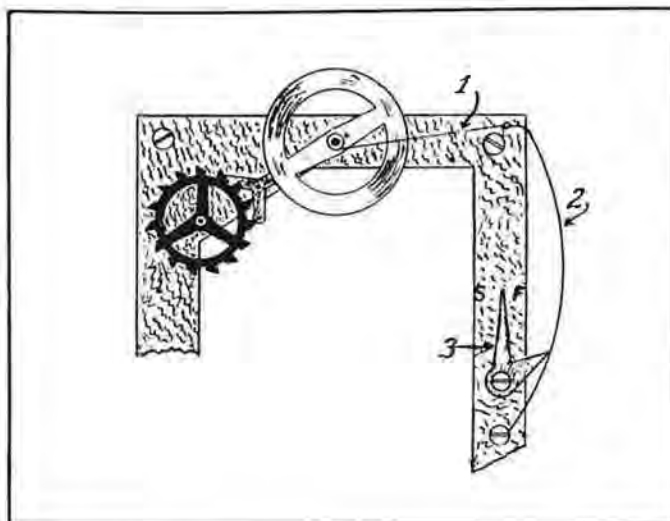
The accompanying illustration shows a device whereby the regular hairspring is entirely eliminated from the clock. The substitution device is easily constructed and using it to replace the hairspring is simple and effective.

The arrangement consists of a silk cord, (View 1 in the drawing), a very fine wire spring (View 2), and a cam, or regulator (View 3). A silk cord is attached to a small roller on the balance staff. The point of attachment for the cord on the roller is such that when the impulse jewel is in the center of the fork slot, the pull of the cord is slack.

When the clock is set in motion, the silk cord will wrap itself around the roller. The tension of the spring (View 2) will return the balance to center when the balance again receives an impulse, the silk cord being wrapped around the roller once more in the opposite direction. This action is continuous, the same as though a hairspring were employed.

The timing of the clock is accomplished by the regulator. When moving the regulator toward the fast side, it will increase the tension of the spring and the speed of the balance increases naturally. Decreasing the tension of the spring will decrease the speed of the balance.

This is an interesting experiment and perhaps some of our readers will try it out.



unashamed and unafraid to bring in problems for instruction where new methods of handling the customer would be taught, etc. There is a fertile field for fraternal activity in every guild.

To those who express indifference toward the guild, I would remind them that generally they are men who think enough of themselves and their families to protect themselves with as much life and accident insurance as they can carry; they pay dues to all kinds of mystic and secret fraternities, subscribe to a number of charitable and church societies, and a number of nonsensical campaigns which they themselves do unwillingly. However, to the most important of all fraternities they remain indifferent. How long can a watchmaker, indifferent and listless, careless and abusive toward his mode of livelihood, retain the respect of his customer and his community? By being alive and enthused with his work and interested in his fellow watchmakers, he can instill a like feeling in his customers and friends to the good and success of his business.

Above all, it must be remembered that we as watchmakers are going to be attached to our benches and loupes the rest of our useful days. Why not learn to respect our work, take pride in it, learn all we can every day, and keep up with the times? And the times demand of us that we maintain membership in AWI and learn to understand our fellow workmen!

Now, a word to . . .

THE FELLOW WHO HAS NOTHING LEFT TO LEARN

There are still a great number of watchmakers who have gotten lost in the rut of self-esteem without giving much thought to the fact that the trade is leaving them behind. New standards of perfection, new methods of timing, new materials, and new tools are all of utmost importance to the well-being of the workman, and still there are watchmakers who refuse to share experiences and confidences with others.

The most important steps in the life of the trade are the institutional plans of the guilds wherein every guild will engage in the teaching and discussing of the various phases of our work. Here one should feel



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Chemical Hazards For The Horologist

By
Stephen A. Sheldahl

This article comes to us from AWI member Stephen A. Sheldahl of Littleton, Colorado. Mr. Sheldahl, an engineer with Western Electric of Denver who holds BS and MEE degrees, has compiled and contributed this important information in order to help fellow horologists choose safe chemicals and safe procedures for their work. We trust that all AWI members will avail themselves of this opportunity to update their knowledge in the rapidly advancing area of chemical safety.

Today we know that most of the chemicals which a horologist might have a need or desire to use are toxic, in some degree, to the human body. How toxic is toxic? It depends upon a combination of the degree of the exposure plus the duration. The professional horologist who deals with these chemicals day in and day out has a different and obviously more serious problem than the once-a-week hobbyist. However, it may be the hobbyist who is most prone to a serious accident due to the lack of knowledge and the lack of consistent activity in handling dangerous chemicals.

I have seen a number of articles and discussions pushing the use of non-flammable chemicals (such as methylene chloride for paint and varnish removal) to eliminate the obvious fire hazard. However, that does not mean that the non-flammable chemical is safe to use without other safeguards. To go back to the methylene chloride example, though it will not burn, it will decompose and emit deadly phosgene gas if it is heated enough. Also, though ventilation is not necessary to eliminate the chance of explosion or fire, use of methylene

chloride in a closed area can result in both short-term (anesthetic and narcotic) and long-term (a buildup of carbon monoxide in the blood) effects.

Most commercial containers of the common solvents carry warnings about proper ventilation and contact with the skin. Proper ventilation means that clean air is blowing toward the user from the side or rear while contaminated air is moved away from the body. In some cases, however, if you can smell the chemical, the concentration is already too high. Most of these chemicals are meant to dissolve something, usually paint products, grease, or dirt. Obviously, the skin's natural oils and greases are equally soluble. Removal of these protective oils can lead to skin problems. More subtle is the ability of the body to absorb chemicals through the skin directly to the blood. Therefore, going to the effort of creating a well-ventilated room can be overshadowed by using bare hands to handle the parts in the chemical. Special note will be made of those chemicals especially susceptible to being absorbed through the skin.

Of course, dangerous chemicals should not be swallowed. Though I would not expect a repair person to chug-a-lug a can of acetone or methanol, all dangerous chemicals must be kept out of the reach of children. This is especially true of the home-based basement or garage shop.

In order to get a feeling for the relative (and sometimes absolute) danger of the common chemicals used as paint and varnish removers, cleaners, and solvents, one must look at many properties and industrial limits. Entire books are written about such properties and limits and how to interpret each of them. One such set of limits with discussions of their uses and dangers is published by the American Conference of Governmental Industrial Hygienists

(ACGIH). The limits are called Threshold Limit Values (TLV) and are broken into two parts as follows:

TLV-TWA This is the Time Weighted Average or the maximum allowed average concentration for a worker under constant 8-hour-a-day, 40-hour-a-week exposure.

TLV-STEL This is the maximum concentration allowed for widely spaced 15-minute exposures. In most industrial applications, these two limits must both be met in order to protect the worker.

Note that the Maximum Allowable Concentration (MAC) value is out-of-date and no longer used.

For the chemicals discussed in this article, the 1980 TLV's are those listed. Those with an asterisk (*) after the TLV indicate that new, lower thresholds are being proposed. Also listed will be the Closed Cup Flash Point (CCFP) which is an indication of the relative degree of flammability. When the explosive danger is mentioned, it assumes the presence of open flame or other source of ignition. This could mean the hot water heater pilot light, furnace, or the arc from the lathe motor brushes.

For the most part, these limit values alone tell no story. The limits are set for different reasons for different chemicals and, therefore, more information is needed to determine the relative toxicity or danger. In some cases, industrial limits are set to simply prevent daily irritation. In other cases, the limit is set to prevent either an immediate loss of a function or a buildup in the body of a long-term poison. And, in some cases, a very low limit is set to show that the chemical has highly poisonous or carcinogenic properties. For each chemical, I summarize the 1980 data as published by the ACGIH as well as data taken from the 1968 edition of *Dangerous Properties of Industrial Materials* by N. Irving Sax. Included in

the summary are comments on how the chemicals affect the body and whether the problem is that of a short-term or long-term nature.

The chemicals are listed by as many of their common names as possible. For example, benzene is benzol, phenyl hydride, and coal naphtha, etc., while benzine is also naphtha VM&P, and petroleum spirits. Such subtle name differences often are the difference between a relatively safe solvent (petroleum spirits or benzine) and a hazardous poison (benzene). I surely cannot guarantee that all of the names are listed, since that would be as hard as finding all synonyms for a common word in the dictionary.

These chemicals are often found in the market place as mixtures of many different things. For example, paint removers are often various mixtures of methanol, petroleum spirits, acetone, toluol, and methylene chloride. Therefore, the stripper can range from being very flammable to fully non-flammable. Though in all cases a user would want to use gloves to protect his hands from the remover, the addition of the non-flammable, relatively safe methylene chloride causes most common vinyl gloves to dissolve. Clock and watch cleaning solutions, such as the L & R Manufacturing Company products, are also mixtures of a number of things. L & R does not define the contents, but does state that the very dangerous chemicals are not present and that they will provide estimated TLV data. In the case of all mixtures, the danger level changes from that of either of the individual elements, and the safety precautions should probably be those for the most dangerous component in the mix.

Those chemicals which are most likely to find their way into the watch and clock shop will now be listed with their TLV statistics and also their CCFP numbers when applicable. We will begin with the most dangerous chemicals—those which should be avoided at all costs—and proceed through chemicals which can only be used with strict precautions to those which can be recommended for everyday use. Please note that the abbreviation "p.p.m." stands for parts per million.

VERY DANGEROUS SOLVENTS AND CHEMICALS

The following solvents and chemicals are very dangerous. Some are carcinogenic, many are highly flammable, and all

cause serious problems to the body. Their use cannot be recommended at all.

Benzene (Benzol, Phenyl Hydride, Coal Naptha, and many other names)

TLV-TWA	10 p.p.m.
TLV-STEL	25 p.p.m.
CCFP	12°F

(Benzene's odor cannot be detected until concentrations reach about 100 p.p.m.)

Benzene is a solvent and thinner which is very seldom used commercially. When inhaled or absorbed through the skin, it first causes a narcotic effect. It then attacks bone marrow where blood cells are created. It is a suspected carcinogen, especially for leukemia. It is also highly flammable.

Chloroform (Trichloromethane)

TLV-TWA	10 p.p.m.
TLV-STEL	50 p.p.m.
Non-flammable	

Chloroform is an industrial solvent whose use was well-known as an anesthetic and dry cleaner. It first attacks as an anesthetic and then can cause damage to the heart, liver, kidneys, and affects offspring. It is a suspected carcinogen.

Carbon Tetrachloride (Tetrachloromethane)

TLV-TWA	10 p.p.m.*
TLV-STEL	20 p.p.m.
Non-flammable	

Carbon tetrachloride, once common as a solvent and dry cleaner, is very seldom used now. It is highly toxic when inhaled, causing headaches, giddiness, and liver dysfunction. Liver and kidney failure have been known to occur even after very low concentrations have been inhaled. It is also a suspected carcinogen. Carbon tet emits phosgene gas if heated to decomposition.

1, 1, 2-Trichloroethane (Vinyl Trichloride)

TLV-TWA	10 p.p.m.
TLV-STEL	20 p.p.m.
Non-flammable	

Vinyl trichloride is used as a solvent for fats and resins. It is more potent than chloroform as a nervous system depressant. It can kill in large concentrations by respiratory arrest.

Mercury

TLV-TWA	approx. .007 p.p.m. (vapor form)
TLV-STEL	approx. .02 p.p.m.

Mercury, found in pendulums of large floor clocks and French clocks,

is a very dangerous substance. It is absorbed through the skin as easily as the vapors are inhaled. *Extreme care* must be used in handling mercury because of its deadly qualities. If mercury is spilled, fumes will be generated for a long time in spite of efforts to clean it up. This is especially true of spills onto porous surfaces such as carpet or concrete.

Lead

TLV-TWA	approx. .02 p.p.m.
TLV-STEL	approx. .06 p.p.m.

Lead is often melted to pour molded parts or weights. *Extreme care* must be used. *Extreme ventilation* is required if lead fumes are present.

When combined with tin to form solder, the problem is still present, but the time of exposure and temperatures used reduce the hazard somewhat.

DANGEROUS SOLVENTS

The following substances can be very dangerous if not used properly. Long-term effects are often very serious. Though these items can probably be used safely with good ventilation and skin protection, there are safer chemicals for ordinary users.

Perchloroethylene (Tetrachloroethylene, Carbon Dichloride)

TLV-TWA	100 p.p.m.*
Non-flammable	

(Odor can be detected about 50 p.p.m., sometimes as low as 5 p.p.m.)

This very common solvent and cleaner is now becoming suspect as being more dangerous than previously thought. It primarily causes nervous system disorders such as dizziness, vertigo, and unconsciousness. It also causes eye irritation. Long-term effects include problems with the liver, heart, kidneys, and skin. It enters the body equally easily through the skin and when inhaled. Short term exposure appears to be not too bad. Studies are in progress regarding its effects as a carcinogen, but no findings are available to prove it one way or the other. If heated to decomposition, it can emit highly toxic chloride fumes.

Trichloroethylene

TLV-TWA	100 p.p.m.*
TLV-STEL	150 p.p.m.
Non-flammable	

(Odor can be detected at levels of about 100 p.p.m.)

Trichloroethylene is used as a
(Continued on page 59)

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Antique Gilbert Calendar Clock

(Circa 1880)

This unusual spring-wound 8-day clock with a simple calendar mechanism is housed in a walnut case typical of the Victorian era. A patent date of June 3, 1879 is stamped on it, and the clock was manufactured by the William L. Gilbert Clock Company of Winsted, Connecticut. Figure 1 shows the actual clock on the wall.

The backboard shows a penciled repair date of 4-27-87 and a corresponding repair initial, E.G.H., in fancy script.

Clock collectors may notice a similarity in the case style between our clock and the famous, much sought-after Gilbert "Columbia" model. Replicas of the "Columbia" clock are commonly produced today. Not always reproduced today, however, are duplications of the original reversed stencils on the front glass panel. Our clock has the original reversed silvertone stencil with a stork motif.

The going (time) and striking trains are generally similar to the standard American movements described in previous articles. One special feature, however, is the wide arc of motion of the pendulum. This can be attributed to its deep-locking, large diameter (1-5/16 in.), 34-toothed escape wheel which engages with a common steel strip anchor pallet. This is the same escapement design used by the Gilbert Company in so many varieties of their clocks, including their ladder chain movements and floor clocks.

The specific unusual feature of this movement, however, is the simple calendar gearing arrangement situated immediately behind the front plate (Figure 2). This arrangement is comprised of three extra gears, and we shall endeavor, via our sketch (Figure 2) to explain how this works.

The hour wheel is indicated as "a." Situated between the hour wheel and the front clock plate is the calendar wheel (b). Attached to the front of the

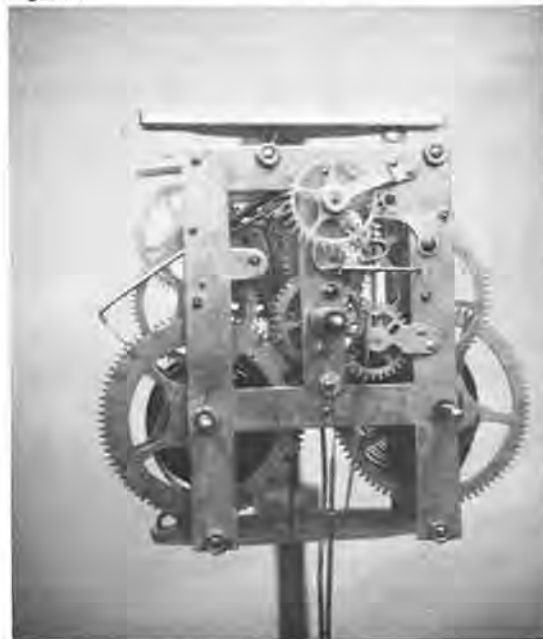
hour wheel, however, is a small gear (c) which, rotating with the hour wheel, makes one revolution in 24 hours. This gear (c) itself meshes with an intermediate wheel (d) which is retained by a bridge (e). The intermediate wheel, therefore, will also rotate once every 24 hours. On a disc attached to the intermediate wheel is a steel pin (f). Once every 24 hours, this steel pin engages with the calendar wheel (b) previously mentioned and rotates it one tooth. To keep the calendar wheel in position and prevent slippage, a brass retaining spring (g) holds it in position. A brass tubular extension of the calendar wheel protrudes through the front plate, encompassing the hour wheel tube and center arbor. The calendar hand is attached to this extension.

The pallet is mounted on a separate lower brass bridge (h). This bridge is secured to the front plate by a steel rivet. The top pivot of the pallet

Figure 1



Figure 3



Essence of Clock Repair

is held in position by a thin steel strip (i), this being lightly tensioned against the pivot and acting as an upper bridge.

The count wheel (j) and count hook (k) on this model may be observed to be heavily defined, the count wheel being of large diameter (2-5/8 in.) and well-slotted to accommodate the fall of the thin-bladed count hook at the hours and half-hours.

The striking hammer arm (not shown in sketch) resides behind the pendulum leader (l) and emerges from the bottom of the movement. See Figure 3. The suspension spring forms the upper part of the pendulum leader and is shown fixed to the center of the front plate.

The striking hammer arm may be bent for adjustment. However, a remarkable special feature has been added

with the incorporation of an adjustable block carrying the gong. This is not shown in our sketch. However, the gong unit is mounted on the inside of the clock's backboard and may be rotated to its correct position and locked by a set screw positioned in the block.

Figure 2 is a diagrammatic sketch showing the layout of the main components as shown from the front plate. All the parts mentioned (a, b, c, d, e, f, g, h, i, j, k, and l) are marked. The steel pin on the intermediate wheel disc (f) is marked with an arrow for the purpose of clarity.

The brass retaining spring (g) is held at its upper extremity by the bridge (unmarked) residing under the escape wheel to the right. It may be followed down to a notch, curling behind

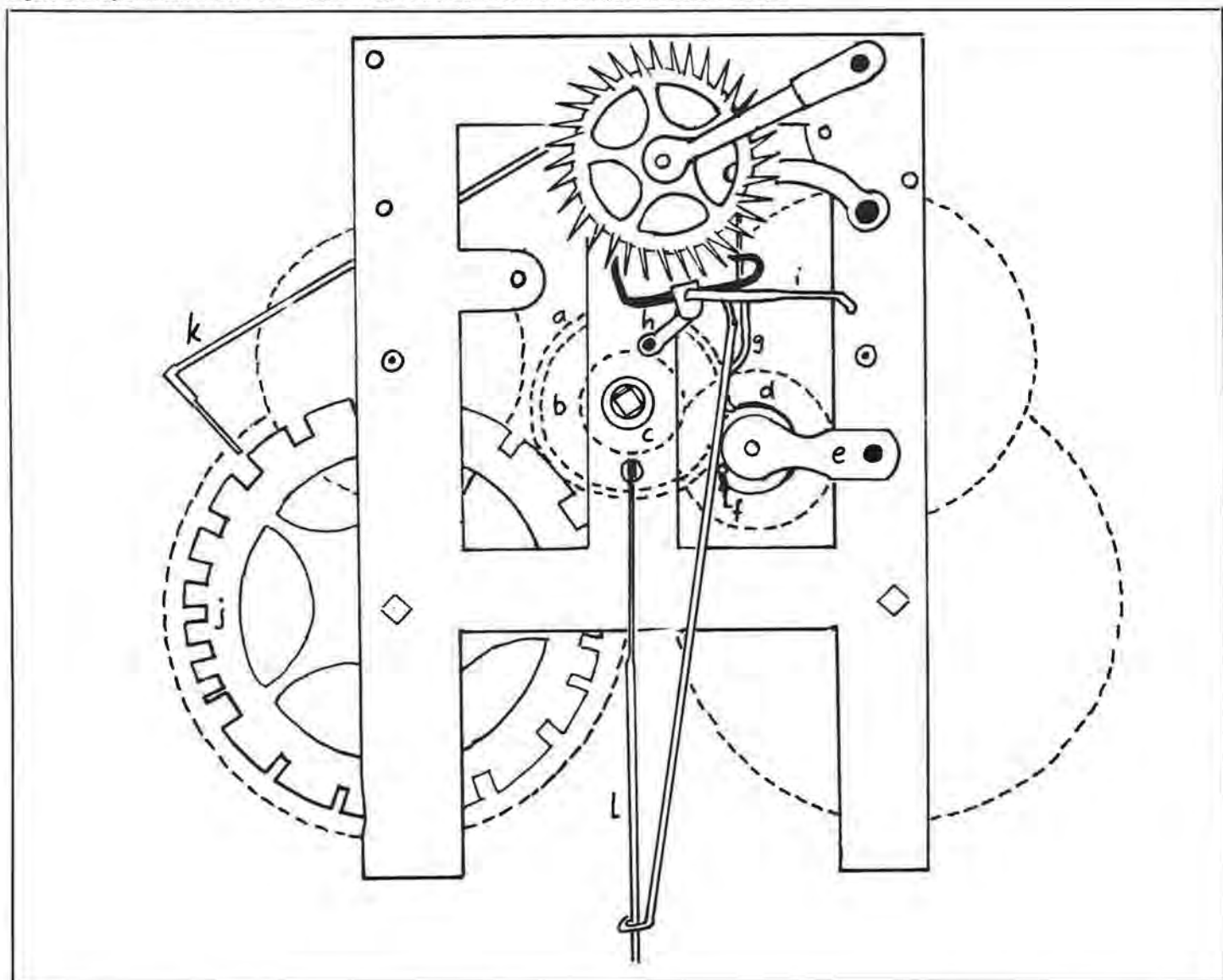
the pallet arm. The tip of the notch is shown in the sketch close to the intermediate wheel disc. The brass pallet arm, riveted to the strip steel pallet at its upper extremity, can be observed lightly hooked around the pendulum leader at its lower end.

Figure 3 is a photo of the actual movement held in a clamp, showing the front plate. One may wish to compare it with the sketch, Figure 2, for component identification.

This movement was loaned to us for this article by Stan Warren, one of our excellent young mechanics. Stan is also a collector and a knowledgeable historian. Our thanks go to him, therefore, not only for the loan of the clock, but also for his help and knowledge in the preparation of this particular article.

THE

Figure 2. Diagrammatic Sketch of Antique Gilbert Calendar Clock. Scale: Approximately Full Size



WMJDA Looks Ahead To A New Decade

The Watch Material and Jewelry Distributors Association took a look into the future of their organization during their annual convention held at La Costa, near Carlsbad, California, March 24-28. The theme of the meeting was a look "Into the 80's." President John Cassedy, of the Cas-Ker Co., Cincinnati, Ohio, reported that the group's membership continued to grow, with a record turn-out present at this year's convention. However, he sounded a note of warning that the distributors must concentrate on building a close personal relationship with the retailers in their areas and stress service and convenience to the customer if they are to continue to be a vital part of the marketing pattern in the years to come. (See adjoining page for Mr. Cassedy's complete message.)

A new slate of officers was elected to govern the group for the next two years: Karl Esslinger, Esslinger & Co., Inc., St. Paul, MN is the new President; Dominic Priore, Niagara Jewelry Supply Corp., Buffalo, NY is First Vice-president; Denis Gaber, Ray Gaber Co., Pittsburgh, PA is Second Vice-president; Robert Mahar, Mahar & Engstrom Co., Inc., Boston, MA is Third Vice-president, and Edward Soergel, The E. & J. Swigart Co., Cincinnati, OH will serve as Treasurer.

The business meetings featured the importance of implementing a plan for internal security and the value of computers in running a more efficient distributor operation. Chris Gugas, Sr., Director of Professional Security Consultants in Hollywood, CA urged that distributors, and retailers as well, tighten up their present internal security procedures to reduce pilferage by employees and shoplifting by customers. He recommended a pre-employment polygraph examination, among other measures, to check out a prospective employee. He stressed that profit margins are so small these days that a businessman cannot afford to let any of his profits slip out the back door.



New officers selected to guide WMJDA for the next two years are shown above. (Front row, left to right) Edward Soergel, Treasurer; Karl Esslinger, President; Dominic Priore, First Vice-president. (Back row, left to right) Robert Mahar, Third Vice-president and Denis Gaber, Second Vice-president.

The second feature on the business program was a presentation on "Computers and Computer Programs for Distributors." Gregory S. Staszko from Main, Hurdman & Cranstoun in Cincinnati, Ohio, headlined this portion of the program.

Special events included a luncheon recognizing William J. Kilb, Kilb & Co., Milwaukee, Wisconsin, who was selected as the WMJDA's "Man of the Year." Curtis Mick, retired executive with L. & R. Manufacturing Co., Kearney, New Jersey, was the honored guest at the annual Awards Reception and Banquet which was held on Saturday as the convention officially ended.

The 1982 gathering will be held at the Greenbriar in White Sulphur Springs, West Virginia, March 2-7. (See page 36 for more Convention news.)

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WMJDA President's Report

Outgoing President John Cassedy made the following remarks to open the annual meeting of the Watch Material and Jewelry Distributors Association, held at Rancho La Costa, California last month. We believe the report should be of interest to all our readers.

Good Morning!

It is with both satisfaction and a degree of concern that I address you today. I believe it is my obligation, as President, to review and evaluate the position of the WMJDA, and to project some thoughts as to how we could improve this association.

The good news is that we are a sound and vigorous organization. Membership is steady and growing, with a healthy attendance record at the annual conventions. Our financial condition is sound, as you will hear in the Treasurer's Report. We have an excellent group of executives serving as directors.

The bad news, if we care to call it that, is that I don't believe we are using WMJDA's capabilities to full potential.

Obviously, our overall mission is to make our businesses profitable and keep the distribution function under our control. When suppliers are seeking distribution of their products, it is important that they desire to have WMJDA members cover their market.

Let us review some history about the concept of marketing with distributors. Over the past half century there has been considerable business literature concerning the value added to the economic system from functions performed by independent distributors—often called middlepeople, wholesalers, jobbers, or resellers. L. D. H. Weld wrote in 1917, "Elimination of middlemen . . . does not mean the elimination of marketing functions, which still have to be performed."

42 years later, R. D. Buzzell wrote in 1959, "Eliminating the so-called middleman, it is now understood, does not eliminate the economic functions performed, nor necessarily reduce the costs associated with those functions."

Another 10 years later, R. S. Lopata wrote in 1969, "Manufacturers have evaluated distribution alternatives, tried them out, and later abandoned these attempts to 'eliminate the middleman.' They have learned, albeit at substantial tuition fees, that they can eliminate the middleman, but they cannot eliminate the economic function of



wholesaling."

The services that we have to perform are in some manner marketing functions. Many do not stop to think and realize the complexity, the difficulty or the expense in performing them. It is up to WMJDA to continue to illuminate the thinking to be certain that we as members, realize who we are and what must be, and that the message and image are transmitted to those companies that need and should use our services.

We carry a tremendous load for the operations of the manufacturers, importers, and suppliers if we perform well, and, as a group, furnish good distribution of their products in all markets.

Let's list a few areas that we can cover:

1. Buy and sell merchandise to have good lines.
2. Sell principally to retailers.
3. Usually carry stock on hand.
4. Purchase in large quantities and redistribute in smaller quantities.
5. Extend credit to retailers.
6. Usually have salespersons or representatives covering the market.
7. Make shipments and deliveries.
8. Often service merchandise sold and render advice to customers.

And, probably most important, is the close personal relationship with customers that has value beyond any pricing, shipping, or whatever services. I repeat; we as distributors are specialists in the performance of a vital marketing function.

WMJDA, in my opinion, has done a creditable job in establishing a forum for exposing ourselves as buyers through our associates program. This convention is more than just an enjoyable get together of friends and competitors in similar businesses. It is:

- A. The voice of the wholesaler/jobber, i.e., the industry barometer of business conditions.
- B. The place for associate members to contact their customers in one central area.
- C. The place where we can find resources or supplies that we might need to round out our lines.
- D. The place where we can address issues with major suppliers.
- E. It is the place, since we are mostly independent entrepreneurs, where we can share ideas on perpetuation of our businesses and learn about maximizing our family estate holdings.
- F. The place where we can get information on how to improve our business practices.

I can go on and on, but would like to pause so we can ask ourselves if we, as a group, shouldn't have more interest in the visitations that went along so well for a couple of years, and shouldn't we be developing more business seminars on such topics as computers now that they are almost a must in most businesses?

Internal theft, shrinkage, or embezzlement does exist. You can close your eyes to it, but that will not make it disappear.

Some of us will learn things from Mr. Chris Gugus' presentation which will enable us to eliminate a substantial amount of shrinkage at savings of thousands of dollars a year. The computer programs to be presented could quite conceivably guide you to a sound decision rather than a bad one on the use of a computer by your firm. The cost of a bad decision on an initial computer installation can run into five or six figures.

What you learn here could be extremely valuable in helping you to reach a correct decision.

We have the vehicle in WMJDA to expand into more areas . . . if it is important. By spreading the costs of a good seminar, it is really quite minimal for the group compared with going it alone.

Are we taking enough business time to expand for our own good?

We are, I repeat, a sound and vigorous organization. WMJDA continues to improve its position and its image. With each of us being more concerned about how we can use WMJDA, we can and should expand our position. I thank you for your support during my presidency and I sincerely hope we have all grown stronger!

Questions and Answers / Henry B. Fried

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



Duplex Escapement Watches

Q I have a problem for the Question and Answer Department. I have a 6/0 size watch, model SS, made by "The New England Watch Company." This watch has the duplex escapement with 13 long teeth and 13 short teeth on the escape wheel. The hairspring is virtually gone. Can you furnish information as to how many beats per hour the balance must operate to have a new hairspring vibrated? I figured to the gears that it should be 18,345.6, but this is an odd number, so it must be wrong.

Also, could you recommend a firm that can vibrate a new hairspring?

Thank you.

Don E. Dohler
Madison, Wisconsin

A You did a very good job of figuring out the vibration rate for your New England Watch Co. model. The actual vibration rate, according to my records, is 18,365. Have it vibrated to as near to that as possible and you'll be in business again.

For those who may read this in the *Horological Times*, here are the other New England Watch Co. vibration rates:

Series I-J	17,160
L-G	17,718
S-	18,480
Z-	18,803
K-R-B-N-O	18,000
A-X	17,850
S-S	18,365
T-M	18,000

All of these, as you know, used the duplex escapement, now being discussed in a three-installment series in *Horological Times*. [See page 26—ed.]

Q I have a 16-size United States Watch Co. pocket watch. I cannot find this listing in any of my new or old manuals.

I need to get a balance staff for it. If you could shed any light on my

problem it would be appreciated.

Thank you.

Robert White
Angleton, Texas

A The United States Watch Company was one of two companies, both with the same name. The first was established in 1864 and was situated in Marion, New Jersey, across the river from New York City. Those products made in New Jersey find more devotees among collectors than the products of the other company, which was situated in Waltham and not at all associated with the Waltham Watch Company.

High grade movements were produced by the New Jersey firm, some with a butterfly-shaped opening to reveal the escapement.

The company in New Jersey failed in 1872, and was reorganized as the Marion Watch Company. That company too failed in 1874, its equipment being sold to the Auburndale Watch Company, the Fitchburg Watch Company, the Independent Watch Company, and the E. F. Bowman Company of Lancaster, Pennsylvania.

The United States Watch Company of Waltham was started in 1884. Their first model was a 16-size stem winder. Its center plate was raised in a step so that the center wheel would have clearance above the barrel. They continued until 1896. However, a United States Watch Company, which was, in a way, a continuation of the Waltham-based company, bought some of the original company's equipment, and bought some equipment from the Howard Clock Company which had also been bought from the Waltham-based company, and then turned around and sold it to the same-named New Jersey company. Then, to make things even more complicated, the New Jersey company sold or moved the equipment up to Waltham. That enterprise ended about 1903.

A firm by the name of Suffolk Watch Company marketed some models which I've seen and suspect were the products of the New Jersey company. These had duplex escapements with

milled out escape teeth, different from those of the New England Watch Company.

If all this seems complicated, believe me, it is. However, to tell you which factory your movement is from, a photograph of good quality and size would have to be examined. At any rate, staffs are no longer available and would have to be made.

Q I am interested in a reference book that describes the clocks built by Achille Brocot (1817-1878) of Paris.

The only references that I can find describe the suspension that he invented, but he also must have made clocks. I understand that his trademark is recorded as an AB inside a five-pointed star.

I have a bronze mantel clock with a rectangular plate, French-type movement, time and strike, with rack and snail chiming train. The back plate is marked with a five-pointed star with an "A" on one side and a "B" on the other, inside an oval. The top of the regulator gear and the suspension spring are plainly marked "Brocot."

All this leads me to believe that the clock was made by Achille Brocot. Is there a book that describes his clocks? If so, is it available to members through the AWI lending program? Thank you.

Melvin S. Kaye
Short Hills, New Jersey

A There is no book on the work of Achilles Brocot itself. There have been numerous articles on his timepieces and inventions. I would assume that the AB with five-pointed star is the mark of Achilles Brocot, a French horological genius. Tardy's *Dictionnaire des Horlogers Français* has a few words on Achille Brocot. It is mentioned that he was born in Paris in 1817 and died in 1874. He was situated at Rue d'Orleans au Marais in 1840 and at

(Continued on page 49)



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AS 1977-2	5½ x 6¾L	3.60mm		25.40
FEF 6632	5½ x 6¾L			29.10
ETA 2442	6L round	3.20mm		47.30
ETA 2412	6¾L round	3.40mm		26.10
FHF 69-N	6¾ x 8L	3.55mm		18.65
FHF 691	6¾ x 8L	4.10mm	Sweep Second	20.05
ETA 2512-1	7¾L round	2.90mm		25.15
ETA 2551	7¾L round	2.90mm	Auto, Date, Sweep	34.95
FHF 371	8¾L round	4.05mm	Sweep Second	20.95
P 7040	10½L round	3.10mm	Small Second	26.80
FHF 969	11½L round	4.55mm	Sweep Second	17.95
FHF 969-4	11½L round	4.55mm	Sweep, Date	19.80
AS 1951	11½L round	4.50mm	Sweep, Date	20.30
AS 2066	11½L round	5.95mm	Auto, Day/Date Sweep Second	31.50
ETA 2783	11½L round	5.20mm	Auto, Date, Sweep	34.30
AS 5206	12L round	6.50mm	Auto, Day/Date Sweep Second	22.60
UT 6497	16½L round	4.50mm	Small Second	26.35
UT 6498	16½L round	4.50mm	Hunting case type, Small Second	26.35

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CALIBER	SIZE	HEIGHT	FEATURES	PRICE
ESA 102.001	3¾ x 10L	3.50mm	QUARTZ ANALOG	41.60
ESA 961.001	6¾ x 8L	3.50mm	QUARTZ ANALOG	25.65
ESA 960.111	11½L round	4.50mm	QUARTZ ANALOG Sweep, Date	27.30

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THE ROCK QUARRY

By Fred S. Burckhardt



Watch History And Appreciation

The whole thing started in 1500 in Nuremberg, Germany, with Peter Henlein exclaiming, "Sun of a gun! I just invented the first mainspring!" Now, almost five centuries, millions of watches, and thousands of watchmakers later, we look on him as the one responsible for all our troubles. If he came back today and saw all the timepieces we now have, he would probably say, "Sun of a gun! Why did I invent that first mainspring?"

After the invention of the mainspring, the first portable timepieces soon appeared. Up until that time, everyone had carried grandfather clocks around with them. These became very unwieldy, however, especially in a supermarket or on an elevator. This was a great era for Boy Scouts because it gave them something to carry across streets for little old ladies.

Through the years, there have been some very popular watches. One of the first, the "Nuremberg Egg," was appropriately named, as many watch manufacturers have "laid" quite a few since that time. During the Spring, here in Texas, we have a style that is talked about quite often. I've never seen one, but I have heard a lot about the "Tornado Watch." There are also the "Skindiver" watches. These are very handy if you ever want to go diving for skin.

Some watches are made for rugged use. If you need to strap one to your boat propeller, or the wheel of your truck, or drop one from an airplane, it is available. However, it is recommended that you remove the watch from your wrist before doing any of those things in order to spare yourself some discomfort.

Many people are very fussy about their watches. Just the other day, a customer came in complaining because he had just had his watch serviced and it wasn't running. I asked him if he had requested that it run after it was cleaned. He said no, so I told him there would be an additional charge as it wasn't included in the original estimate. He apologized for being so upset, but I told him there was no need for apologies—just see to it that it didn't happen again.

One lady was unhappy because her watch hadn't kept good time since I had repaired it. She said she had owned it for twenty years and never had anything done to it since it

had always kept perfect time. I told her not to feel bad because mine was the same way. It never has run right since I worked on it. She was very understanding and told me if she found a good watchmaker she would let me know.

As we all know, watches have helped us make a good living for many years. After all, what would it be like if we didn't have watches? For instance, think of all the bare wrists and empty watch pockets that would be around. What would you tap on or hold up to your ear to see if it were ticking or humming or making no sound at all? When would people ever get the chance to use the expression, "My darned watch stopped!" How would you know when to feed your pet aardvark? What would you have to look at while you are sitting in church or at some boring meeting? Thousands of customers wouldn't be able to ask, "Is my watch ready yet?" How would you know when to turn on the educational programs on your TV, like "The Gong Show" or "The Beverly Hillbillies?" How would you like to call up the material house and have nothing to say? What would you steal jewels from if there weren't any in watches? How would an apprentice watchmaker learn the trade if there were no watches on which to practice? What would we do with all of our material and equipment if watches had never been invented? Think of the great movies that wouldn't have been made, like "Watch on the Rhine" and "I Was a Teen Age Watchmaker." And how about that famous poet who wouldn't have a middle name—Henry Watchworth Longfellow?

You see, if you just think about it for a few minutes, you will realize all the many benefits derived from people owning watches. On the other hand, there would be some good come out of there not being any watches. Then all the watchmakers who are always complaining about how much money plumbers, carpenters, and electricians make could become plumbers, carpenters, and electricians!

So, Herr Henlein, wherever you are, our hats are off to you. Save us a good spot in that big watch repair shop in the sky. In the words of a famous person, whose name I can't recall, "I never met a watch I didn't like."

Let's see now. I have an appointment at four o'clock, and the big hand is between seven and eight and the little hand is . . .

TIME

A black and white photograph showcasing a variety of watch repair tools and Maxell SR916SW 1.55V Silver Oxide Watch Batteries. The tools include a pair of long-handled pliers, a pair of side cutters, a pair of tweezers, a small screwdriver, a larger screwdriver, a small metal clip, a small metal ring, and a small metal cap. The batteries are arranged in a fan-like pattern, with one battery lying flat in the foreground. The background is a plain, light-colored surface.

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Count on Maxell batteries being easily available from your local watch material distributors. After all, what good is a tool if you can't put your hands on it. Rely on Maxell for quality. Many of the world's leading quality watch manufacturers include Maxell batteries as original equipment. And they recom-

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SIMPLE MEASURING DEVICES

It seems that someplace I read or heard that a watch/clockmaker is as good as the tools that he makes himself. If I did not hear or read it, then I think I just created the statement. However, in either case, it must be taken with a grain of salt, although it does sound rather profound.

Perhaps in the very early days it was true. Apprentices spent time making tools that would enable them to pursue their careers after the apprenticeship obligations had been met. Many of them continued making tools and equipment the rest of their working lives.

When you consider that, by the 18th century, material houses were advertising 160 or more items for the use of watch/clockmakers, the number of individuals making all of their own equipment had greatly diminished. However, craftsmen still made much of their specialized equipment and were extremely talented in adapting items for a particular job.

As you look at the catalogs and equipment available today, it is apparent that less and less is being made. Faced with this situation, let us see how we can adapt some easily obtainable tools into specialized devices for measuring.

Figure 1 shows some old-time calipers that are commonly known as pinion gauges. They are no longer available, and should you want something similar, you would have

to make it yourself. Notice the turned designs at the ends. Decoration was a desirable feature even if not necessary for operation of the item.

Figure 2 shows a tool that is known as a cylinder height gauge, and it was used to measure cylinders when they were being repaired or replaced. It is a small tool about two inches in height and, like so many other tools, is no longer available.

Figure 3 shows a small pair of dividers that are available. A recent sale catalog listed similar ones for \$1.95 each. They are from four to five inches in length.

The first pair was modified by cutting a "V" notch across one of the legs as shown in Figure 4. This was done by filing or grinding one leg short to the point that there was sufficient room to accommodate the notch. A piercing saw was then used to cut the notch centrally and acted as the guide for a three-cornered file which finished the notch. The other leg was then filed down and repointed to the new length.

This divider is shown in use in Figure 5. It is excellent for measuring the tooth spacing on escape wheels, as well as on any other types of gears. The notch fits nicely on the tip of a tooth, and it is a quick operation to check and adjust



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



Figure 7



Figure 8



Figure 9



Figure 10



Figure 11

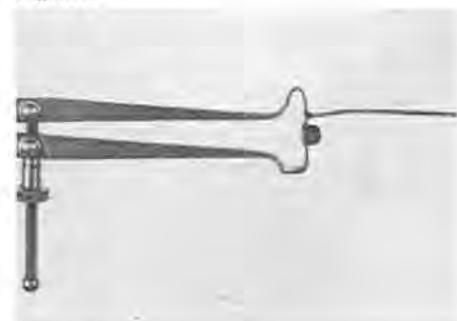


Figure 12



Figure 13



Figure 14



Figure 15

all teeth to the same setting. It is also handy for marking the location of new teeth when a piece of brass has been inserted for replacement of broken teeth in a gear.

Figure 6 shows another pair of dividers that have been altered by flattening one leg and then drilling a cone-shaped hole. The other leg is shortened and repointed to match the length of the leg with the hole. Figure 7 shows the divider in use. Measuring from a hole with a pivot or axle in it can be difficult, but with this type of divider, you place the hole end on the pivot and it is easy to make measurements from that point.

Figure 8 shows a pair adapted to take measurements when one leg is required to rest against a flat surface.

It has always been difficult to take a measurement from the center with a hole larger than the divider's leg. Figure 9 shows a pair of dividers that have been modified for such a task. They are of a type known as inside-out or hermaphroditic dividers and are obtainable from machinists' tool suppliers. The pair pictured came from one of the largest mail order/retail store with retail branches in many cities around the country. The one leg was removed and the piece with the cone on the end made to replace it. This new arm was made

from aluminum, but any other material may be used.

Figure 10 shows the dividers being used to check the outside diameter of the gear for roundness at each tooth. Imagine trying this with straight dividers.

Another handy pair of dividers are shown in Figure 11. These are inside dividers or calipers that have had the outside of the tip filed or ground flat. When they have been adapted to this style, they are used to measure the width between the faces of pallets when opening or closing them during adjustment for lock as shown in Figure 12.

Many times, the dividers available are too large when very small measurements have to be taken. An easy way to get such a pair of dividers is to grind fine points on ruling pens used by draftsmen. These modified pens are shown in Figure 13, and as you can see, there is a fine pointed one and a super-fine pointed one. The super-fine one is being used to measure the teeth on a watch crown wheel shown in Figure 14. The adjusting screw on the pen is very sensitive and small changes are easily made.

The last items are depth gauges. These are some of the easiest items to make. The idea is not original with me, (Continued on page 53)

REPAIRING THE DUPLEX ESCAPEMENT *

PART II

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



This month, we continue our discussion of the repairs required by the duplex escapement.

If the escape wheel's locking teeth are bent, chipped, or blunted, the safety action may be impaired and result in an uncertain impulse action. In this case, the escape wheel will trip prematurely or become jammed as in Figure 1. The thinner the safety post, the more critical is the locking action. Should one or more escape wheel locking teeth be bent, the more likely it is they will trip past the post. Teeth whose tips are dulled, worn, or shortened also will cause tripping.

Bent teeth most often are neither hard nor brittle and are easily straightened with a pivot-straightening tweezer. Hold the bent tooth between the blades and at right angles to the width of the tweezer, as in Figure 2. With mild pressure and slow withdrawing movement, the bends will become straightened.

Stretching shortened teeth can be done by peening between a flat-faced stump held in the staking set and a flat-faced punch of equal diameter aligned as in Figure 3.

The shortened teeth problem

Sometimes one encounters an escapement in which the escape wheel has raced-tripped, shortening all or most of the teeth. Replacements are virtually non-existent and making one is quite an involved undertaking. Even so, it is still possible to use the escape wheel to effect a workable (if not the most desirable) repair.

The staff's locking roller post will have to be increased in diameter to allow the shortened teeth to lock on a thick locking roller post. This can be done by turning a new cylindrical locking roller on the lathe, with a new roller-collar of an increased diameter, and drilling a hole in it which will allow this roller-collar to slip over the roller post friction tight. A passing slit is provided by the

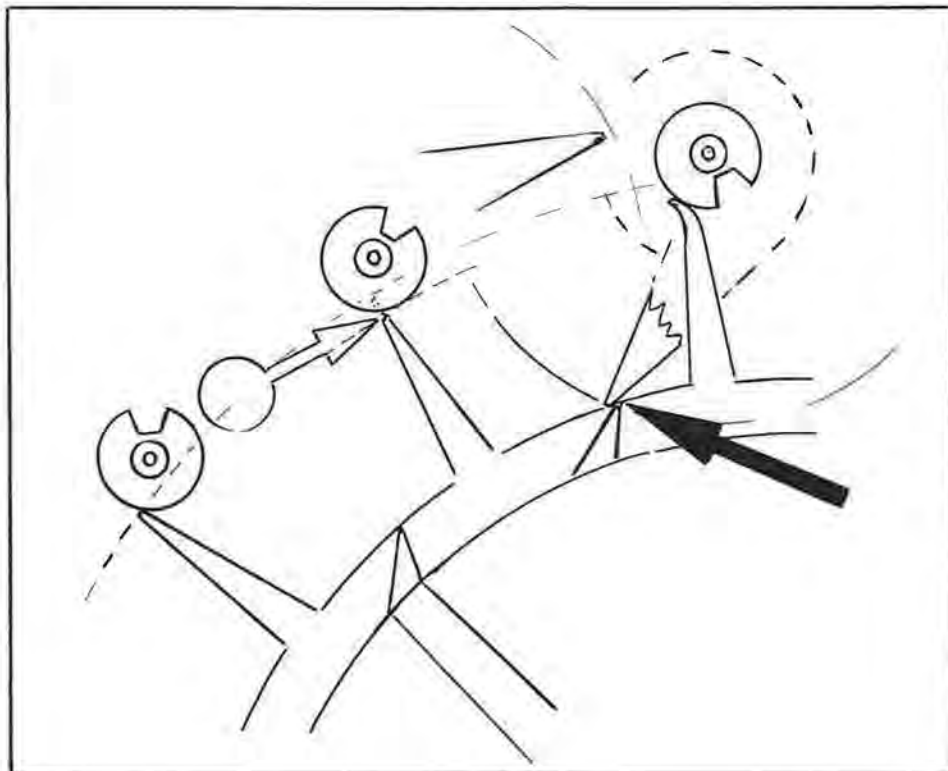


Figure 1

methods described in part one of this article. The new roller is polished to reduce friction during the period of frictional rest of the locking teeth on the roller post. The slit in the new roller should be aligned with the original slit in the post to insure correct escapement action.

It is also possible to cannibalize the safety roller of a spare roller table from a jeweled lever watch for use as the sleeve since it already has the width and a polished surface for the locking action, as well as a passing hollow or crescent. Hypodermic needles also can serve as sleeves to thicken the diameter of the roller post, but the slit must be provided for the passing action as in Figure 4.

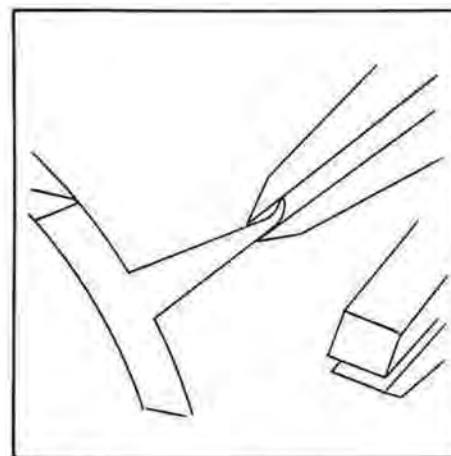


Figure 2

Rake the teeth

The teeth of the escape wheel can be "dressed down" by placing the wheel in the lathe. Holding an arkansas

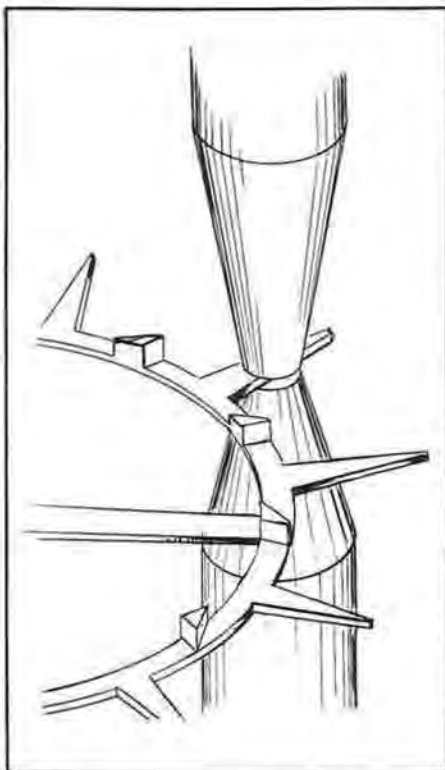


Figure 3

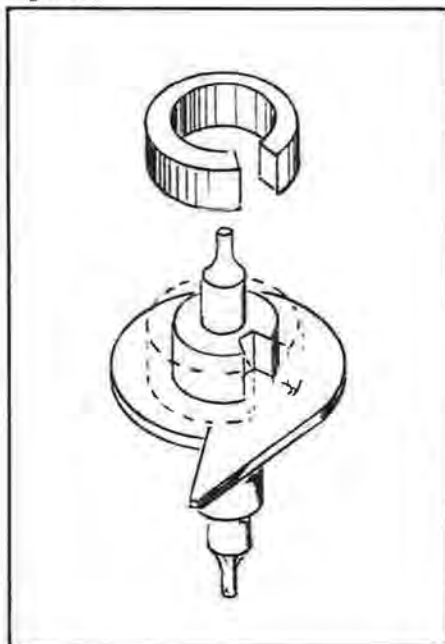


Figure 4

stone slip firmly in the hand under the escape wheel, apply the slip to the teeth while the lathe is turning rapidly in the opposite direction as shown in Figure 5 (clockwise as viewed head-on). Afterwards, supply a *front* rake to the shortened and equalized teeth. The reasons for this will become apparent as the adjustments for the new safety roller are explained and illustrated.

Working on the escape wheel first and observing the void between the new tooth-tips will tell you how

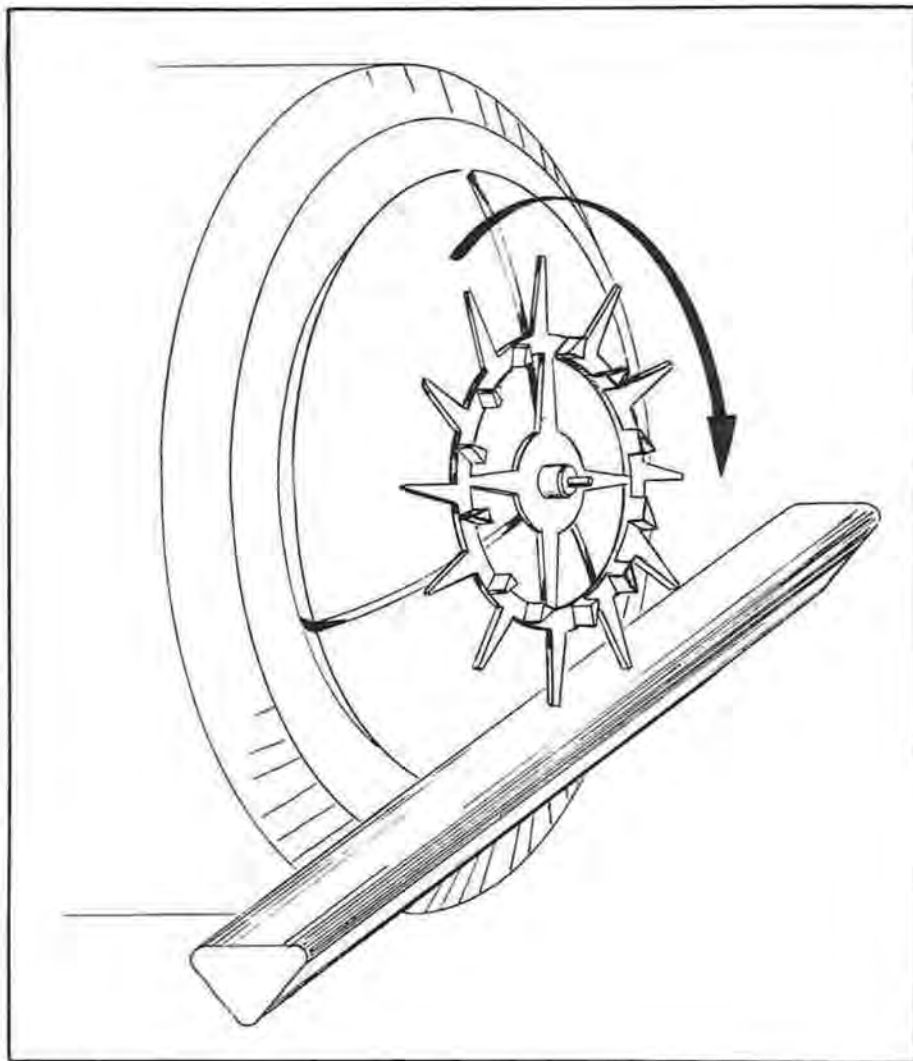


Figure 5

thick to make the new sleeve or new locking-passing roller.

Figure 4 shows how a sleeve which has been split to provide the passing space can be fitted over the roller post. Judicious application of a tiny amount of instant glue assures a tight fit.

Figure 6 shows the shortened teeth and indicates why the fronts of these teeth rather than the backs require hand honing. In Figure 6 at A, a normal tooth is locked against the safety roller. Notice that its impulse finger correctly clears the impulse tooth during the balance's free movement.

In position B, the shortened tooth, dressed in the lathe as instructed earlier, is locked against the enlarged safety roller-sleeve. This allows the tooth to lock but is now farther to the left of the balance center. This also causes the escape wheel to rest further counterclockwise than it used to. As a result, the impulsing tooth shown at the heavy arrow also is in a corresponding backwards position.

Jammed impulse finger

When the impulse finger on the balance swings near this impulse tooth, it will become jammed against it. To grind or hone the back of the locking teeth will not alter this condition. Therefore, we must hone the *front* of these teeth as shown at position C. Doing so will allow this locking tooth to move forward. When this tooth is adjusted to move forward, its shorter impulse tooth will also move forward and out of the path of the moving impulse finger, yet be able to meet it during the impulsing action.

Sometimes, instead of honing the fronts of these shortened teeth, they are bent backwards judiciously as in D, Figure 6. This has the same effect as honing the fronts and does not weaken the shortened tooth tips. It also allows the escape wheel to lock in a counterclockwise position relative to the balance center. Further, it allows the impulse teeth and finger to clear each other during the balance's excursions.

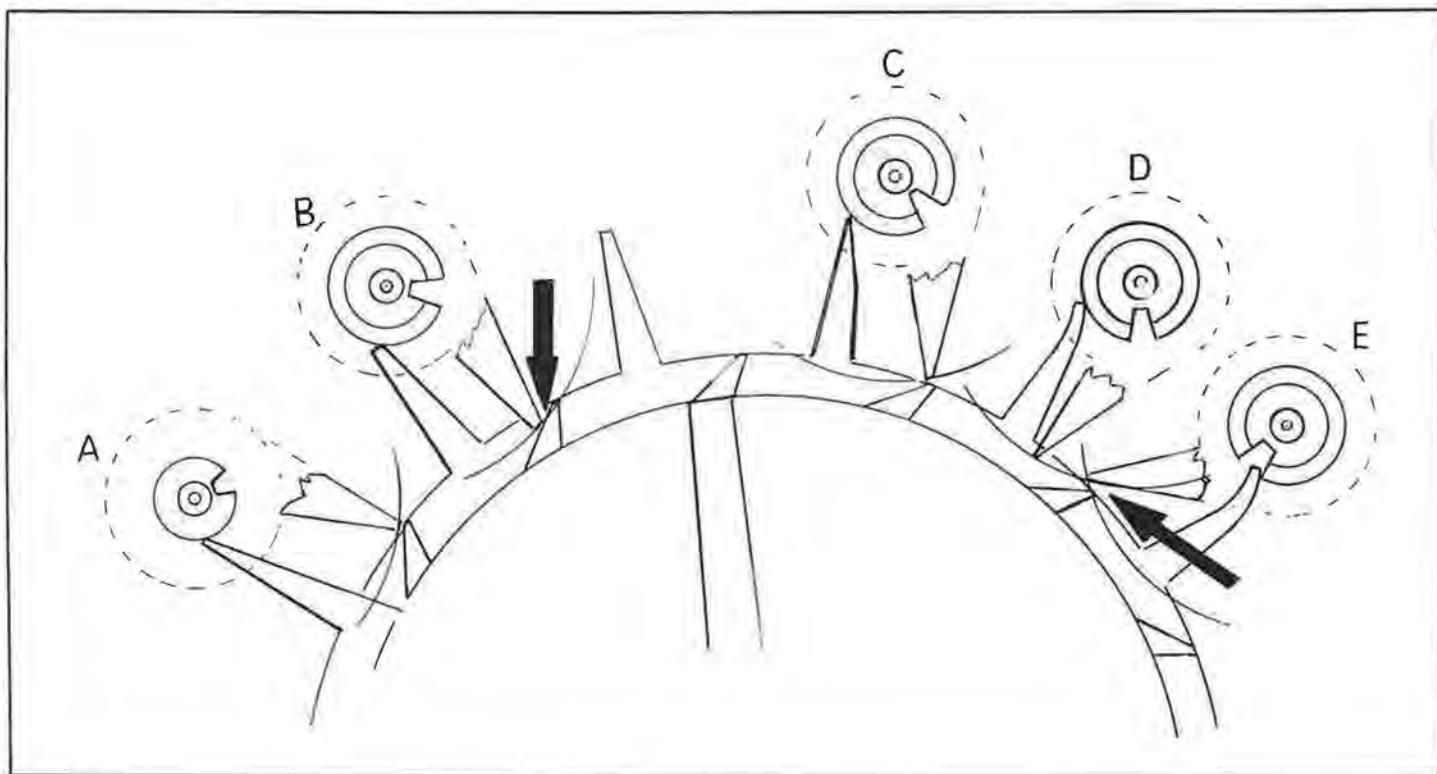


Figure 6

When the balance turns clockwise, the passing slot is in a favorable leverage angle to the bent tip of the locking teeth and will easily override the locked teeth in its clockwise non-impulsing direction.

A slight override

When the same enlarged roller turns counterclockwise, as in D, the bent tooth tip will enter the slot in a slight rolling contact and in the override action, will drop off, yet allow a good contact between the impulse finger and the escape wheel's impulse teeth. In this phase, the impulse tooth is already in a position to receive an escape impulse tooth.

If the tooth, however, is bent too far back, as shown in E, then the impulse finger will miss contact with the oncoming escape wheel's impulse tooth. With this knowledge, the teeth can be bent carefully, and the escapement will work again.

The inside counterclockwise face of the passing hollow never actually makes contact with the locking teeth tips even if bent as in positions D and E.

The same considerations can be applied with the double duplex escapement since it is only the escape wheel that is different. To understand the double duplex escapement

better, examine Figure 7. Note the various clearance angles, dimensions, and construction lines. Moving from left to upper right, the front of the twin teeth clears the safety roller by $\frac{3}{4}^{\circ}$ ($45'$) while the back tooth is locked against the safety roller. The distance from the middle of each double tooth to the impulse roller is 30° .

While some escapements are designed with the fronts of the impulse and locking teeth as a straight radial line, here a rake of 10° is assigned to the impulse and locking teeth, as it allows better beginning engagement with the safety and impulse sections of the balance.

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In the center position, the back tooth is ready to drop off the passing slot of the safety roller. The impulse finger is already in a position to receive an impulse from the stud-like impulse tooth.

Note that the locking tips of the double teeth are 3° equally distant from the center of their

common stalk. Also note that in this escapement, the impulse finger is situated $53\frac{1}{2}^{\circ}$ from the center of the passing slot. To supply strength to the locking tooth tips, they are not brought to a sharp point, but have a flat top of $\frac{1}{2}^{\circ}$ ($30'$), as do the tips of the impulse teeth. The backs of the locking teeth have been given a curved

shape although they would work equally well with straight, angled backs.

This escapement's motion is eye-catching. Its action found such favor with the Oriental buyer that most such watches had glass covers over their movements to prevent damage from curious fingers.

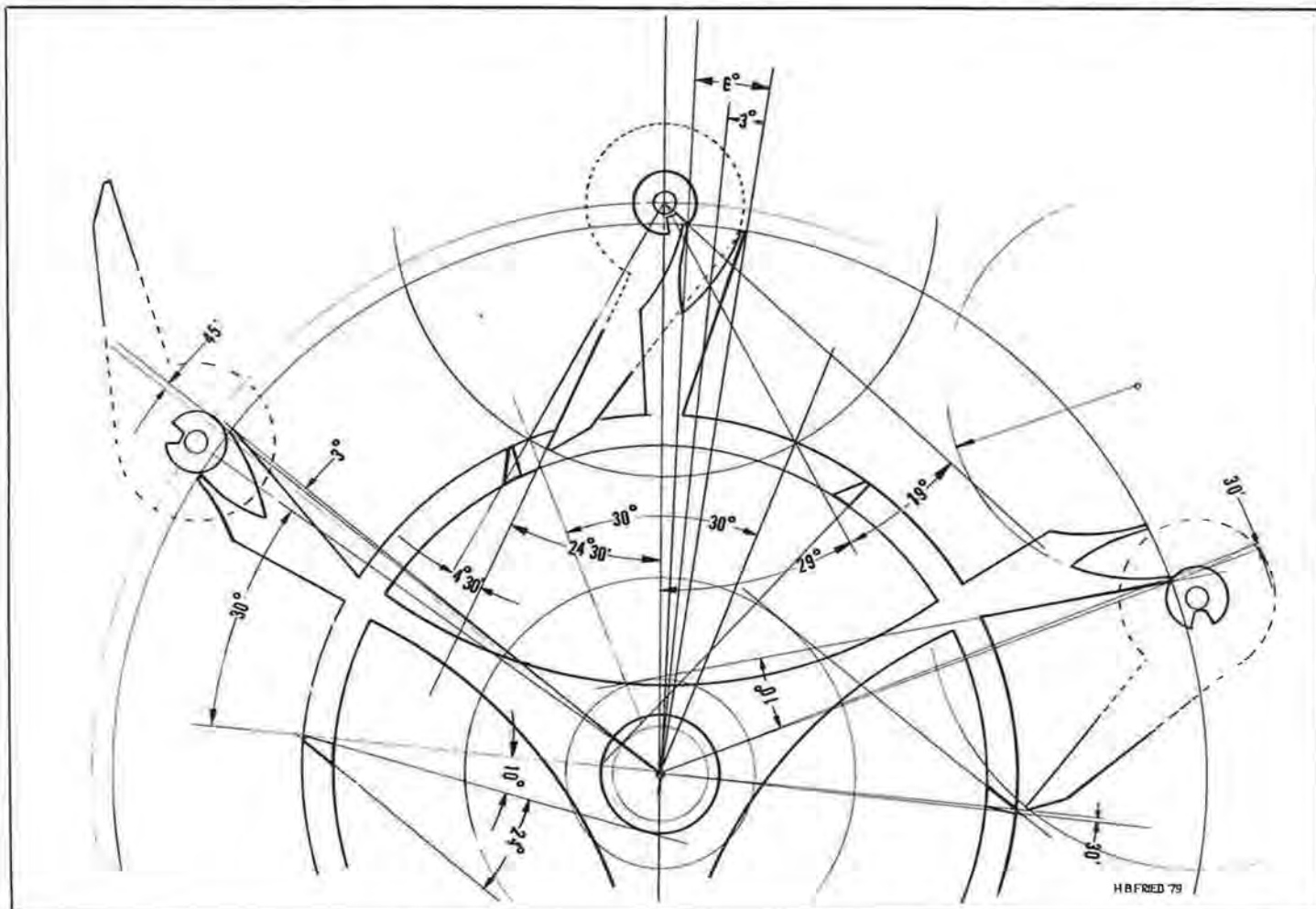


Figure 7

(See page 37)

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By Marvin E. Whitney, CMC, CMW



American Chronometer Makers

Part VII

This month, we resume our discussion of the careers and contributions of some of the lesser-known American chronometer makers. Some of these individuals and firms were very important, although they tended to be overshadowed by Bond, Bliss, and Negus.

H. H. HEINRICH, 14 John Street (moving to 102 Fulton Street in 1896), New York City. Mr. Heinrich was born in Germany where he also received his training as a chronometer maker. During his apprenticeship, he became interested in the science of chronometry, an interest which he continued to pursue throughout his lifetime. He was an exceptional chronometer maker, and upon his retirement, he devoted the remainder of his life to writing about his experiences and studies in chronometry.

Nowhere does it tell us when he immigrated to America. However, in a letter dated February 17, 1879, Superintendent John Rodgers of the Naval Observatory wrote Mr. Heinrich, c/o Tiffany and Company, 15 Union Square, New York City, stating "... This morning the chronometer came in good order. It will be started this evening, Greenwich Mean Time, and will be tested as far as our facilities will permit, and a daily record kept. We have, however, no good means of applying cold to a chronometer without danger of injuring its works, and therefore, in the cold test, we will have to rely upon natural atmosphere."

Naval Observatory records do not further identify this instrument nor the outcome of the trial. Tiffany and Company has been

unable to find any records on Mr. Heinrich as the company's records from that time are not complete.

In early March, 1884, Mr. Heinrich, whose address was listed as 12 John Street, New York City, wrote the Observatory regarding the selection of instruments for the Greely Relief Expedition. On March 23, 1884, Superintendent Franklin informed Heinrich that, although the instruments for the Expedition had already been selected and placed on trial, he would be happy to place any of Heinrich's chronometers on trial the following winter and compare them with those of other American makers, if Heinrich so desired.

On December 2, 1885, Mr. Heinrich sent two chronometers, numbers 8 and 10, to the Observatory for trial. The trial for these two instruments commenced on January 1, 1886 and was completed July 1, 1886. The trial consisted of twenty-three periods during which the instruments were subjected to temperatures ranging from 44°F to 90°F. Both instruments performed very well, with number 8 being the better of the two.

The largest mean daily rate for number 8 was -1.944 seconds against a mean daily rate of +1.719 for number 10. However, the performance of number 8, even though it showed a greater mean daily rate, was considered better since it maintained a losing rate throughout the entire trial, consequently, a smaller mean deviation of rates. In determining either the temperature compensation error or mean deviation, the computations are done alge-

braically. Number 10 developed a losing rate during six of the twenty-three periods. Hence, the plus-minus error resulted in a larger mean deviation of rates for number 10.

Heinrich then submitted his chronometers numbers 11 and 12 for trial on April 27, 1887 and requested that number 11 be tested in various positions, which the Observatory agreed to do. By positions, he was not referring to the positional type of test which was a requirement for watches. He was alluding to the polarity test of the balance, whereby the chronometer, in a dial-up position, is tested with the figure 12 aligned with each of the four cardinal points of the compass.

The Observatory notified Heinrich on August 10, 1887, that number 12 stood 30th and that number 11 stood 39th out of a trial of 43 chronometers. The polarity test that Heinrich requested for his number 11 was conducted at the conclusion of the trial. On October 12, 1887, the results of the test were forwarded to him, but nowhere does the content of the test appear.

On December 3, 1887, Heinrich submitted numbers 811 and 3458 for trial. You will note here that there is quite a variance in his numbering sequence. Number 3458 was fitted with a palladium hairspring. Before discussing Heinrich any further, let's digress a moment and review some of the horological trends of the time so we can put things in proper perspective.

Charles A. Paillard, in 1877, invented palladium, a non-ferrous metal which was rust-

THE SHIP'S CHRONOMETER

resistant, non-magnetic, and also reduced acceleration. In December of 1887, the Non-magnetic Watch Company, 177-179 Broadway, New York City, sent the Observatory a watch fitted with "Paillard's Patented Non-Magnetic Compensation Balance and Hairspring." In their cover letter, they stated, "... We have received from the Observatory at Geneva many bulletins, Class A for our watches, and the trial of marine chronometers containing these inventions and have proved their superiority over all others. We are now supplying LeRoy of Paris with our balance and springs for use in marine chronometers for the French Navy."

Heinrich was not only a superb craftsman, but he had an analytical mind and enjoyed writing about his chronometric findings. He was always seeking out information from the writings of other horologists and enjoyed experimenting with new chronometric ideas.

Heinrich was acquainted with the scientific investigations of Sir William Gilbert which were published in the early 1600's. In Gilbert's dissertation, he not only coined the term "magnetic pole" to account for repulsion as well as attraction, but he also explained how and why the magnetic compass was influenced by the earth's magnetic field.

Also, in the writing of Jacques F. Houriet of Le Locle, Heinrich had read that during William E. Parry's 1820-21 Arctic expedition, the chronometers became very erratic. According to Houriet, this capricious behavior was due to the influence of the north's magnetic pole.

Later, it became known that a piece of iron or steel placed in the earth's magnetic field became magnetized by induction, just as if it were placed in the field of a magnet. Thus, in a steel ship, the magnetism induced by the earth would be diffused over the entire ship.

Heinrich rationalized that if the earth's magnetic force affected the compass, it would also affect a chronometer. Furthermore, if this chronometer were on a steel ship, this added dimension, i.e., the ship's

magnetic character, would to some degree affect the rate of the chronometer.

Thus Heinrich was hopeful that, as an outgrowth of his studies and experiments, a means would be devised to overcome the negative effects that oxidation and magnetism had on a chronometer. In order to apprise others as to what had been done in these areas, Heinrich, in the latter 1800's, began writing a series of articles for the *Jeweler's Weekly*.

One particular article dealt with the non-magnetic experiments conducted by Arnold and Dent. Arnold and Dent noticed that when chronometers were placed so that the figure XII (12) was pointing towards the various points of the compass, their rates varied. From these observations, they concluded that these rate changes were due to the earth's magnetism.

To prove their hypothesis, they conducted a series of experiments in which they made their balances and hairsprings out of various non-ferrous metals. Hairsprings were made of glass, gold, alloys of gold, copper, and silver, while others were made of steel and then gilded. These hairsprings were fitted to balances made of brass, platinum, and silver, or combinations thereof. Steel hairsprings were also tried with different non-ferrous balances. They even experimented with a glass hairspring fitted to a glass disc balance wheel. Although their experiments resulted in a partial solution to the polarity problem, they experienced problems with acceleration and temperature compensation.

As an outgrowth of the Arnold and Dent experiments and those of other individuals, particularly Heinrich, the Observatory in the early months of 1890 included the polarity test of the balance as a segment in their competitive trials.

After the instruments had completed their twelve weeks' trial in the chronometer room, they were tested for polarity of the balance. The chronometers were tested for one week in each of the following positions: XII North, XII East, XII South, and XII

West. The rates for these four periods were reduced to the mean temperature for the periods. It was assumed that if there were no polarity of the balance, both means should be nearly the same.

The Observatory found that if the balance of a chronometer were polarized, the rate obtained with the XII figure in one position with regard to the magnetic meridian would be accelerated or retarded when the XII figure was in the opposite position.

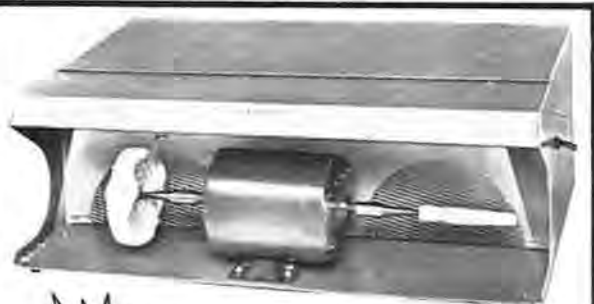
Those instruments that showed a marked variation in the four positions were given another trial. This was done to make sure that the changes were not purely accidental. Should the changes appear during the second test, it was deemed that the changes were due to the polarity of the balance. Chronometers showing such changes were rejected.

On July 21, 1888, Allan D. Brom, the Assistant Superintendent of the Naval Observatory, wrote to Mr. Charles W. Ward of the Non-Magnetic Watch Company that he had enjoyed Mr. Heinrich's article in the *Jeweler's Weekly* regarding the experiments of Arnold and Dent. He also mentioned that he was enclosing the record of the Heinrich chronometer number 3458—the only one which had a palladium spring. Brom said, "This chronometer was received last Fall (1887) for competitive trial just closed. Its record, while better than at the former trial, is inferior to that of Heinrich number 811 which has a steel hairspring."

Although number 811 was fitted with a steel hairspring, it was fitted with a new style of balance. Nothing more is said about the construction of this balance, so this becomes a matter of conjecture. However, since Heinrich was experimenting with various types of balances, it, too, was no doubt made of a non-magnetic material. The Observatory notified Heinrich on August 24, 1888 that his number 811 was being purchased for \$325.00.

Shortly after number 811 was purchased and issued, the Observatory became concerned as to its care and whereabouts. In a letter dated September 6, 1890, the Observatory informed the Navy's

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"Mr. Heinrich has signified his desire to submit six additional chronometers of like construction for the competitive trial. I have the honor to request that this chronometer, with a record of its performance, be returned."

In due time, number 811 found its way back to the Observatory, and on August 2, 1893, the Observatory shipped number 811 to the Mare Island Navy Yard for issuance to the Pacific Fleet.

However, nowhere does the performance record aboard the *Constellation* appear in Observatory records. Nor is there any further reference to whether or not Mr. Heinrich ever submitted "the six similar chronometers" as mentioned in the Observatory's letter of September 6, 1890 to the Bureau of Equipment.

Records show that Heinrich submitted four chronometers for trial on December 1, 1894, but there is no mention of their serial numbers or type of construction. The four did not fare too well, for on May 17, 1895, the Observatory notified Heinrich that the four had failed trial.

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On June 19, 1895, the Observatory notified Bliss, Bond, Heinrich, and Negus that after the next competitive trial, chronometers with auxiliary balances would no longer be accepted for trial. Nevertheless, a limited number of such instruments would be admitted to subsequent trials, if the makers so desired. However, the Observatory was rather explicit in stating that such submissions would only be for the information of the Department and the personal satisfaction of the makers, and not for acceptance. There was a gentlemen's agreement that when the Observatory held a competitive trial, instruments that passed were purchased. The purchase price depended on the instrument's trial number on a scale of 0 to 25; e.g., trial numbers 0 to 5, \$425.00; 5.1 to 10, \$375.00; etc. The makers would be supplied with a copy of the results.

The Navy was as good as its word, for on November 30, 1896, Heinrich was notified by the Naval Observatory that his chronometer number 1025 with a patented auxiliary balance, could not be admitted for competitive trial. See Figures 1, 2, and 3, page 41.

Records showed that a Heinrich number 1007 was issued to the U.S.S. *Yantic* during August of 1891 and was returned to Heinrich on May 13, 1896 for repairs. Heinrich made a charge of \$14.00 for repairing the instrument. It passed the repair trial on June 24, 1897, with a trial number of 17.199, and was issued to the U.S.S. *Helena*.

Heinrich submitted numbers 994 and 1021 for trial which ended June 24, 1897. Number 1021 had a trial number of 25.917 and was purchased for \$300.00. Number 994 failed because it had a trial number of 30.019.

By this time, Mr. Heinrich was getting along in years and wished to retire so he could devote some time to writing about his chronometric experiences. He began to rely on a Mr. C. A. Geissler, a chronometer maker who had worked for him, to carry out the day-to-day operations of the business since he was busily engaged in finishing his last chronometers for competitive trial.

On December 1, 1899, Mr. Heinrich submitted his last chronometers for trial. Eleven instruments were submitted, and upon completion of the trial on June 12, 1900, Mr. Geissler was notified that four of the eleven had passed and thus were purchased: one for \$330.00 and the other three for \$250.00 each.

After retiring, Mr. Heinrich devoted the remainder of his life to writing about his experiences and studies in chronometry. Some of his writings appeared in 1901 in the *British Horological Journal*.

(Continued on page 41)

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WMJDA officers joined the Board of Directors for the picture above. (Front row, left to right) Officers Dominic Priore, Karl Esslinger (newly elected President) and Dottie Keech, Director. (Second row, left to right) Edward Soergel, treasurer; John Cassidy, outgoing President; Directors Sheppard Fargotstein; Michael Perkins and Roger Borel. (Back row, left to right) Robert Mahar, Third Vice-president; Directors Ken Weil, Denis Gaber, J. Goldman, and Charles Britton. Not shown are Directors Morris Beresh, John Frei, Sr., Norma Nest and Shimon Perlmutter.



The Man-of-the-Year luncheon honored William J. Kilb of the Kilb Company, Milwaukee, Wisconsin. Here he is, seated, far right. Seated, left to right, are Robert Kilb who introduced his father, Mrs. Kilb, and the honoree. Standing are Marilyn and John Cassidy.



Individual conferences in which Active WMJDA members discussed areas of common interest with representatives of Associate Member companies, were the featured activities on Friday during the La Costa meeting. William Cureton, in the striped sweater, chatted with visitors at the Newall Mfg. table.

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Figure 5 (March 1981)

THE DUPLEX ESCAPEMENT (Continued from page 29)

For the sake of clarity, we here reproduce Figures 4 and 5 from the first article in this series on the duplex escapement (March 1981, pages 50 and 51). Figure 4 shows the "Chinese Duplex" escapement in an isometric view. Figure 5 shows the sequential action of this escapement.

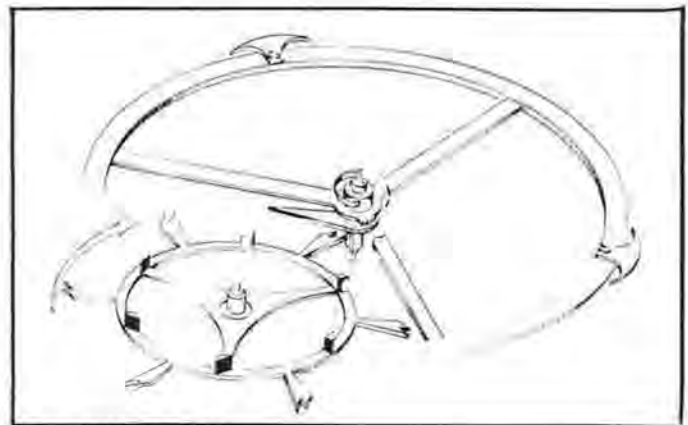


Figure 4 (March 1981)

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BOTTLE COLOR	DIAMETER	TAP	OPENING	POST	BOTTLE COLOR	DIAMETER	TAP	OPENING	POST
1 YGF	4.0 MM	10	2.0 MM	FLUSH	12 STEEL	5.0 MM	10	2.0 MM	FLUSH
2 YGF	4.0 MM	8	2.0 MM	FLUSH	14 STEEL	5.0 MM	8	2.0 MM	FLUSH
3 YGF	4.0 MM	10	2.5 MM	FLUSH	15 STEEL	5.0 MM	10	2.5 MM	FLUSH
4 YGF	4.0 MM	8	2.5 MM	FLUSH	16 STEEL	5.0 MM	8	2.5 MM	FLUSH
5 STEEL	4.0 MM	10	2.0 MM	FLUSH	17 YGF	5.0 MM	10	2.0 MM	FLUSH
6 STEEL	4.0 MM	8	2.0 MM	FLUSH	18 YGF	5.0 MM	8	2.0 MM	FLUSH
7 STEEL	4.0 MM	10	2.5 MM	FLUSH	19 YGF	5.0 MM	10	2.5 MM	FLUSH
8 STEEL	4.0 MM	8	2.5 MM	FLUSH	20 YGF	5.0 MM	8	2.5 MM	FLUSH
9 YGF	5.0 MM	10	2.0 MM	FLUSH	21 STEEL	5.0 MM	10	2.0 MM	FLUSH
10 YGF	5.0 MM	8	2.0 MM	FLUSH	22 STEEL	5.0 MM	8	2.0 MM	FLUSH
11 YGF	5.0 MM	10	2.5 MM	FLUSH	23 STEEL	5.0 MM	10	2.5 MM	FLUSH
12 YGF	5.0 MM	8	2.5 MM	FLUSH	24 STEEL	5.0 MM	8	2.5 MM	FLUSH

40 CROWNS

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BOTTLE COLOR	DIAMETER	TAP	OPENING	POST	BOTTLE COLOR	DIAMETER	TAP	OPENING	POST
1 YGF	4.0 MM	10	2.0 MM	MED	12 STEEL	5.0 MM	10	2.0 MM	MED
2 YGF	4.0 MM	8	2.0 MM	MED	14 STEEL	5.0 MM	8	2.0 MM	MED
3 YGF	4.0 MM	10	2.5 MM	MED	15 STEEL	5.0 MM	10	2.5 MM	MED
4 YGF	4.0 MM	8	2.5 MM	MED	16 STEEL	5.0 MM	8	2.5 MM	MED
5 STEEL	4.0 MM	10	2.0 MM	MED	17 YGF	5.0 MM	10	2.0 MM	MED
6 STEEL	4.0 MM	8	2.0 MM	MED	18 YGF	5.0 MM	8	2.0 MM	MED
7 STEEL	4.0 MM	10	2.5 MM	MED	19 YGF	5.0 MM	10	2.5 MM	MED
8 STEEL	4.0 MM	8	2.5 MM	MED	20 YGF	5.0 MM	8	2.5 MM	MED
9 YGF	5.0 MM	10	2.0 MM	MED	21 STEEL	5.0 MM	10	2.0 MM	MED
10 YGF	5.0 MM	8	2.0 MM	MED	22 STEEL	5.0 MM	8	2.0 MM	MED
11 YGF	5.0 MM	10	2.5 MM	MED	23 STEEL	5.0 MM	10	2.5 MM	MED
12 YGF	5.0 MM	8	2.5 MM	MED	24 STEEL	5.0 MM	8	2.5 MM	MED

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BIMETALLIC TEMPERATURE ADJUSTMENTS

Practical adjustments to temperature on bimetallic balance wheels are now seldom performed. Most of the adjustments are done on fine marine chronometers for which it is essential. It is necessary to know the procedure so that we can avoid possible errors in manipulating the bimetallic balance wheels of some very fine watches that may still be found in repair shops.

As stated before, the principle of adjustment is the automatic change in the radius of gyration of the balance to compensate for change in elasticity of the hairspring caused by variations in temperature. The mathematical solution of the problem seems very impressive on paper, but unfortunately, it does not work as precisely as we would like. To achieve good rates, we are forced to use the good old trial and error method of adjustment. To begin with, we know that the balance rim moves toward and away from the center quite uniformly. Because one end of the rim is cut and the other is attached to the balance arm, the free end of the rim always moves more. If we were to use a bimetallic balance without the screws, there would be some compensation, but we would have no way of increasing or decreasing it as necessary. With the mass screws on the balance wheel, we have the opportunity to achieve the compensation as desired. How it works can easily be seen by a simple experiment. If we were to use a bimetallic balance wheel and heat it over an alcohol lamp, the free end would move toward the center of the staff decidedly, and when cooled, it would move in the opposite direction. It is easy to see that if the screws were grouped at the end of the rim, more mass would be moved toward the center; therefore making the radius of gyration smaller. If the screws were grouped near the arm, a smaller amount of mass would move toward and away from the center, making the average radius of gyration larger. This would result in slower rate at higher temperature than in the former case. The balance wheel is made in such a way that there are always a number of empty screw holes, so that the pairs of screws can be moved from the arm to the cut and vice versa. See Figure 1.

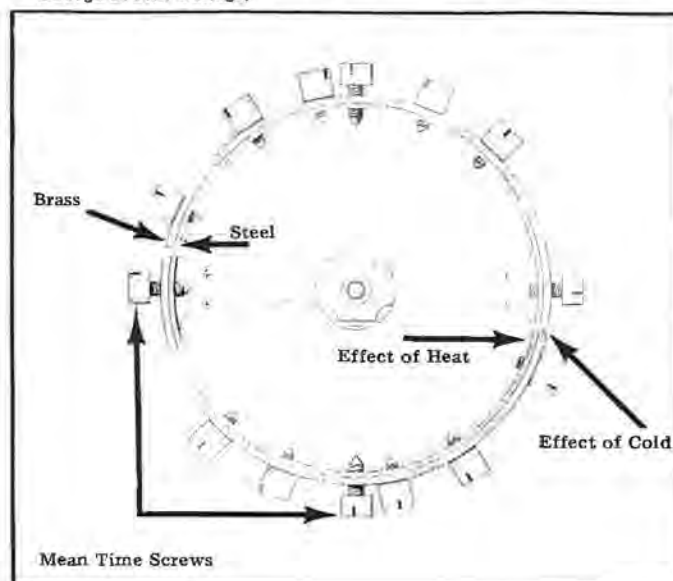
The practical adjustment consists of placing the watch in the refrigerator for 24 hours at a temperature of 45°F and recording the rate against a reliable timekeeper. The next day, the watch is wound and set to exact time and placed in a heating chamber to run at approximately 90°F. The rate is again recorded and compared to the rate at the low temperature. If the watch is faster at 45°F than at 90°F, it is undercompensated. To improve the rates, it is necessary to move one pair of opposite screws near the balance arm

closer to the cut. The procedure of running the watch in the refrigerator and in the heating chamber is repeated until the two rates are equalized. When the differences in rates become smaller, the screws are moved only a short distance from where they were located originally. In this way, the adjustments can be made more precise.

Although it is not very likely that many watchmakers today would bother with temperature adjustments, it is well worth the while to remember these simple rules for other situations. Quite often we are required to make repairs on watches with bimetallic balances, and among other repairs, we often have to replace the balance staff. When poising the balance wheel, we must keep in mind the sensitivity of the balance to the temperature variations. Two situations are particularly important. The truing of the balance wheel must be nearly perfect at room temperature. It is also necessary that toward the end of the truing process, we avoid touching the balance wheel with the fingers because this may raise its temperature to the body temperature in which case the rim would curve inwards, giving us the wrong idea that it needed further truing.

The placing of the timing washers is also very important. They should never be placed near the cut. In fact, the conscientious watchmakers would place them only up to half way between the balance arms and the cut, and the closer

Figure 1. Compensation Balance (drawing compliments of George Brown College)



to the balance arm, the better. The screws on the half of the rim toward the cut should also be left unmutated by drilling, filing, and undercutting. Any removal or addition of the mass on that half of the balance rim will immediately change the adjustment to temperature.

The middle temperature error has been an almost continuous challenge for the best horologists. The best solution to the problem, however, was discovered by a metallurgist, Dr. C. E. Guillaume. He found that certain alloys of iron and nickel do not have an expansion factor directly proportional to the temperature. When the steel portion of the bimetallic rim was replaced with invar alloy, the middle temperature error was considerably reduced. Further experiments proved that for best results the rim should be cut somewhat further away from the arm than the ordinary bimetallic balance. This became the distinctive feature of the Guillaume's balance. For marine chronometers, the rim is usually cut at the center between the two arms, and four weights are used instead of the usual two. When properly constructed, it does away with the auxiliary compensation because the middle temperature error is so small that it is not necessary to reduce it any further.

The same types of alloys of nickel and steel with small additions of tungsten, chromium, or beryllium are now used for making hairsprings which do not change their elasticity greatly within the normal range of temperatures. Total compensation, however, is not quite possible with alloy hairsprings alone. A method for compensation must be used if better results are expected. For the ordinary watches, i.e., all but chronometer quality, the compensation is not used because the errors are small enough to be neglected. For fine quality chronometer watches, there are a number of different ways that it can be achieved. Normally, a good quality balance

wheel is made of beryllium alloy which possesses excellent qualities. Reddish in color, it is very hard (415 brinell) and difficult to bend or mutilate. When a good quality alloy hairspring is used with it, it has a small temperature error of not more than 2 sec./24hr. between the high and low temperature range. The middle temperature error is usually between ± 0 and $\pm .5$ sec./24hr.

There are mainly two types of compensation used. The one introduced by P. Dietisheim is mainly the adaptation of a bimetallic balance strip to an alloy balance. Figure 2 illustrates how the compensation is achieved. The balance wheel is filed or milled away near the arms to provide room for curving of the bimetallic strip which is screwed to the balance wheel. The screws fitted to the bimetallic strip provide the means for adjustment to temperature. Moving the screws toward the free end of the strip will speed up the rate in higher temperatures and vice versa.

The second type of compensation was developed by Volet. He reasoned that if an alloy balance wheel which does not expand or contract were made with an arm of a metal which does, the balance wheel so constructed would become oval in high and in low temperatures. If a few screws were fitted at right angles to the balance arm, they too would move closer to the center of rotation in higher temperatures, making the radius of gyration smaller and vice versa. Figure 3 illustrates such a balance wheel. Although the change in rate is very small, it is sufficient to compensate for the small temperature error that exists when alloy balance wheels and alloy hairsprings are used.

Some other methods of compensation were proposed by various horologists, but most of them are too impractical to be used on a large scale.

Figure 2. P. Dietisheim's monometallic balance with bimetallic strips.

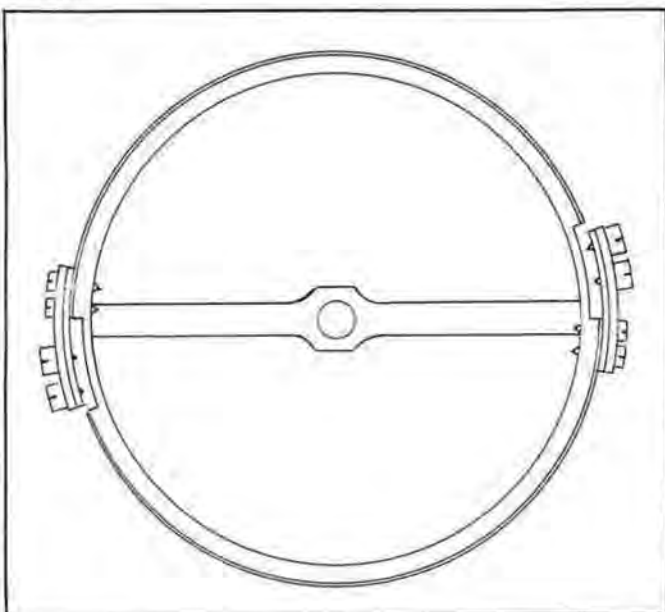
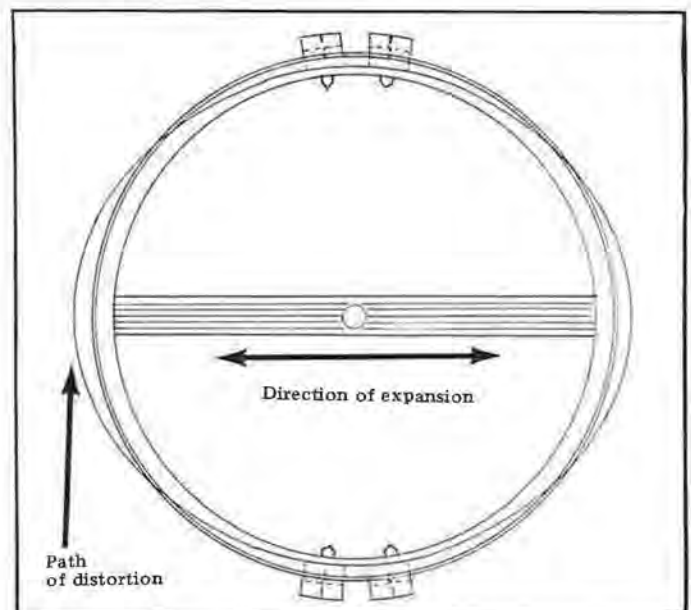


Figure 3. Volet's ovalising balance wheel.





An Open Letter To AWI

Last June, the Trustees of AWI's Educational Library & Museum Trust (ELM Trust) selected Dean H. Armentrout to receive assistance from the J. E. Coleman Fund and the ELM Trust Fund. Mr. Armentrout was judged to be a highly motivated young horologist with unique abilities. For this reason, the selection committee agreed to help him attend West Dean College in West Sussex, England. This College offers highly specialized training in antiquarian horology. Students do complete restorations on clocks which date from between 1650 and 1850.

During his studies at West Dean College, Mr. Armentrout has completed a number of important restorations. Achievement reports from the College indicate that Mr. Armentrout has proved to be an outstanding student. We are now concerning ourselves with finding proper placement for Dean Armentrout when his training at West Dean is completed in the Fall of 1981. It is essential that we find placement in an environment that will best utilize this young horologist's special talents. We would welcome inquiries and suggestions as to where Dean Armentrout's training could best be utilized when he returns to the United States.

Dean's enthusiasm for his chosen profession and the training he is receiving at West Dean College have prompted him to write the following open letter to the AWI membership:

Last summer, I had the good fortune and honor of being selected the first recipient of the J. E. Coleman Memorial Fund Award. The financial assistance allowed me to join the 1980/81 Antique Clock Restoration Course held by West Dean College, near Chichester, West Sussex, England.

My purpose in writing this letter is twofold. Firstly, I want to draw attention to the clock restoration course

and highly recommend it to anyone searching for structured training in this field. Secondly, I wish to illustrate the degree to which the students are exposed to antiquarian horology.

West Dean College is an independent college for the Crafts, administered by the Edward James Foundation. The College is intended as a center to foster and teach a wide range of traditional arts and crafts. Professional courses are held in the conservation and restoration of antique furniture, clocks, and porcelain. The courses are held in conjunction with the British Antique Dealers' Association, and the West Dean/BADA Diploma will be awarded upon successful completion of the course. The duration of the professional courses is three twelve-week terms.

The Antique Clock Restoration Course is unique in that, with the exception of exercises in bushing and repivoting, all practical work is actual restoration of clocks dating from between 1650 and 1850.

From a personal viewpoint, the single most important concept stressed to the students is the need for the highest standards of skill and workmanship. This point cannot be overstated. The philosophy of conservation and restoration of antique clocks at West Dean is multi-faceted and space doesn't permit me to delve too deeply into it. Let it be said, however, that the objective of the course is to produce competent, confident, and commercially employable craftsmen who parenthetically have been impressed by the need for honest and aesthetically correct restorations.

In my course, we have been exposed to and methodically trained in such areas as tools of the trade, heat treatment of metals, design of horological gearing, gear and pinion cutting, and horological calculations—to name but a few.

The historical aspect of our education is not overlooked, and we are

regularly lectured on such topics as important horological achievements, the development and application of the pendulum, the history of the Clockmakers' Company, and the lives of the master craftsmen.

We also make a variety of field trips, visiting such places as the British Museum, the Science and Maritime Museums, the Clerkenwell district of London, and various workshops of established restorers.

West Dean clock course is supervised by a committee of eminent horologists who are intimately involved in the progress and assessment of individual students.

The facilities available to students should also be mentioned. The main workshop is equipped with two "Myford" lathes and twelve benches, each with a clockmakers' lathe. In addition, there are two gear cutting engines and a full complement of associated machinery, drill press, grinder, etc. Besides the main workshop, there is a second workshop which accommodates cleaning equipment and a finishing workshop which allows clocks to be assembled and adjusted in clean conditions.

This has been a general overview concerning the clock restoration course at West Dean. I am involved currently in restoring a mid-18th century Dutch musical bracket clock which I hope to cover in a separate letter.

I feel strongly that the late Jesse Coleman would be highly satisfied with the level of practical ability and sophisticated knowledge of horology that the average student achieves after a year at West Dean.

Further information about this course at West Dean College can be obtained from: The Principal, West Dean College, West Dean, Chichester, West Sussex, PO18 0QZ ENGLAND.

MCB



Figure 1. Dial view of H.H. Heinrich, No. 1025. (Photos courtesy of Henry B. Fried.)



Figure 2. Movement view of H.H. Heinrich No. 1025 chronometer.



Figure 3. Close-up view of Heinrich's patented balance fitted to No. 1025.

THE SHIP'S CHRONOMETER

(Continued from page 33)

My records show that during his years as a chronometer manufacturer, Mr. Heinrich submitted thirty-four chronometers to the Naval Observatory for competitive trial. I am certain that he made a greater number than that, as he also sold and repaired instruments for other segments of the maritime service. All of the Heinrich instruments that I have examined have had Mercer movements which were sprung and finished by him.

HEWITT AND SON, 180 Water Street, New York City. The firm of Hewitt and Son is listed in several of the early 1850's New York Business Directories as chronometer makers. Little else is known about this firm. There was

a Hewitt and Son in London, founded by Thomas W. Hewitt (1799-1867). Thomas was a master of his trade and the instruments that I have seen carrying the Hewitt and Son name were also signed, "Maker to the Admiralty." Thus it is quite possible that the New York firm of Hewitt and Son could very well have been a branch of the London firm, or it could have been an enterprising nautical chandler capitalizing on the Hewitt name, since both firms were in business during the same period of time.

HOLZWORTH, GEORGE, 77 Summer Street, Kingston, Massachusetts. Mr. Holzworth was a contributing writer to Samuel Levin's magazine *Horology* in the early 1900's. When he was working at the bench, he serviced and repaired chronometers. I have been told that it

was not unusual to find fifty or more chronometers in his care.

KLINE, SAMMOS AND COMPANY, KLINE AND COMPANY, KLINE AND DILLON, Chronometer Makers, New York City. Kline, Sammos and Company was formed in 1853, consisting of three members, two of whom were former employees of Bliss and Creighton—Calvin Kline, a machinist, and Thomas E. Dillon, a brass turner who made chronometer boxes. Mr. Sammos, the third member of the partnership, provided the financial backing.

The business got its start at 20 Fulton Street, but remained there for just a short time before moving to 74 Water Street. Mr. Sammos soon realized that his investment was not a wise one; the partners began feuding and Mr.

(Continued on page 61)

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SALES TALK

By Wes Door, CMW



Clerk Or Salesperson?

Before explaining the difference between a clerk and a salesperson, I would like to preface my sales talk with a few explanations. First, I am not a "super salesman" but just a person like yourself who has a job of repairing and selling. The ideas which I present are an accumulation of what I have read, seen, and experienced, much like the ideas which you have acquired over the years; I just happen to be the one putting this material together each month.

I remember that my friend Scotty—one of the best salesmen I have ever known—used to say if he received just one new idea from each of his many books on salesmanship, it would be worth many times the price of the book. Scotty was a real salesperson, and not just a clerk.

What is the difference between a clerk and a salesperson? A clerk is a person who guards merchandise. If the customer asks to see it, the clerk unlocks the showcase, very carefully shows the merchandise, and then puts the merchandise back and locks the showcase. Oh, yes. And if the customer says, "I'll take that one," the clerk wraps it up, takes the customer's money, and says thank you.

What is a salesperson? A salesperson is a person who sells. It's that simple. He or she is not just a guard. I would rather be a salesperson, wouldn't you?

It is important to have people suggest methods and dialogue to use in selling, but you and only you are the one to decide which methods and words really fit you. Sometimes, we can rightfully resent what others say about how we sell.

This reminds me of the time I was selling a watch to a customer, and someone else came in. I glanced up and recognized him to be a friend whom I had not seen for quite some time. I completed my watch sale, and my customer left. My friend approached the showcase, we shook hands, and I asked him where he had been the last several years. He said that he had graduated from college and then gone on to study to be an insurance salesman. I got the impression that he felt he had learned all there was to know about salesmanship. My suspicions were confirmed when he said, "Before we get started talking about why I came in today, I would like to tell you what you did wrong in that watch sale." I



Every sale demands the best of the true salesperson—especially selling a diamond to one's own daughter and future son-in-law.

guess I looked up with a slight amount of resentment, but he continued, telling me that after I had sold the watch, I should have reviewed the features of the watch with my customer, telling about the 17 jewels, the water-resistant case, the sweep second hand, etc. I commented that my selling method must not have been too bad, as I had made the sale.

Incidentally, he wanted me to buy insurance, and you can guess how much I bought.

Now, if he had approached me in a less forceful manner, maybe I would have listened better. For instance, he could have said, "Wes, I've known you for a long time, and since I've just completed a salesmanship course, I would like to make a suggestion. This idea works in the insurance business and maybe it would apply to the jewelry business as well." With that introduction, maybe he, too, would have made a sale.

I think sometimes we are not our best as salespeople because we equate this with high pressure salesmanship. We have caught ourselves saying, "I'm not a salesman, I'm a watchmaker. I don't need to sell, and I don't want to sell. I've certainly had my share of those high pressure salesmen, and I don't want to be like them."

Salesmanship is not pressure selling, at least it should not be. I talked once to a jewelry salesman who does not consider himself to be a pressure salesman. In his words, "I take a sincere interest in serving my customers. When I walk into a store, I don't even think of the money I'm going to make if I make the sale. I concentrate on how I can best help my customer and let my rewards look after themselves. Also, you must be honest with your customers, or you will not last."

To explain selling with and without pressure, let's use this example. Suppose you are showing two watches, an expensive one and a lower-priced one. You have explained all of the features and benefits of the finer watch, but the customer still decides to buy the lower-priced one. Now, anything said from this point forward in an attempt to convince the customer to change his or her mind would be high pressure selling. Remember, you've had your chance.

On the other hand, if your customer buys the lower-priced watch because you did not take the opportunity to explain the benefits of the better watch, then you are doing your customer a disservice by underselling. For example, suppose this customer should come in later and say, "What's that watch in your showcase? It looks thinner and nicer than the one you sold me last week." When you explain that it is nicer, but it costs fifty dollars more, the customer replies, "Just fifty dollars more? I would rather have had it, and I could easily afford the difference."

You see, everyone loses when we undersell. We lose money, and the customer is unhappy that he or she was typecast and undersold.

Next month, we will slip in a few interesting facts about brides, so until then, remember we are *salespersons*.

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A Tall Case For Clock Repair Training



George Schlehr

During a recent pleasure trip through the scenic Ozarks of Arkansas, I came upon a small town in the hinterlands with a population of less than 1,000 souls. There was a watch and clock repair shop in town, a one-man operation located on one of the few side streets. As a friendly gesture, I stopped in to say hello to a fellow craftsman and was almost shanghaied by the harassed owner. At first he thought I was considering settling in the area and was overjoyed at the thought that someone had finally come to relieve him of a mountainous backlog of repair work, mostly clocks. His bench had barely the well-known "144" of J. E. Coleman. He pleaded with me to send him somebody, anybody, to help him out. Small comfort that it was, I told him, in effect, that he was just another statistic in the declining number of practicing horologists.

In 1970 there were an estimated 22,000 active watchmakers in the United States, with an average age of 58 years. In 1980, this number had dropped to only 16,000 repairmen behind the bench, still averaging 58 years in age. Fortunately, approximately 7,500 of these persons are members of AWI who know what they are doing. By simple arithmetic, this means that there is one repairman for every 15,000 people in our country. No wonder our Razorback friend is tearing his hair out.

As if this lopsided ratio of watch repairmen were not enough, the proportion of clock repairmen to the general population is even more ridiculous.

There is not just a scarcity of competent mechanics in this field; we are fast approaching an absence thereof.

In the United States and Canada there are some 40-odd schools of horology (the number is odd, not the schools), sparsely distributed among only 26 states and the province of Ontario. That leaves 22 of the neighboring states devoid of horological training. About one-third of these institutions offer some instruction in clock repair, with only a handful having clock repair curriculums of any repute.

Small wonder that those repairmen still in business are extracting higher-than-average charges from the public for their repair work. Some have admitted to me that they have escalated prices deliberately in the hopes that the customer will be discouraged. No such luck, they report; the work "just keeps a comin'." A poll of six repair shops in my city revealed that they are all turning down more work than they take in.

Interest in collecting antique clocks has mushroomed in the last few years. The National Association of Watch and Clock Collectors (NAWCC) boasts 33,329 members, most of whom desire more than just a little instruction in the care and feeding of their own collectibles. In our area, we prepare technical presentations for NAWCC chapter meetings, and these short, practical demonstrations have been most enthusiastically received. These people are starving for competent instruction in clock repair.

Some schools operate days, nights, and weekends, the year around, and the demand for training is still not completely satisfied. The excellent courses offered by AWI in clock repair and clock restoration, along with the courses offered in clock making techniques by a few outstanding schools, are still not enough.

The ideal institutions to successfully undertake programs in clock repair are the community/junior colleges and the vocational/technical high schools. Surely in such progressive states as Connecticut, Delaware, Indiana, Maryland, Oregon, Utah, Vermont, and others too numerous to mention but not to be slighted, there are educators aware of the need for horology departments in their secondary and post-secondary school systems.

The impetus should come from local guilds and state watchmakers associations as they petition the appropriate education agency to appoint an investigative task force.

⌚ *Every Minute Counts* ⌚



PRESIDENT'S MESSAGE

(Continued from page 4)

published, are expected to aid our financial picture during this coming fiscal year. These include *The Essence of Clock Repair*, a 54-chapter book by Sean C. (Pat) Monk. This book is currently being typeset and should be available by mid-June. It will sell for \$19.95. Due soon after Pat Monk's book will be *Watch & Clock Information Please!* featuring the writings of the Dean of American Watchmakers, W. H. Samelius, as compiled by Orville R. Hagans. This classic volume will retail for \$30.00. AWI is currently accepting advance orders (no checks at this time, please) for this book; the first 500 copies will be serially numbered and autographed and will become collectors' items. Presently in the editing stage is a comprehensive book on *Automatic Watches* by Henry B. Fried. We expect this book to be off the press before 1982. Another book waiting in the wings is *Marine Chronometers* by Marvin E. Whitney.

It is the hope of your Directors that these additional revenue-producing projects, combined with prudent management and restructuring of some of our costly educational programs, will help us to effectively cope with the ever-present realities of inflation.

Another subject equally as important as finances to the success of AWI is that of committee membership. Next month will be annual meeting time again; along with this comes the naming of committee members who will carry out many of our policies for the coming year. I invite any member who has an interest in serving on a particular committee to convey this information to me at AWI Central as soon as possible.

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THE PICKLE BARREL

By Marshall F. Richmond, CMW



MISCELLANEOUS JEWELRY REPAIR

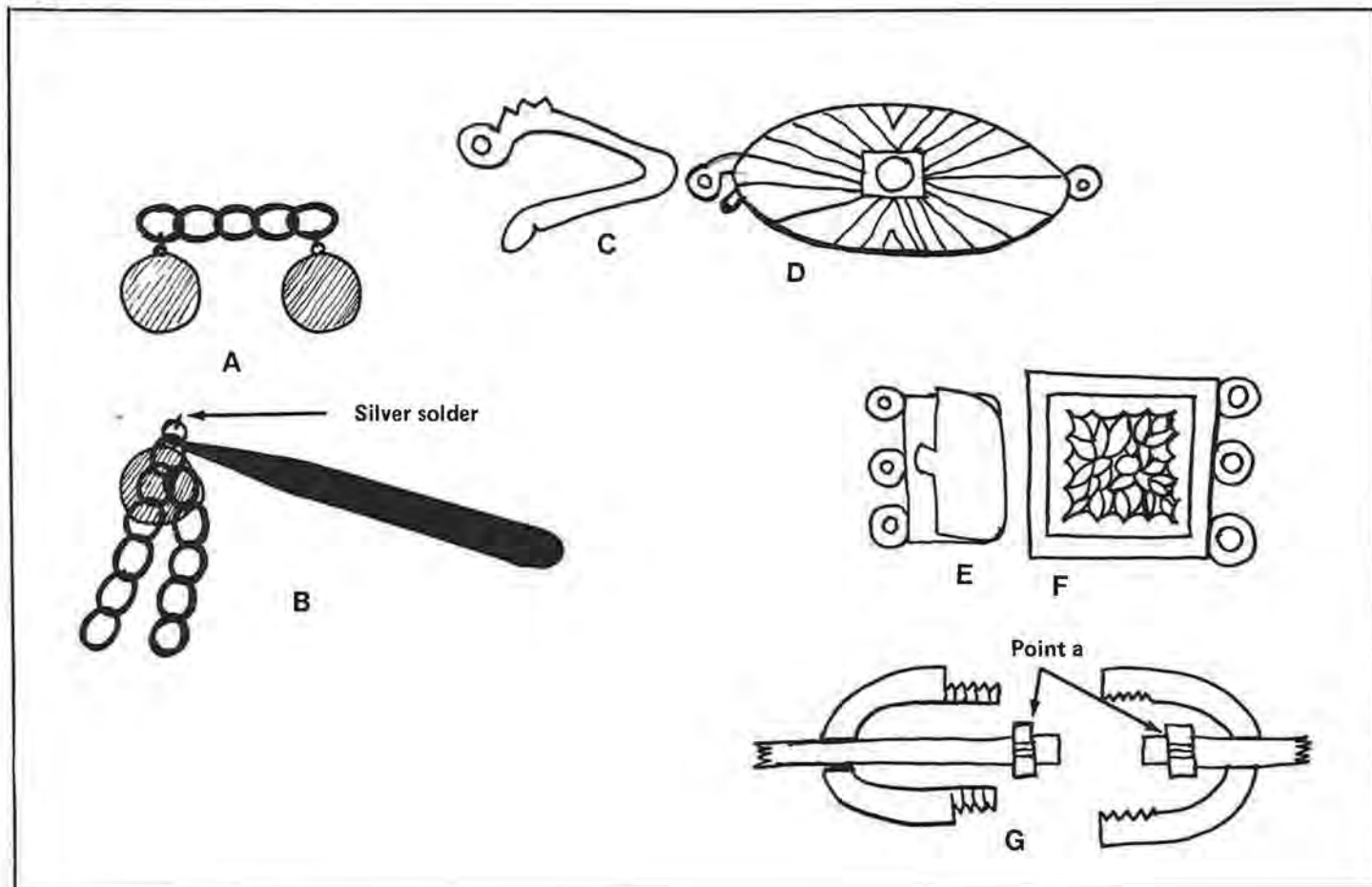
Part I

Articles that show up on the jeweler's bench sometimes require repairs other than the usual ring sizings or setting work. Many of these repairs require a great amount of ingenuity, as well as the usual skills of the jeweler. By combining the skills of the watchmaker and the jeweler, many a watch or piece of jewelry can be repaired that otherwise would have to be refused or at least sent out, requiring transportation charges, risks, and extra time. In this article, we will discuss some miscellaneous repairs that can be made much easier by combining the skills of the watchmaker and the jeweler.

Pierced earrings should have posts or wires made of no lesser quality metal than 14K yellow or white gold. Lesser-quality metals are subject to tarnish (corrosion or oxidation) that can have an irritating effect on sensitive skin and can even cause serious infection of the ear lobes. As most post clutch-type earrings are fitted with .8mm posts, it is a good idea to stock some 14K white and yellow gold wire. As many post earrings come in for repair with a post missing, it is easy for a watchmaker-jeweler to chuck up a piece of this wire in a number 8 chuck in the watchmaker's lathe, turn a small notch

in the end to accommodate the clutch back, round and polish the end so it will easily insert through the hole in the ear lobe, and then cut off the post to the exact length of the post on the matching earring. The new post is then ready to be gold-soldered to the earring. If the missing post is of the screw type (threaded with screw nut), this presents a different problem. Replacement threaded posts and the screw nuts are available from the material jobber. I have found two different diameters of these posts, 1mm and 1.10mm. I do not stock these replacement posts, but I do have the wire stock so that a piece of the correct

Figure 1



THE PICKLE BARREL

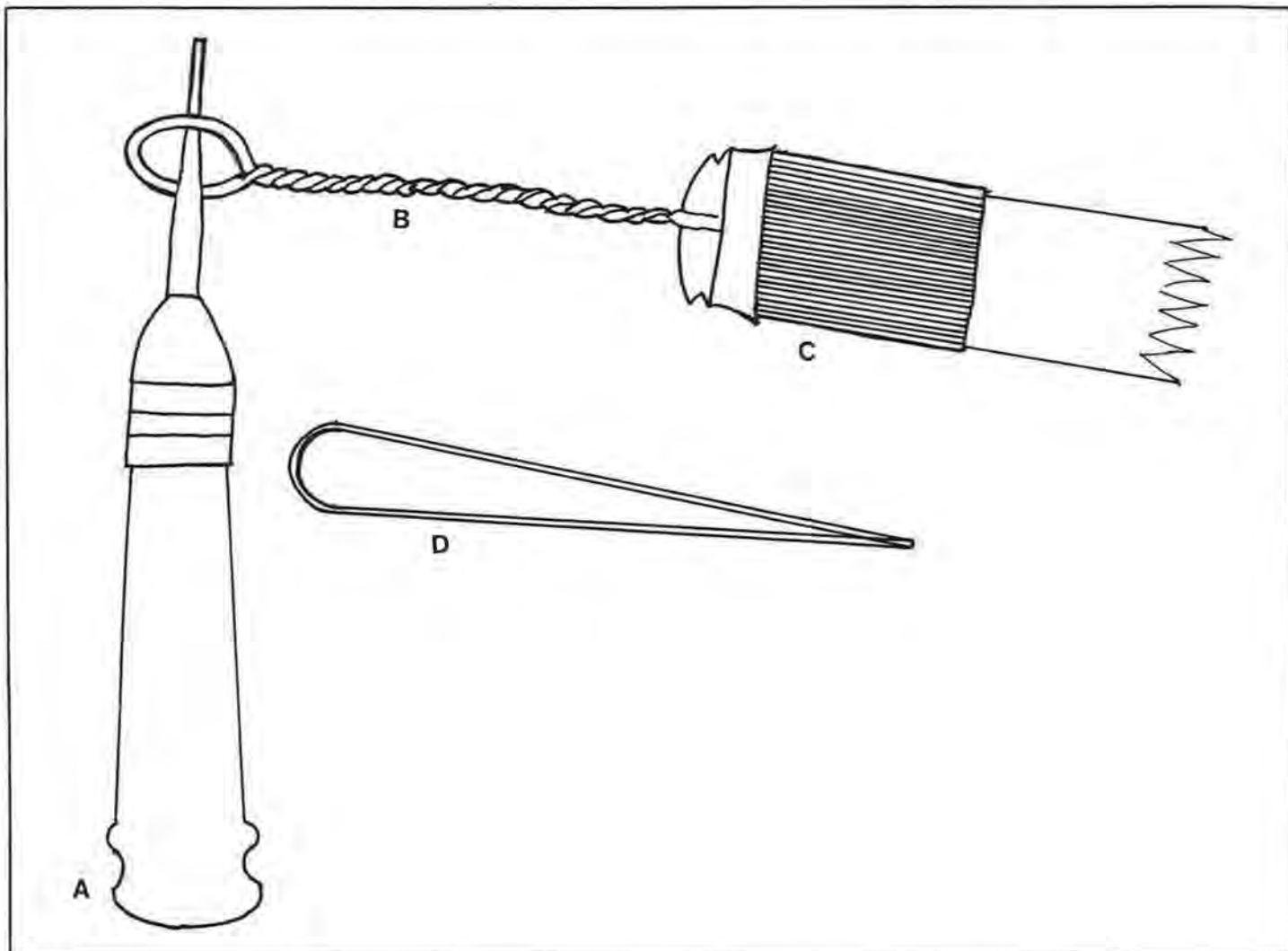


Figure 2

diameter wire can be chucked up in the watchmaker's lathe, using number 10 chuck for 1mm wire, or number 11 chuck for 1.10mm wire. The post can then be threaded to match the post on the good earring; the end can be polished, and the overall length cut to match the other post. The end should always be turned round and polished smooth so no injury will result to the ear lobe when putting on the earring.

When accepting repairs of this kind, always insist that the good earring be left with the one to be repaired so you have a pattern to go by and can make the repaired earring identical to the sample. Replacement posts should always be identical to the originals, so that the nuts (or clutches) can be interchanged.

The earwire type of pierced earring, often used in hanging drop-type styles, also requires repair quite often. We commonly get these bent out of

shape or broken, sometimes even in more than one place. Sometimes part of the wire is missing. These earwires can be purchased from the material distributor, but as earwires are made in many shapes and sizes, I find it better to stock the wire and either make a new one to match the one in good condition, or repair the old broken one. Making a new earwire requires round nose, chain nose, and cutting pliers, and the wire can be bent with these tools to match the sample. Some of these have the loop for the drop bent in the wire, while others have a small ring soldered from which the drop can dangle. A small jump ring can be gold-soldered with the open part at the top, and then the drop can be installed by bending the ring open and closing it with chain nose pliers, just as when installing any attachment with a jump ring. These wires can also be repaired by gold soldering the breaks, or in case a part of the wire is

missing, a piece of identical size wire can be gold soldered, shaped, and cut off to match the sample. Always round and polish the end after cutting with cutting pliers.

This covers only some of the possible repairs on posts and wires. There are many other repairs on earrings that confront us, such as missing, broken, or bent prongs, beads, or stone settings. All these repairs can be made with the knowledge and skill of the jeweler, and many are easier if the jeweler is also a watchmaker with watchmaker's tools and equipment.

Many times, earrings that are not pierced come in to be converted into pierced earrings. Each job must be analyzed to see what metals have to be soldered, and if stones are involved, whether they will stand the heat of hard soldering or will have to be soft-soldered or removed. Also to be considered is where to locate the post so an emblem

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or a pattern will stay upright when the earring is worn. As was previously stated, although these posts can be purchased from the material jobber, I usually make them. Many times, earrings of poor quality are brought in with a request to convert them, and the customer is willing to pay the cost. My thought on this is that if a good job can be done so that the customer can derive pleasure and satisfaction from wearing them, the customer is entitled to this service. These posts for soft soldering can be made by punching a piece of thin gold in the watchmaker's staking tool with a round bottom punch and then gold soldering the post to the center of the dome side. For use with half-drilled pearls, this concave or domed disc can be drilled, the post cut a little longer, and the soldering done with the post protruding through the disc. The half-drilled pearl can then be cemented to the earring with Aaron Alpha cement.

Most jewelry stores sell charm bracelets and charms, and it is usually up to the watchmaker-jeweler to install the charms on the bracelet. The quality of the chain bracelets and charms can range from inexpensive gold or rhodium plate to good sterling silver or 14K gold. The charms usually come with jump rings for attaching them to the bracelet and they can easily be attached with chain nose or flat nose pliers. This is fairly secure if the opening in the jump ring is tightly closed and aligned properly. Many customers request that they be soldered in the split to make them more secure. The inexpensive ones can be soft soldered quickly with a soldering iron, soft solder flux, and lead-base solder. As some charms are molded from a lead-base alloy, care must be used not to melt the ring that is molded in the charm. Therefore, never use a torch for these charms. Sterling silver or gold charms can be hard soldered, using silver solder with silver and gold solder with gold. This can be done with a torch or a soldering machine. Many silver charms come with oval tapered-end jump rings, and when soldered, do not make a very neat job. I always keep on hand round heavy silver jump rings (number 36) which are substituted for the originals. To silver solder these, insert a small piece of silver solder in the split, flux with hard solder flux, and apply heat until the solder flows. To hold while applying heat, use an old pair of 3-C tweezers and hold as illustrated in Figure 1, View B. Gold or gold filled can be soldered in exactly the same manner, only using gold solder. As silver is a better conductor of heat than gold or gold filled, it will require more heat to make the silver solder flow.

Charms are a repeat business item as customers usually buy a bracelet and one or a limited number of charms

as a gift, following up on gift-giving occasions by giving more charms. Therefore, when installing the original charm or charms, a little planning should be done in order to keep the charms evenly spaced and balanced as more charms are added. The first charm can be started in the exact middle of the bracelet, and as more are added, an uneven number of links should be maintained between charms (one, three, five, etc.). This way, a charm can always be added in the exact middle between the two existing charms. If several charms are to be installed on a bracelet with no charms, it is wise to start in the center with the largest, adding the next largest on each side, then the next two largest on each side of those, etc. The charms will taper down from center to each side, making a very attractive arrangement. When charms are added intermittently, the tapered arrangement cannot be maintained without shuffling charms around, and this can be costly if they are soldered on. However, at least the spacing can be maintained if the odd number of links between charms is observed. View A, Figure 1 illustrates the proper spacing of charms.

Bead and pearl stringing is a repair we occasionally encounter. Even though a jewelry repairman or watchmaker does not usually get enough of this work to really become proficient, when these jobs can be done on the premises without the delay of sending them out or the risk of loss in transit, the price that can be charged will easily compensate for the time and material involved. There are many problems involved in bead stringing that require ingenuity, and I will discuss some of these.

Several materials are used in stringing pearls and beads, with nylon or linen cord, plastic-coated wire cable, and foxtail chain being the most commonly used. Nylon bead cord is the most frequently used and is available in several diameters. It can be purchased by the spool with beading needles purchased separately, or in individually packaged assortments with a needle already attached to a length of cord approximately the proper length to string one strand. The assortment usually contains cord of three or four different diameters. Plastic-covered wire cable can be purchased in small coils in at least three different diameters. Foxtail chain can be ordered by the foot in several different thicknesses. Use that diameter of cable or foxtail chain which will easily thread through the hole in the beads; when using cord, choose the diameter which, when doubled, will fit through the hole.

Usually fishhook or box-and-tongue catches are used with bead cord, and spring rings and jump rings are used

with foxtail chain. With wire cable, one generally uses a catch that threads together with a male thread on one half and a female thread in the other half. Figure 1, Views C and D show the fishhook catch; E and F show the box-and-tongue, and G shows the screw-together catch. The threaded catch uses a small tubular ring that slips over the end of the cable and is crimped tightly over the cable. It then slips back in the recession in the catch end and will be secure. This is shown in Figure 1, View G, point a. All these supplies are available from most material distributors. Soft stone beads, such as oddly shaped or large turquoise, are usually strung on plastic-covered cable. Foxtail chain is used for glass, hard crystal, or stone beads that have sharp edges on the rim of the drilled holes which would cut bead cord in a short while. Nylon or linen cord is used for pearls and most simulated stone beads. For regular bead stringing, I use nylon cord that I purchase by the spool.

I make my own beading needles. To make beading needles, I use a piece of number 24 binding wire that I always keep on hand for jewelry work. This piece of wire is bent double (See Figure 2, View D) and the end chucked in a pin vise. With a prong pusher through the loop end, the wire is twisted by rotating the pin vise. See Figure 2, Views A, B, and C. The end is cut off, the bead cord put through the loop end, and when enough length is threaded, the ends are knotted together and cut from the spool. This hand-made bead needle is made of fine enough wire that even when doubled it will go through the holes in any beads that I have encountered. Also, binding wire is soft enough to twist tightly.

There are several ways to attach bead clasps. On less expensive beads and pearl the bead tip is commonly used. This is a small concave disc, drilled in the center, with a metal strap forming a ring around it. It looks a little like a round-bottomed bucket with a hole in the bottom. Before any pearls or beads are strung, this should be strung on the cord with the knot resting in the concave. The ends of nylon cord can be fused by heating with a match, cigarette lighter, or flame from an alcohol lamp which will keep the knot from ever coming untied. With linen cord, a little crystal cement will accomplish the same thing. I always knot the first three beads individually on any strand that does not have to be strung with knots between each bead. This is because bead cord will usually break close to the clasp, and with these three knots, only one bead is apt to be lost if the cord breaks. In stringing with cable, no beading needle is necessary because the cable is stiff enough to go through the beads. Foxtail

chain can be used with a beading needle, but the wire must be put through the end link before twisting. A jump ring can be installed in the end link on the opposite end before the first bead is strung.

There may be many methods for making the repairs described above, some better and quicker. If you know of them, use them, but these methods work for me and make profitable and durable repairs possible. I hope that they are helpful to some of my fellow watchmakers and jewelers.

The next article will be a continuation of miscellaneous repairs.

TIME

QUESTIONS AND ANSWERS (Continued from page 20)

Rue Des Infants in 1850. He invented the escapement known by his name and the unique and popular suspension of the pendulum system. The later patents were dated 1858. He devised a free pendulum escapement and a perpetual calendar mechanism often used in elegant French mantel clocks. Some clocks attributed to Brocot have a form of coup-perdu escapement. Perhaps there should be a book on Brocot. It is said his first invention, probably the escapement, was made when he was but nineteen years old.

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Affiliate Chapter Glossary

Two months ago, we discussed ways to help a chapter grow. Continuing our Affiliate Chapter Glossary, we will skip a few letters and stop at the letter "L."

Leadership: n. those who direct the operation, activities, or performance of a group or organization.

One of the reasons—or, more accurately, the excuses—for the problems experienced by a chapter is the lack of leadership. True, no group can operate without a leader. Just as a ship needs a rudder to keep from wandering aimlessly on the sea, each chapter needs members who will act as the rudder. However, the rudder cannot function without a driving force, whether it be the wind, the engine, or the motivation of the rank and file members. Too many times, however, the leaders must be both the rudder and the engine.

Theoretically, the good leader needs only to inspire others to do the work, but in practice, this is seldom the case. The dedicated member who accepts a leadership role often finds it easier and quicker to do the job himself. While this is theoretically wrong, I can understand the reasons. A watchmaker's most valuable asset is time; the time spent away from the bench must be spent wisely. I know from experience that the temptation to do chapter business the quickest way is very strong.

Perhaps the "let George do it" syndrome is more prevalent among watchmakers than other professions. The very nature of our craft requires qualities of patience and the ability to work long periods essentially alone. Although there are exceptions, because of these qualities, many are somewhat introverted and are



Robert F. Bishop

uneasy or unwilling to assume a leadership role.

If this is true, it is doubly important that you support your leaders in every way you can. You—the member—must be the driving force. Don't force your leaders to be both the rudder and the engine.

License: n. a permission granted by a competent authority to engage in a business, occupation, or activity, otherwise unlawful.

Watchmakers' associations have been formed for the sole purpose of securing licensing laws in their state, because they wished to protect the public from unskilled or unethical watchmakers. Wisconsin, Michigan, Indiana, North Carolina, Florida, Louisiana, Iowa, Minnesota, Kentucky, North Dakota, and Oregon are all states which have or have had licensing laws. Because this is an effort by a profession to insure professional standards of its members and promote consumer confidence in a service that the public knows little about, it is hard to understand the current

antagonism by various state governments toward these protective laws.

Recent court cases have ruled that it is unconstitutional to restrict an individual's right to practice a profession, unless that profession affects the public health, safety, or welfare. It is hard to understand why a "butcher" job on a customer's watch does not involve the public welfare, but such is the case in many states that have lost their licensing laws. Another reason is that there have been few complaints brought before the licensing board, and therefore, the public is not overly concerned. This may be true, but the real value of a license lies in the fact that the watchmaker has demonstrated his competency at some point in time, and the general level of skill is higher in a licensed state.

Thus it is now up to us—the individual member and the Affiliate Chapter and AWI—to do all we can to maintain professionalism and a sense of ethics whenever and wherever we can.

Little more than a month remains before our 1981 Affiliate Chapter Meeting. It will be held this year on Friday, June 26th, at the Americana Inn, Cincinnati Airport. By now your officers will have received the Affiliate Chapter Report Form and a new questionnaire on how your chapter organizes and holds its annual convention. We feel that this will be of great help to those chapters which are not as experienced as others in this important activity. Please give it your support.

Express your feelings about the role of AWI, your chapter, and our industry in your work life to your delegate, so that he can be your voice at the Chapter Meeting and the AWI Board of Directors meeting following. **TUES**

...from all around the ASSOCIATION...

CONVENTIONS AND SEMINARS



ARIZONA

The Third Annual Convention of the Arizona Horological Association will be held at the Doubletree Inn, Tucson, Arizona on Saturday and Sunday, May 16 and 17, 1981. This Association is the statewide organization for watchmakers and clockmakers and affiliated crafts and is a chapter of the American Watchmakers Institute.

Saturday will be devoted to registration and a golf tournament, which will be played at the Randolph North Golf Course where the recent Tucson Open was won by Johnnie Miller. Golf will be followed by a cocktail hour hosted by McGuire's Jewelry Supply of Tucson and Langert Brothers Co. of Phoenix. A dinner will be held in the evening, followed by dancing and live music.

Sunday morning will feature a continental breakfast hosted by Mr. and Mrs. Norman Levine of Portescap Corporation. The National Association of Watch and Clock Collectors, Chapter 113, Tucson, will display many of their valuable and rare watches and clocks.

The educational program will consist of three seminars. Dr. Joseph Baier of Phoenix, second vice-president of AWI, will present a program; Mr. Gene Chipley of Prescott will demonstrate his processes for building wooden wheel clocks. Bulova Watch Company will also participate with an afternoon program, following a lavish buffet luncheon. Door prizes will be awarded, followed by a short meeting and adjournment.

All watchmakers, clockmakers, and collectors in the state will receive an invitation to attend this fine convention. The state officers cordially invite the participation of interested horologists.

IOWA

The Spring Technical Seminar of the Iowa Jewelers and Watchmakers Association was held on April 5, 1981 in Des Moines, Iowa.

The many features of the seminar included a program on "Estate Planning" by Mr. Pete F. Buffer. Mr. Buffer is an

attorney from Kalona, Iowa. His specialty is small, family-owned corporations and estate planning for the businessman. The program concentrated on planning estates so as to pay the least amount of taxes and the best ways to retire from the jewelry business while paying the least amount of taxes. Also discussed were the advantages and disadvantages of incorporating.

Also featured was a film called "Gems of the Americas," which was followed by a round-table discussion and another film entitled "This is a Hold-Up."

Cal Sustachek, a Field Service Instructor for Bulova Watch Company, held two Bench Courses. The course covered the Bulova Accuquartz.

OHIO

Now is the time to be making reservations and completing plans to attend the next WAO-AWI seminar in Zanesville, Ohio on Sunday, May 17. Les Smith will be instructing on the Seiko LCD Chronograph/Alarm. There will be the usual Saturday night Hospitality Room for all WAO members and spouses.

NEW JERSEY

An exciting look at a new microminaturization process, by which Japan threatens to revolutionize the diamond industry, was featured at the February meeting of the Watchmakers Association of New Jersey. The speaker was Mr. Harold Smith, the New Jersey sales representative of Okuda Jewelry Technical Institute, United States.

Okuda JTI is introducing scientific printing of investment diamonds in this country. By this method, an inscription is put on the stone itself to show a guarantee number, carats, proportion, clarity, and color grade. Okuda claims this imprint is so precise and fine that it does not affect the weight or integrity of the stone.

Also presented was a demonstration of the Okuda diamond grading microscope and color grading computer.

With these instruments, Okuda promises a jeweler will be able to grade any color gem stone safely and accurately, and determine the clarity, color, and proportion of a diamond all in a few easy steps.

Guest speaker at the March meeting of the Association was Mr. Galo Destruge, director of technical and repair services for Longines.

He presented an illustrated talk on the electronic ESA 9150 and 9156 covering various techniques of disassembly and reassembly for efficient repair. Both are early models and were chosen for discussion so the rapid progress being made in electronics could also be discussed.

Mr. Destruge advised all watchmakers present that Longines will gladly supply them with technical bulletins on request.

ILLINOIS

"Selling Repairs" was the topic of the March 19, 1981 meeting of the Central Illinois Watchmakers Association. Guest speaker was Mr. Lester Chambers, manager of Robert Burke Jewelers and Manufacturers in Peoria, Illinois.

PENNSYLVANIA

Nine watchmakers from the central Pennsylvania area met in State College, Pennsylvania on Sunday, March 15, 1981 to form the Keystone Watchmakers Guild, under the by-laws of the Watchmakers Association of Pennsylvania, Inc. George H. Jones was elected president; William Jaggard, vice-president; and Stanley Wall, secretary-treasurer.

Regular meetings will be held the third Tuesday of each month, with programs designed to keep its members current with the changing technology in the watch repair profession.

Ralph Henning, President of the Watchmakers Association of Pennsylvania, Paul Fehrenbach, Director, Robert Murtland, President of the Allegheny Watch-

makers Guild of WAOP, and Bob Bishop, Affiliate Chapter Director of the American Watchmakers Institute, were present and aided in the formation of the new guild.

Following the meeting, an AWI slide-tape program, "Casing Made Easy" was presented, after which a dinner was held for the members and their wives.

Watchmakers in the central Pennsylvania area who wish to join the Keystone Guild may do so by contacting George Jones at 814-238-1668 or 238-2741.

The Keystone Guild becomes the fourth guild in the State organization. The others are the Allegheny, Central, and Delaware Valley watchmakers guilds.

- Prediction of the future price of gold.
- Key historical events affecting gold, such as the gold coinage recall in 1933.
- The relationship of gold to the petrol dollar.
- The role of the Hunt brothers in silver.

The talk was not only a fascinating descriptive presentation, but was also replete with practical information. For example, Mr. Vigdor pointed out that whereas the very popular Krugerrand coin contained 22 karats of gold, the less known Canadian Maple Leaf contained 24. Consequently, when melting the coins down to gold bars, the Krugerrand required an extra refining fee which was unnecessary for the Maple Leaf.

A very active question and answer period concluded the meeting.



Luis Vigdor, Vice-president of Manfra, Tordella and Brookes, addressing the Horological Society of New York.

NEW YORK

On Monday, March 2, 1981, Luis Vigdor, vice-president of Manfra, Tordella and Brookes, addressed the Horological Society of New York on the subject of gold.

Gold has fascinated the general public but has a special significance to the jewelry industry and all the fields related to it. The members of HSNY had a rare treat in that Mr. Vigdor's presentation covered an extremely wide range of topics such as:

- How the price of gold is determined on the international markets.



The new officers of the Horological Society of New York are (left to right, seated) Al Rudnick, executive secretary; Ann-Louise Brackbill, vice-president; Aaron Rennert, President; Harry Fisher, editor; Peter Davis, treasurer. (Second row) Ben Matz, executive committee; Aaron Cohon, executive committee; Irving Albert, trustee; Dennis Tricarico and Irving Feld, executive committee. (Third row) Morton Silver, executive committee; Victor Hull, recording secretary; Howard Levy, trustee.

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NORTH CAROLINA

The Triangle Guild of the North Carolina Watchmakers Association held a meeting on February 9, 1981 in Cary. Mr. John Capps recounted his experiences in a GIA Gemology course which he took in California.

The Land of the Sky Guild held elections during their first meeting of the year. The results are: President, A. C. Hogan; 1st Vice-President, Conrad Hoxit; Director, Wilbur L. Miller; and Secretary, Fred A. Kolls.

The Unifour Guild held a meeting February 10, 1981 in Hickory. A slide presentation from AWI on selling was featured. At the Piedmont Crescent Guild's monthly meeting in Mooresville, AWI slides on clock escapements were featured.

On Sunday, February 1, 1981, the North Carolina Watchmakers Guild's Board of Directors held a meeting in Charlotte. Walter Hanson presented an account of the State Convention, seminars, demonstrations, and speakers. 

CLOCK CHATTER

(Continued from page 25)

having been made in one form or other since horological times immemorial. The basic materials are shown at the bottom of Figure 15 and consist of a piece of bushing wire with a piece of pivot wire that fits the hole with a small amount of play. The wire is given a bend which assures a tight fit in the tube yet allows easy sliding action for use.

Three examples are shown at the top. The two outer ones have had the wire thinned down for holes of small diameters. The thinning down is done on the lathe—obviously before you put the bend in the wire. The center one is a variation featuring a collar made for it with a cut-out portion to straddle any obstruction. The operation is the same.

The idea of the operation is to push the wire out far enough so that when you push the tool down, the edge of the bushing tube makes contact with the upper portion of the item being measured and the end of the wire is in contact with the bottom, thereby measuring the depth. A ruler may be used to measure the amount of wire extending, or the tool may be used as a direct measure by comparing it with the item being made or altered. It is excellent for balance staff work, stem depths, cylinders, and many other places that require depth measurements.

Let your imagination and ingenuity take over and fly away. It is a certainty that many of you have far better ideas than these, so how about taking a minute or two to send your little gems to Joe Crooks, our beloved "Jingle Joe." He needs the work! 

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TECHNICALLY WATCHES

(Continued from page 9)

tooth reaches the edge of the receiving lip of the cylinder, it unlocks and the impulse plane of the tooth slides across the lip of the cylinder, giving impulse to the balance wheel. When the tooth leaves the receiving lip of the cylinder, it drops onto the inside wall of the cylinder as in View "d." The balance continues to travel in the direction of the arrow as in View "e." Then the balance reverses as in View "f." The tooth reaches the discharge lip of the cylinder and unlocks as at "g" and slides over the discharge lip, giving impulse to the balance. When the tooth leaves this lip, another tooth drops onto the outside of the cylinder. This completes the whole cycle of locking, drop, and impulse.

Figure 5 shows the construction of the cylinder. The receiving impulse face is left with somewhat of a semi-circular rounded face with 3° lock and 3° impulse. The discharge impulse face has a longer curved shape which is 10° . The lock on this side is 3° as is the receiving side. The shell of the cylinder spans 180° from the locking point on the receiving side to the start of the impulse face on the discharge side, as is illustrated in Figure 5.

Figure 6 shows the drop on the cylinder escapement. View A shows the outside drop. This space must be a sufficient amount to prevent the heel of the tooth from touching the outside surface of the cylinder. The drop allowed is usually 1° . If there is insufficient outside drop and excessive inside drop, then the cylinder is too large. View B, Figure 6 shows the inside drop. This should be 1° also. If the inside drop is

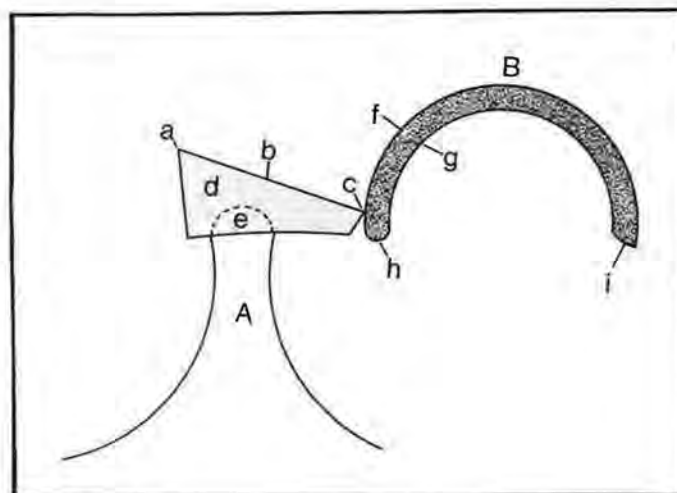


Figure 3

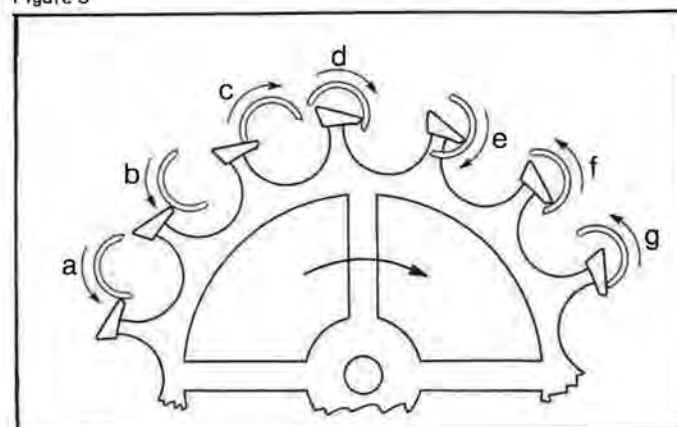


Figure 4

insufficient and the outside drop is excessive, this could indicate that the wall of the cylinder is too thick, or the cylinder is too small. If the outside drop is correct and the inside drop is insufficient, this indicates that the cylinder wall is too thick. The drops must always be made equal.

The maximum amount of motion the balance wheel can take in a cylinder escapement is slightly less than one turn. This amount of motion is limited due to the design of the escapement. To limit the motion, a small banking pin is placed in the edge of the balance wheel. This banking pin works in connection with a banking stud that extends downward underneath the balance cock. The action of the banking pin with the banking stud is shown in Figure 7. An escape wheel tooth is locked up inside the cylinder with the banking

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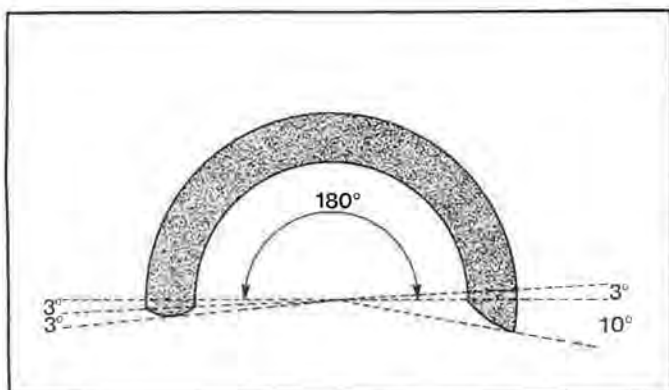


Figure 5

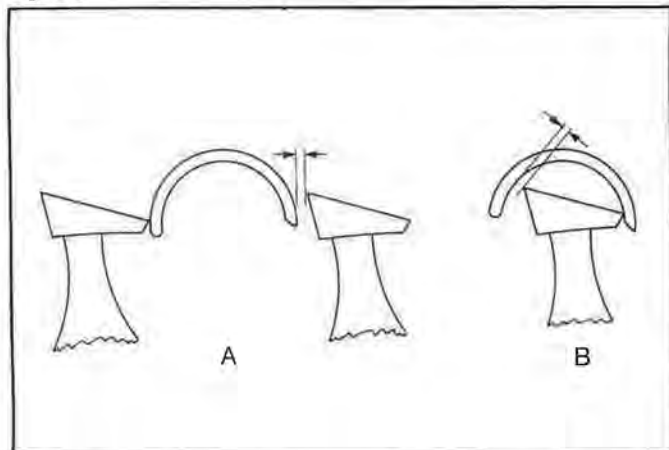


Figure 6

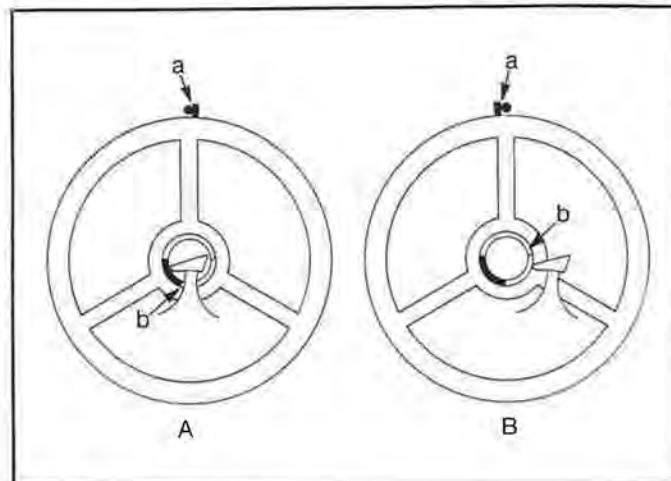


Figure 7

pin against the banking stud at "a" in View A, Figure 7. There should be a slight amount of clearance between the arm of the teeth and the edge of the cylinder wall as shown at "b" in Figure 7, View A. If there is no clearance, the watch is likely to gain time because the balance will get a rebound as the edge of the cylinder wall strikes the teeth. If this condition does exist, then the edge of the cylinder wall that clears the rim of the wheel should be cut back further to correct this condition.

Figure 7, View B shows an escape wheel tooth locked up on the outside wall of the cylinder when the banking pin goes against the banking stud at "a." The toe of the escape wheel tooth must still be locked safely on the outside of the cylinder wall. If the cylinder is inserted into the balance wheel in an incorrect position in relationship to the banking pin, the toes of the escape wheel teeth can become locked up on the cylinder wall at point "b" in Figure 7, View B. When this happens, the escapement is said to be overbanked. To correct this condition, the balance wheel is turned on the cylinder until the banking pin is at right angles to a line running across the impulse faces of the cylinder.

Most cylinder watches and clocks have three dots on the plate close to the balance wheel. There is also a dot on the edge of the balance wheel. This is shown in Figure 8. These dots are used in checking the escapement for the proper amount of lock and impulse. These dots can also be used to tell if the escapement is in beat, especially if the cylinder is placed in the balance wheel in the proper position. The cylinder

(Continued on page 58)

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Tightening the 218 Accutron Center Wheel Assembly

A practical tip from Mr. Winfred Linder, 119 N. Church St., Spartanburg, South Carolina 29301.

I am now 72 years old and have been repairing watches for the past 60 years. My experience began while watching my dad when I was 6 years old. At 12 I started my apprenticeship under dad.

Having now retired, I will have some leisure time and will be glad to share some of my tips about problem jobs in watch repair. If you can use it, here is one that comes to mind now.

This is how I tighten an Accutron 218 center wheel on the cannon pinion.

Tools needed are a small pin vise, bench anvil, and a needle of the correct diameter.

Place wheel, with the pinion removed, over hole in the bench anvil.

Insert needle between one of the two arms and the rim of the wheel into the hole. Then tighten the pin vise on the needle about $\frac{1}{2}$ mm above wheel. Press straight down into the hole until the pin vise touches the wheel and repeat the same process on the other arm.

The pin vise works just like a depth gauge and there is no danger of bending the two spokes out of round or breaking them.

Snap cannon pinion on wheel and, if not tight enough, move needle out of the pin vise $\frac{1}{2}$ mm more to repeat the procedure again.

Thanks for the Accutron tip, Winfred. Didn't clear it with my good friend Mr. Henry Frystak because I know he will approve of this safe way to tighten the 218 wheel and pinion.

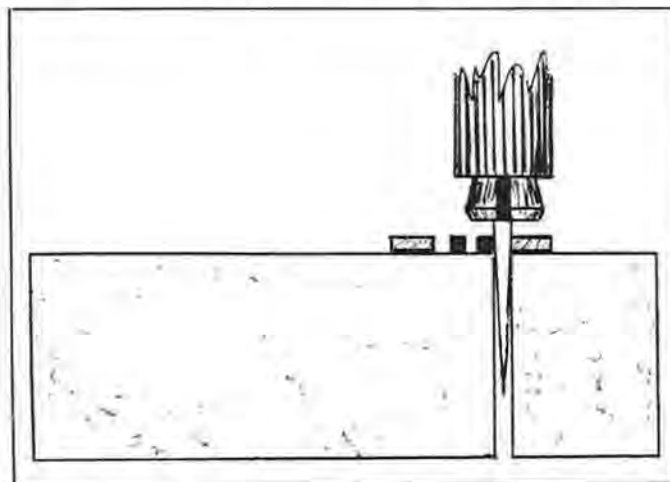
In fact, I like this idea so well, I tried it on a three-spoke ETA wheel with great results. I had been smacking them with a very slightly oval punch on the topside of the wheel, which was centered in the staking tool.

Clean the wheel and cannon pinion before snapping together, and then lubricate lightly with Molybdenum Disulphide (Moebius OL-207) before checking for tightness. Sad to say, had these type wheel and cannon pinions been lubed with "black Molly" the last time they were cleaned, they would not have become loose.

With your 60 years at the bench, you have witnessed many changes in our profession and we will certainly welcome any tips you may send us to share with fellow craftsmen.

Our sincere best wishes to you and Mrs. Linder in your retirement and may they be many happy years.

Send your tips to Jingle Joe, 265 N. Main St., Mooresville, North Carolina 28115.



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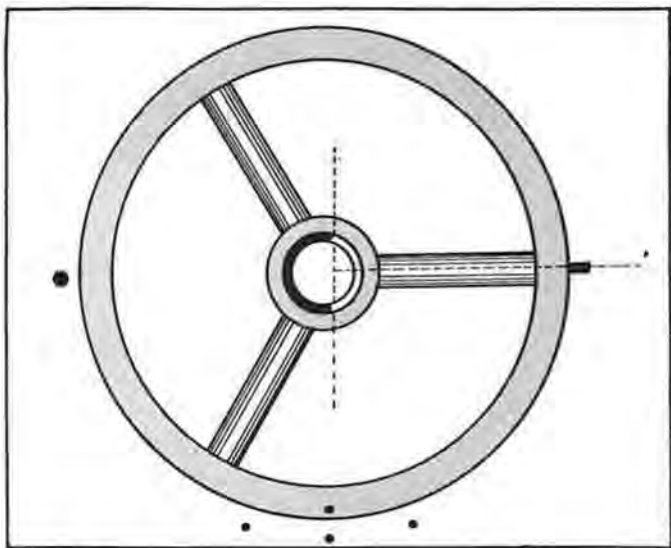


Figure 8

should be inserted into the balance in such a position that the two lips of the cylinder are at right angles to a line running through the center of the cylinder and the banking pin on the edge of the rim of the balance wheel. This is shown by the dotted line in Figure 8. The banking stud in the balance cock should be opposite the banking pin. When these conditions are achieved, the dot on the balance wheel should be lined up with the center dot on the plate. The escapement should be in beat when these two dots line up if everything is correct.

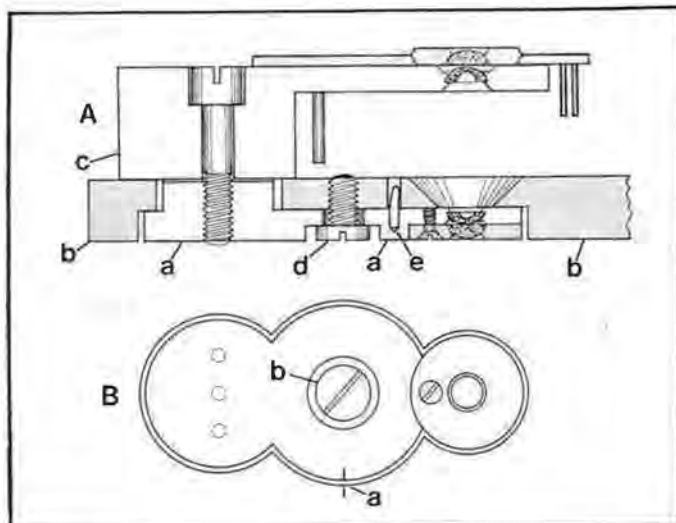


Figure 9

When the escapement is in beat, a tooth of the escape wheel should be resting almost centered on one or the other of the impulse faces of the cylinder, and the dot on the wheel should be in line with the center dot on the plate. To check the amount of lock and impulse, move the balance wheel with the finger until a tooth drops and locks up. Note the position of the dot on the edge of the balance wheel in relation to one of the outside dots on the plate. If the lock and impulse are correct, these dots should be lined up. Now, turn the balance the opposite direction until a tooth drops and locks up again. Then see if the dots line up. If the dot on the balance wheel goes past the outside dots on the plate, then the escapement is set too deeply. If the escape wheel teeth drop and lock before the dot on the balance wheel reaches the outside dots, the escapement is set too shallow. The total impulse should be 40° with 20° on each impulse face of the cylinder when correctly set up.

To adjust the depth on a cylinder escapement, an adjustable plate called a chariot is shifted nearer or farther away from the escape wheel. This arrangement is shown in Figure 9. View A shows a cross section view of the construction of the chariot fitted to a watch or clock plate. Point "a" is the chariot, "b" is the watch or clock plate, "c" is the balance cock, "d" is the chariot screw, and "e" is the chariot steady pin.

As will be seen in Figure 9, the balance cock is attached to the chariot by steady pins and the balance cock screw. When the chariot is moved, the balance cock is likewise moved, and since the cylinder is supported by the jewels in the balance cock and the jewels in the chariot, it is moved also. This causes the depth between the cylinder and the escape wheel to be changed to correct a light lock or a heavy lock.

Figure 9, View B shows a flat view of the chariot. Note the space around the chariot to allow it to be shifted. Usually a mark is placed on the chariot and plate so the amount of the move can be noted. This mark is shown at "a." The chariot screw is shown at "b." To shift the chariot, loosen the chariot screw and shift the chariot; then retighten the screw. In order to shift the chariot, it may be necessary to slightly bend the chariot steady pin in the direction opposite to the direction the chariot is moved. Sometimes it is necessary to slightly enlarge the hole in the plate that the steady pin fits into in order to shift the chariot enough.

Next month, the making and fitting of cylinders and cylinder plugs will be discussed. Trouble shooting of the cylinder escapement will also be discussed.



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GOOD & WELFARE: CHEMICALS

(Continued from page 13)

degreaser, solvent, and dry cleaner. Its early effects are as an anesthetic affecting visual perception and motor skills somewhat like a narcotic. Long-term problems include effects on the heart, liver, kidney, lung, and skin. Its carcinogenic effect is being investigated.

Tolulene (Toluol, Methylbenzene, Phenylmethane)

TLV-TWA	100 p.p.m.
TLV-STEL	150 p.p.m.
CCFP	40° F

Tolulene is an in-between chemical. If pure, it seems to only affect the body with headaches, nausea, and some loss of muscular coordination. However, tolulene can contain impurities of benzene which, of course, is very dangerous. It is highly flammable. It is dangerous whether inhaled or absorbed through the skin. It emits toxic fumes if burned.

Xylene

TLV-TWA	100 p.p.m.
TLV-STEL	150 p.p.m.
CCFP	80-100° F

Xylene is very much like tolulene in symptoms and in the ability to be contaminated with benzene.

Methyl Isobutyl Keytone (Hexone, MIBK)

TLV-TWA	100 p.p.m.*
TLV-STEL	125 p.p.m.*
CCFP	73° F

The vapor of this solvent attacks the membranes of the eyes, nose, and throat, followed by weakness, headache, nausea, dizziness, etc. It has a bad odor and irritates the eyes at concentrations of about 200 p.p.m. It may affect the kidneys. It is highly flammable and explosive.

RECOMMENDED SOLVENTS

The following chemicals can generally be recommended for use. They are still dangerous if not used correctly, but there is a greater margin of safety than with the others previously listed. Ventilation and skin protection are still mandatory precautions, as is watching out for fire and explosive situations.

Acetone (2-Propanone)

TLV-TWA	1000 p.p.m.*
TLV-STEL	1250 p.p.m.*
CCFP	1.4° F

(Odor is detectable at concentrations between 200 and 400 p.p.m.)

Acetone is a widely used and easily available solvent and cleaner. It is very flammable and somewhat explosive. Though very high concentrations can cause dizziness, nausea, and

lack of coordination, it seems safe for short term exposures. It absorbs water much like alcohol but does not contaminate itself by absorbing water vapor from the air.

Ethyl Alcohol (Echanol)

TLV-TWA	1000 p.p.m.
CCFP	55° F

(Odor threshold is about 1000 p.p.m.)

Ethyl alcohol can be purchased as drinking liquor or as denatured alcohol, the latter being poisonous. Inhaling the fumes of either gives essentially the same results as drinking liquor. It is flammable and dangerously explosive.

Isopropyl Alcohol (2-Propanol, Isopropanol)

TLV-TWA	400 p.p.m.
TLV-STEL	500 p.p.m.

Isopropyl alcohol affects the body in a way very similar to ethyl alcohol but is twice as toxic. When highly diluted with water, it is used as rubbing alcohol. Inhaled or absorbed through the skin, it acts as a narcotic. Fumes irritate eyes, nose, and throat. It is very flammable and very dangerous around heat or flame.

Methyl Alcohol (Methanol)

TLV-TWA	200 p.p.m.
TLV-STEL	250 p.p.m.
CCFP	54° F

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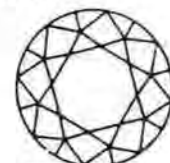
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Methyl alcohol is also widely used and easily available. Very high concentrations over long periods of time can cause headaches and blurred vision. However, the body appears to slowly eliminate methanol with time. Methanol is also absorbed through the skin as easily as inhaled and is flammable and explosive.

There are many other "alcohols" but these three are those likely to be available and used by the horologist.

Ammonia

TLV-TWA	25 p.p.m.
TLV-STEL	35 p.p.m.

Non-flammable

(Odor is detectable as low as 1 p.p.m. and objectionable as low as 20 p.p.m.)

As most users know, ammonia causes irritation of the nose and eyes. Though very dangerous in high concentrations, it is easily detected and usually used highly diluted to prevent such concentration.

Benzine (Naptha, Petroleum Spirits, Rubber Solvent)

TLV-TWA	400 p.p.m.
CCFP	-18° F

Though extremely flammable, naptha has little toxic effect. It is also moderately explosive. Do not confuse with benzene.

1, 1, 1-Trichloroethane (Methyl Chloro-

form)

TLV-TWA	350 p.p.m.
TLV-STEL	450 p.p.m.

Flammable only in excess oxygen

Methyl chloroform can cause skin irritation and some anesthetic effects. Some long-term liver and kidney changes have been seen, but they were reversible with time. Methyl chloroform is exhaled from the body fairly easily. It is virtually nonflammable. Do not confuse with 1, 1, 2-Trichloroethane or Vinyl Trichloride.

Methylene Chloride (Dichloromethane)

TLV-TWA	200 p.p.m.*
TLV-STEL	500 p.p.m.

Nonflammable

(Odor threshold is above 100 p.p.m.)

Methylene chloride is a very popular, nonflammable paint remover and plastic solvent. It can cause painful burns on the skin. High concentrations can cause headaches, giddiness, numbness, etc. It has a long-term effect of being converted to carbon monoxide in the body. It is this conversion to carbon monoxide which makes the long-term effects dangerous if care is not exercised. If heated to decomposition, it gives off phosgene gas.

Turpentine

TLV-TWA	100 p.p.m.
TLV-STEL	150 p.p.m.

CCFP

90-115° F

Turpentine can cause lung irritation, eye irritation, headaches, nausea, and even kidney damage in high concentrations. Long-term effects are minimal. It is flammable and moderately explosive.

Methyl Ethyl Keytone (2-Butanone, MEK)

TLV-TWA	200 p.p.m.
TLV-STEL	300 p.p.m.
CCFP	35° F

MEK should be preferred to Methyl Isobutyl Keytone. Its only effects seem to be nose and eye irritation. It is flammable and moderately explosive.

Freon (Freon TF, etc.)

"Freon" is Du Pont Chemical Company's trademark for a large family of fluorocarbon compounds. There are numerous Freons in use as refrigerants, spray can propellants, cleaners, and solvents. The horologist is most likely to come into contact with Freon-113 (Trichlorotrifluoroethane) or Freon-TF as an ultrasonic cleaning solution. It can also be bought mixed with acetone as Freon-TA, with ethyl alcohol as Freon-TE or Freon T-E35, with methylene chloride as Freon-TMC, with isopropyl alcohol as Freon T-P35, or with water and a surfactant as Freon T-WD602. All are nonflammable with TLV-TWA's

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L & R Manufacturing Co. has

provided copies of the Material Safety Data sheets filed with the Department of Labor in 1975. Their chemicals are a combination of soaps (sometimes with ammonia) and flammable hydrocarbon solvents. Their chemist states that their products contain no solvents from the benzene group nor any chlorinated solvents (such as perchloroethylene, trichloroethylene, etc.). The TLV, though an admitted estimate for such a mix of components, confirms his statements. These cleaners and rinses are flammable.

Editor's note—It is reported that Zenith Manufacturing Co. also produces cleaning and rinsing solutions, but precise

statistics were not available at press time.

SUMMARY

The study of the effects of chemicals on the human body is an ongoing process. The findings often result in changing the allowable safe exposure limits. As we all know, benzene, carbon tetrachloride, etc. are now known to be very dangerous to use. Now perchloroethylene, trichloroethylene, MIBK, and others are becoming suspect with lower exposure limits being proposed (those marked with an asterisk). For the safety of all involved, we must be aware of these changes and revise our shop habits accordingly. 

THE SHIP'S CHRONOMETER

(Continued from page 41)

Sammos vehemently expressed a desire to be free of this albatross. He found that dissolving a partnership was a distasteful and difficult undertaking. However, an agreement was finally reached, an auction was held, and fortunately for Mr. Sammos, he recouped his initial investment.

Kline then became the sole proprietor of the shop, and the business became known as Kline and Company. Shortly thereafter, Kline and Dillon again became partners, and the firm was known as Kline and Dillon. However, the partnership did not remain in force for any length of time, for Mr. Dillon died suddenly while working at his bench.

In the Fall of 1861, Kline wrote the Navy requesting information regarding trial numbers and prices paid for accepted instruments. Superintendent Gilliss provided the requested information in two separate letters. In his December 13, 1861 letter, he said, "... until recently, all chronometers were required to remain one year at the Observatory and to perform within a certain limit (8 seconds) before being purchased for the Navy. The same rule will be returned to on the restoration of peace."

Gilliss in his December 20th letter stated, "... a price of \$225.00 is being paid for all instruments which have performed satisfactorily. If you will send in the daily comparison and rates of your best instruments, they will be examined, and if the performance has been satisfactory, they will be next in order for purchase."

There is little evidence that Kline produced any chronometers. This writer has a chronometer, number 583, signed Kline and Company, New York, which is very similar to those of Charles Frodsham. Just inside the chapter ring, near the seconds orbit, is engraved, "re-sprung by Frodsham and Keen, Liverpool, 1884." Even though the Naval Observatory informed Kline that they were willing to accept his chronom-

eters for trial, there is no record that any were submitted and/or purchased. Undoubtedly, Kline's contribution to this era of chronometer making lay in the area of repairing and rating chronometers.

Shortly after Mr. Dillon's untimely death, Mr. Kline chose to close out his business. After working for several different firms in the New York area, Kline was employed by the newly formed United States Watch Company in Marion, New Jersey, as a balance maker.

MAX KUMER COMPANY, 804 First Avenue, Exchange Building, 812 First Avenue, Seattle, Washington. This firm was founded in 1919 and known primarily as a manufacturer and importer of nautical and surveying instruments. They were agents for the Ritchie and Baker compasses and the famous Kelvin compass, binnacles, and sounding equipment. However, they repaired and rated chronometers, most of this work being done for the merchant marine services. In 1941, they notified the Naval Observatory that they had chronometers for sale, none of which were signed by them, but rather all being signed by American and English makers.

LAINE, FRANK, Lindenhurst, Long Island. Mr. Laine is not known for producing any quantity of chronometers, although he certainly had the training and skill to do so. However, he did construct a beautiful instrument by his own hands which I deem worth mentioning.

Mr. Laine was born in Helsingfors, Finland. His father was a watchmaker, and since it was customary for male members of the family to be trained in the family craft, Frank was taught watchmaking by his father. Frank was captivated by these complex devices, and to enhance his skills, he chose to seek training elsewhere. Therefore, in his late teens, he left home, first traveling to Denmark, then to Germany and on to Switzerland. In each of these countries he spent some time working and learning how these countries' craftsmen made

and repaired their timepieces. After satisfying this thirst for knowledge, he returned home.

He not only enjoyed his work and travels, but his inquisitive mind drove him to investigate other horological challenges, primarily the chronometer. Mr. Laine's chronometer-making experiences developed when he journeyed to St. Petersburg, where he worked for the famous Paul Bure and Augusta Ericson, repairing chronometers for the Russian Navy.

At the conclusion of the Russian revolution, he returned to Finland, but not for long. His wanderlust brought him to Montreal, Canada in 1924. In 1930, he made his way to New York City, where he found employment with Tiffany and Company.

Laine's chronometer is unique in that it is larger than the standard 56-hour chronometer. The plates are made of white metal, artistically damasked, while the engraving is embellished with gold. It has 17 jewels, all of which are set in 14-karat gold settings.

The balance is bimetallic with round compensating weights and is a trifle heavier than those usually found in chronometers. The teeth of the escape wheel are cut on the radical which he rationalized would give him better motion with a weaker mainspring. It is difficult to follow his rationale, for whatever the gain may be, it would be counterproductive as far as having the escapement functioning safely and properly. The hairspring is helical, and the stud is fitted to the side of the balance bridge.

All of the steel parts are finished beautifully. The dial is triple sunk, silver satin finished, and hard enameled, with Arabic numerals. The bowl is made of a special alloy, giving it a very rich gold color, and it is mounted in a gimbal of the same metal. The box is mahogany inlaid with ebony, boxwood, maple, and kingwood. Over 2,000 pieces were used to create the geometric matrix.

Next month, we will continue with the careers of Low, Meeks, Monroe, Riggs, Stewart, and others. 

Swiss Say, "MECHANICAL WATCHES ON THE REBOUND"

In recent years, Swiss industry statistics have consistently shown that to every rise in electronic watch exports, there corresponds a decline in the shipments of mechanical timepieces. However, the figures for January 1981 signal a sharp upswing: as expected, quartz watch exports grew handsomely (by 43.7%) and so did mechanical watches—by no less than 18%.

According to a spokesman for the Swiss watch industry, there are a number of reasons for this surprising development: market resistance to electronic timepieces in various countries, the proven reliability of a quasi-perfect technology, the advantages of a self-generating power system and, last but not least, a smooth efficient servicing system with a century's experience. However, a subjective factor also seems to be playing a role: realization of the value a "living" possession has for some people.

Reflecting this trend, it should come as no surprise that mechanical time is rebounding vigorously at the Basle Fair. There are more selfwinding models coming on the market, and newly designed mechanical calibers, including a 6 $\frac{1}{4}$ " - 8" and an 11 $\frac{1}{2}$ " construction with center seconds and day-date calendar, are being introduced. These items are designed to meet rising world demand for the standard-quality mechanical wristwatch, the Swiss contend.

Nevertheless, it is at the high end of the market—where quality carries far more weight than quantity—that mechanical watches continue to express im-

mutable character. Here is where the beauty of the traditional mechanical movement can fully flower in glittering, engraved and openworked skeleton movements, and repeater chimes or perpetual calendars. Among the most newsworthy items being presented this year are:

- a model whose extra-thin movement is reversed in the case to show off its "living" organs—balance wheel, geartrain, barrel—here facing the front instead of the back of the case.
- a pocket watch with a dial on either face; the main dial shows the time "sectorially."
- a skeleton-type wristwatch with a movement which seems suspended inside a totally transparent case, absolutely water-resistant to 50 m.
- a pocket watch with a separate display of every time division; one each for the hours, the minutes, and the seconds.

L&R REPORTS ON RECENT INTERNATIONAL SALES MEETING

James J. Lazarus, President of L&R Manufacturing Company, a major worldwide manufacturer of ultrasonic cleaning systems and chemicals, states that the recent, three-day intensive meeting between all sales divisions proved to be highly rewarding. The meeting was held at the Corporate Offices in Kearny, New Jersey on February 10-12.

Extremely detailed discussions regarding the international markets, new product development, advertising, corporate image



and sales were held. New programs were developed, such as worldwide sales offering more personal contact, and extended exhibition of products.

Pictured (left to right) are: David Romanok, controller; Paul MacKay, new products manager; Frances Horowitz, office manager; Robin Platt, international sales manager; Rocky Frack, Asian representative; Lenny Shapiro, chemical division manager; James Lazarus, President; Kurt Sittig, export coordinator; Rita Tybur-ski, export manager; Jules Allemand, European sales manager; Jacques Zeitlin, Belgium representative; Jose Penichet, production manager; and Tom Lange, technical director.

ASUAG & SSIH MOVE TO COLLABORATE

In order to strengthen the position of an important branch of the Swiss watch industry, the Committee of the Board of Directors of ASUAG (General

Corporation of Swiss Horological Industries Ltd.) and the Board of Directors of SSIH (Societe Suisse Pour L'Industrie Horlogere SA) have entrusted their respective general managements with the task of examining all opportunities for profitable future collaboration. The independence of the brands will be maintained.

NEW APPOINTMENTS ANNOUNCED AT SEIKO

The following new executive appointments at Seiko Time Corporation have been announced by Robert Pliskin, President.

Melvin S. Fishman has been promoted to Vice-President, Finance. Prior to Seiko, he had been corporate controller at Lane Bryant, Inc., New York. He began his accounting career with Coopers & Lybrand certified public accountants. Mr. Fishman is a member of the American Institute of CPA's and New York State Society of CPA's. A graduate of the University of Michigan with BBA and MBA degrees, he

is a resident of Port Washington, New York.

Stuart Zuckerman has been promoted to general manager of merchandising. Mr. Zuckerman, who joined the company in 1974, had been merchandising manager for the past two years. His responsibilities—including product planning, purchasing, and inventory control of all product lines—have expanded rapidly, reflecting the accelerating popularity of Seiko's product lines. A resident of Staten Island, Mr. Zuckerman received a BA degree from CCNY.

Hal Wilensky, who joined the company 2½ years ago, has been promoted to general manager of distributor watch sales. He will be responsible for watch sales through Seiko's 17 regional distributors who serve more than 18,000 retail jewelers and department stores nationally. He was formerly manager for distributor watch sales. Prior to joining Seiko Time Corporation, Mr. Wilensky was sales manager at Eisenstadt, a major diamond and jewelry wholesaler servicing the retail jeweler, from 1976-78, and sales manager for Lenox Candles from 1972-76. A graduate of the University of Vermont, where he received a BS degree, he resides in Katonah, New York.

RAY-O-VAC AND MITSUBISHI ANNOUNCE LITHIUM AGREEMENT

Ray-O-Vac Corporation of the U.S. and Matsushita Electric Industrial Company of Japan have reached an agreement whereby Matsushita Electric grants license on its high-energy "Lithium Battery" patents and know-how to Ray-O-Vac Corporation.

Under the terms of this agreement, Ray-O-Vac Corporation is granted a non-exclusive license to manufacture, use, and sell "Lithium Batteries" produced under the Matsushita patents on carbon monofluoride lithium bat-

teries. The ten-year agreement also includes the technical collaboration between the two companies.

PULSAR NAMES MANAGER OF INCENTIVE AND MILITARY SALES

James W. Keenan has joined Pulsar Time, Inc. as incentive and military sales manager, it has been announced by Arthur J. Cohen, vice-president of sales and marketing.



Mr. Keenan, formerly sales account executive with Black & Decker Inc., in charge of incentive and military sales for the western U.S., will have national sales responsibilities in Pulsar's rapidly-growing incentive and military sales program.

A native of Minneapolis, Keenan holds a BA degree from the University of Minnesota. He is a resident of Hohokus, New Jersey.

VARTA NAMES CANADIAN DISTRIBUTOR
Varta Batteries, Inc. of Elmsford, New York, has named the BDD Power Corporation of Downsview, Ontario as Canadian distributor of Varta batteries.

A world leader in research, development, manufacturing, and sale of batteries, Varta has found a growing demand for its product line in Canada.

Kasey Bakowsky, President of BDD Power Corporation, has

become a well-known figure in trade circles during his 20 years of involvement with the battery business. He will handle distribution of Varta watch, photo, hearing aid, computer stand-by, calculator, industrial and general consumer batteries throughout Canada.



NATIONAL CALCULATOR AND WATCH OPERATIONS GOING TO NOVUS

National Semiconductor Corporation has announced that it has signed an agreement, subject to closing May 4, 1981, to sell all the assets of its calculator and watch operations to Novus Electronics Corporation, a new corporation formed on behalf of a joint venture, consisting of a group headed by Sam Nassi. Novus plans to continue marketing these products under the NSC brand name. Full warranty service will be continued.

Charles E. Sporck, president and chief executive officer of National Semiconductor said, "This divestiture is in accordance with our strategic plan to focus on semiconductors and on digital systems where our semiconductor capabilities provide us an advantage."

WOSIC SEMINAR AT PARIS JUNIOR COLLEGE

Jacques Reymond of the Watchmakers of Switzerland Information Center in New York presented a technical seminar recently

(February 2) at Paris Junior College, Paris, Texas in the college's horology department. About 25 persons including the college faculty, students, and area watchmakers gathered to learn about the latest in quartz movements. PJC has programs in horology (watch repair), jewelry repair and stonemasonry, and gemology.



JA STARTS PLANS FOR JULY SHOW IN NEW YORK

Plans are well underway for Jewelers of America's 1981 July New York International Jewelry Trade Show & Convention, which will take place starting Saturday, July 25 through Wednesday, July 29, at the Sheraton Centre and New York Hilton Hotels.

In the words of JA Chairman Michael D. Roman, "When you consider the fact that more than 1,100 exhibitors display the newest jewelry store products, designs, and services from all over the world—more than at any other jewelry trade show in the country—you can understand why more than 18,000 jewelry buyers from every state in the nation and from overseas flock to JA's New York Show."

In addition to the exhibits, other elements of the July Show add to its importance.

"With so much change facing our industry," Roman continues, "jewelers need information that is current and pertinent. Our two-day convention will cover topics and issues that affect our entire industry, featuring industry leaders and experts who share their knowledge and offer their advice."

COMPLETE SCALE LISTING AVAILABLE FROM SWEST

Swest, Inc. announces publication of a brochure giving pictures, descriptions and prices of the extensive line of Swest scales and scaleweights for weighing precious metals, stones and investment compounds.

Included in the brochure are scales costing less than \$10 to one costing over \$3,000; electronic digital scales and balance scales; troy, metric and carat scales and scaleweights; and weight conversion tables.

The brochure is FREE on request. Contact Swest, Inc., 10803 Composite Dr., Dallas TX 75220; or 1725 Victory Blvd., Glendale CA 91201.



FREE CROSS-REFERENCE GUIDE FOR CALCULATOR BATTERIES

A cross-reference guide for calculator batteries is now available from VARTA Batteries, Inc.

The pamphlet lists calculator batteries by application (LCD or LED), type, voltage, mAh capacity and dimensions as well as standard cross-reference type numbers.

VARTA's guide is available free from VARTA distributors or by calling or writing, VARTA Batteries, Inc., 85 Executive Blvd., Elmsford, NY 10523. Phone: (914) 592-2500. Ask for the VARTA Calculator Battery Cross-reference Guide.

REPAIRING QUARTZ LCD AND ANALOG WATCHES: VOLUME III

In electronic time, change is extremely fast-paced, and parallel growth is taking place in market demand for electronic timepieces.

When quartz watches and solid-state digitals were first introduced, it was thought that the only servicing tasks for watch repairers would be changing either the battery or the entire module. However, this has not been the case, and retail jewelers and repairers want not only to be able to inform and advise their customers about purchases, but provide better and faster service and maintenance of electronic timepieces.

These considerations have led us to prepare volume III of our handbook on quartz watch repair. As with the first two volumes, volume III contains complete repair and servicing

procedures for 16 new international calibers and modules.

"Repairing Quartz LCD and Analog Watches, Vol. III" is distributed in the U.S. through the Watchmakers of Switzerland Information Centre, 608 Fifth Ave., New York, NY 10020.

JEWELERS SERIES CLOCKS FROM BOSTON

The Jewelers Series is the name of the new family of brass cased quartz clocks that has been introduced by Boston Clock, a division of Chelsea Clock Company.

The clocks are ideal as gifts for the home or office and are priced at or under \$300 each. They are presented in attractive gift boxes.

Two models are available immediately, both featuring a heavy brass case with hand-

polished edges. The Lucerne has a silvered line-finished face with Roman numerals, and the Geneva a brass line-finished face and an integral alarm.

The Boston Clock division of Chelsea has been producing quality timepieces since 1880. For further information, contact the Chelsea Clock Company, Inc., 284 Everett Ave., Chelsea, MA 02150.



DIAMOND SUBSTITUTES SET FROM GEM INSTRUMENTS CORP.

Gem Instruments Corporation, wholly owned subsidiary of the Gemological Institute of America, offers a unique Diamond Substitutes Set.

The set includes seven major diamond simulants, all synthetic; Cubic Zirconia, GGG, Strontium Titanate, YAG, Synthetic Spinel, Synthetic Sapphire, and Synthetic Rutile. The stones are approximately 1 carat diamond size, brilliant cut, and displayed on a tray in a small, easy-to-carry case—featuring a locking clasp. Weights of each stone, together with identification information, are included with each set.

GEM Diamond Substitutes are excellent for display purposes, and the slotted tray is ideal for showing customers what simu-

lants look like in comparison with diamonds. The tray lifts out of the case and may be used with the Gemolite for stone examinations. The set is outstanding for training store personnel by demonstrating how the appearance and properties of diamonds differ from their common simulants.

For further information about the GEM Diamond Substitutes Set, write Gem Instruments Corporation, P.O. Box 2147, Santa Monica, California, 90406.



ATTRACTIVE NEW PULSAR QUARTZ DISPLAY

An attractive Pulsar Quartz "LC Digital Watch Center" display (which can be utilized as a window or back-of-counter display) is one of the many new Pulsar brand point-of-sale display materials available to the jewelry trade.

This Pulsar Quartz LC Digital Promotion Package contains the following elements: A laminated display card featuring a photograph of four Pulsar Quartz LCD models: UP008S (Ladies' Alarm), KS003 (Men's Alarm Chronograph), KS001 (Men's Alarm Chronograph), and JZ001 (Men's Calculator Alarm), measuring 8" x 7"; a black plastic "Pulsar Quartz" brand sign with logo in raised letters and silver color trim with a slot in the rear for a display card (of dimensions: 6½" x 3" x 1½" high); and four "P" shaped watch holders to highlight men's and ladies' models. The display—the



most recent in Pulsar's comprehensive point-of-sale program for the jewelry trade—is currently available as individual elements or as a complete package. It can be ordered from Pulsar's local sales representative.

BROCHURE AVAILABLE FOR K-TRON'S NEW DS-1-T ELECTRONIC SCALE

K-Tron Arizona, Inc. has just published a brochure describing their DS-1-T series: the first portable electronic scales that comply with U.S. HB44 and California specifications for direct sales applications. The scale delivers laboratory accuracy in rugged conditions, beneficial to silver refiners, silver reclaimers of electronic parts and photographic film, silversmiths and casters, plating industries, and all silver dealers who require accurate and dependable weighing performance.

K-Tron's patented digital mass transducer (DMT) measures mass rather than force, freeing the scale from the problems that usually plague conventional force measuring load cells. The scale is insensitive to ground-based vibration, temperature change, and off-level conditions. The new DS-1-T trade scale also offers portability, instant turn-on, and availability of a rechargeable

battery pack. In addition, K-Tron's automatic variable resolution (AVR), offers accuracy, flexibility and cost efficiency—you would have to buy three conventional fixed resolution scales to achieve the precision weighing range of just one K-Tron digital scale. The DS-1-T trade scale is available in four capacities in each of the following readouts to suit all silver applications: pennyweight, troy ounce, metric, or avoirdupois. To obtain a brochure, write or call: K-Tron Arizona, Inc., 14433 N. 73rd St., Scottsdale, AZ 85260; (602) 991-0990.

TIMEPIECES FOR THE GRADUATE: STYLISH YET TRADITIONAL

The school year is winding down. When your customers come in looking for a graduation gift, why not suggest a traditional timepiece with contemporary flair?

Shown here are two new offerings from Citizen Watch Company's collection of classically styled men's analog watches. From Citizen's ultra-thin 790 series: (left) a gold-tone rectangular analog with date feature and genuine leather strap. Model No. 43-4060-80 has a retail price of \$350. Citizen day/date analog

(right) features gold-tone case and "brick" patterned strap. Model No. 44-9342-80 has a retail price of \$225.

For more information, contact Citizen Watch Company of America, Inc., (800) 526-6257.



ACCUTRON MEDALLION DIAL WATCHES

"Alert jewelers can obtain additional business in their communities," says Bernard Dwortzan, Director of Bulova's Presentation and Incentive Division, "by selling larger companies Medallion Dial Watches for their award programs."

Great names in American industry, such as General Motors, Anheuser-Busch, Texaco, Equitable Life and many others, have chosen such watches to recognize outstanding service or to reward exceptional achievement.

Interested jewelers should contact their sales representative or Mr. B. Dwortzan directly: (212) 335-6000.

TIME



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Tradesman

WHEELS, Pinions, barrels or whatever, repaired or made new. Repivot arbors. Parts made to order. Send sample for free estimate. No watch parts. Ken Leeseberg, Ken-Way Inc., 19 W 672 Army Trail, P.O. Box 219, Addison, Illinois 60101.

Clock repair material and tools. Manufacture of clock springs, dials, escape wheels, verge kits, weights, all types of brass and steel stock and custom made parts. Catalog postpaid \$2.00; Tani Engineering, Box 338, Atwater, Ohio 44201. (216) 947-2268.

CLOCK WHEEL AND PINION CUTTING Fast Service—Write for free brochure and price list. Fendleys, 2535 Himes St., Irving, TX 75060.

STOP WATCH REPAIR. Heuer factory trained specialist. All brands repaired. Bill Albrecht, P.O. Box 465, Springfield, NJ 07081. 201-233-8290.

We repair early **WATCHMAKERS ULTRASONIC** cleaners (WT), and related equipment. Sent to: Bruce, S Electronic Shop, 983 South Quince Road, Walnutport, PA 18088. (215) 767-1413.

DIAL REFINISHING, CRYSTAL FITTING & WATCH REPAIR. 48-hour services on Dial Refinishing & Crystal Fitting. Finest quality. Quantity works welcome. Send your works to: Kirk Dial & Crystal Co., 625-4th & Pike Bldg., Seattle, WA 98101.

DIGITAL WATCH REPAIR SPECIALIST, LED and LCD. Tuxedo Electric, Tuxedo Square, Tuxedo NY 10987. Phone: (914) 351-5678.

Superior Tweezer Resharpening. \$2.50 each, including return first class postage. Minimum of three tweezers. Advance payment required. Harvey C. Watkins, CMW, P.O. Box 1738, 1204 West Cason Street, Plant City, FL 33566.

Coffmans Digital Watch Repair. LED and LCD, wholesale/retail, fast service. 4343 Kalamazoo S.E., Grand Rapids, Michigan. 616-455-3690.

WATCH REPIVOTING, WHEEL and PINION CUTTING expertly done by **EUROPEAN WATCHMAKER** with diploma from GLASHUTTE \$15.00 and up. Specializing in **REPEATERS, CHRONOMETERS, TURBILLONS, KARRUSELS**, watches with **PERPETUAL CALENDAR, UNUSUAL ESCAPEMENTS**, etc. I can make any part for any watch; it is just a matter of economics. Send **SASE** for **FREE** price list. **FREE** estimate given on your watch. **PHILIP PONIZ (NAWCC, AWI, MBHI)**, 1207 Scrub Oak Circle, Boulder CO 80303. 303-494-9666.

Pearl and Bead Restringing. All types. Fast service. Jean A. Gruenig, P.O. Box 12007, 1279 Inglis Ave., Columbus, Ohio 43212.

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TRADE WATCH REPAIR. Guaranteed quality work. Two watchmakers—Certified Master and Swiss trained. Send **SASE** for price list of our fast service. The Regulator Time Company, 121 South Third Street, Manhattan, KS 66502. (913) 776-6977.

WATCH REPAIR FOR THE TRADE: AC-CUTRON, STEP-MOTOR QUARTZ, DIGITAL ANALOG & MECHANICAL. The Watch-Repair Shop, 2616 Kendall Ave., Madison, WI 53705. 1-608-231-3606.

Restoration of watches and antique clocks; repeater, chronometer, gear and pinon cutting. Will take repair for store looking for quality work. Jean Fischer, 39-20 Greenpoint Ave., Sunnyside, NY 11104.

'A' QUALITY SWISS SPRING BARS. WRITE FOR FREE SAMPLES. P.O. Box 774, GREENVILLE, MS 38701.

PULSAR WATCH REPAIRS. Complete repairs on all L.E.D. PULSARS except calculators. Prompt service. Leo G. Kozlowski, 55 E. Washington Street, Chicago, IL 60602. 312-236-8052.

Help Wanted

Trade shop requires experienced watchmaker. Full or part time. Send resume to G & T Inc., 317 Wall Street, Las Vegas, NV 89102.

SALESPERSON: A fine well-established jewelry and watchmaterials wholesaler is looking for good salesmen to cover the States of North Carolina, South Carolina, Georgia, Alabama, Florida, Mississippi, Tennessee, Arkansas, Iowa, Missouri, Wisconsin, Nebraska, Kansas, Oklahoma, and Texas. We offer an excellent compensation program, benefits, and an opportunity to succeed. Would prefer watchmaterial experience, but not necessary. Aggressive and knowledgeable man or woman. We are building for the future. Please reply to: *Horological Times*, Dept. HW301, P.O. Box 11011, Cincinnati, OH 45211.

Situations Wanted

British trained young American horologist specializing in antiquarian horology seeks employment in this field commencing in the Fall of 1981. This uniquely talented craftsman will consider any opportunity that can make use of his specialized skills and training. Contact: Coleman Fund Committee, c/o *Horological Times*, 3700 Harrison Avenue, Cincinnati, OH 45211.

WATCHMAKER, CLOCKMAKER: A recent graduate with an Associate Degree in Applied Science in Horology and one year's experience in a retail repair shop seeks position in the Southwest. For information, contact Roy Burkey, 25½ Pierpont St., Petersburg, WV 26847.

Wanted To Buy

\$100.00/Day: Buying scrap gold. Write: Harland, 1312-Z H-st., Eureka, California 95501.

IMMEDIATE CASH PAID for Gold, Silver, Platinum, any form! Jewelry scrap, filings, gold filled, sterling! Immediate top dollar cash offer return mail! Satisfaction guaranteed. Ship insured/registered mail to: American Metals Co., St. Andrews Branch, P.O. Box 30009H, Charleston, SC 29407.

STERLING FLATWARE STOCKS—new or used needed. Call us before you sell for scrap. Also wanted: silver, diamonds, gold scrap, coins and coin collections. Call or write: Mr. Neff, HT, WFN Enterprises, 2300 Henderson Mill Rd., N.E. Suite 318, Atlanta, Georgia 30345. Phone 404/938-0744.

IMMEDIATE CASH PAID!! Old Mine and Old European cut diamonds. Especially needed: Stones over 1 carat. Ship with phone number for highest offer, or call Mr. Neff, (404) 938-0744. W. F. N. Enterprises, Inc., HT, 2300 Henderson Mill Rd., NE, Suite 318, Atlanta, GA 30345.

YOUNG, ambitious and highly qualified watchmaker wishes to start own business in Southern California or Texas. Will relocate. Interested in becoming partner or buying store with low down payment. Please contact Horological Times, Dept. WTB-581, P.O. Box 11011, Cincinnati, OH 45211.

GOLD FILLED and ROLLED GOLD PLATE RGP \$3.50/t.o.; 1/10 10k \$16/t.o.; 12k G. F. \$8.75/t.o.; 14K G. F. \$14.75/t.o.; 25 year watch case \$17/t.o. Prices based on \$600 gold. Send for schedule. CASH or CHECK. Ship to AVON METAL SERVICE, LTD. P.O. Box 17484, Milwaukee, WI 53217. (414) 351-0933.

One pallet fork complete No. 2975 single roller—Straight pivot 0's Elgin G267. S. Kita, 1006 First St., Napa, California 94558.

For Sale

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1-3—South Carolina Retail Jewelers Association Convention '81; St. John's Inn, Myrtle Beach, SC

1-3—Rocky Mountain Jewelers of Colorado and Eastern Wyoming Convention; Hilton Inn, Denver, CO

3-5—11th Hawaii Gift Show; Blaisdell Center, Honolulu, HI

16-19—Canadian Jewelers Association Convention and Conference; Empress Hotel, Victoria, BC

24-29—American Jewelry Distributors Association Annual Convention; The Homestead, Hot Springs, VA

28—American Watch Association Meeting; Edgewood Country Club, River Vale, NJ

JUNE

4-6—National Conference of the Society of N. American Goldsmiths; University of Kansas, Lawrence, KS

6-7—Sean C. (Pat) Monk speaker at the Watchmakers Association of Pennsylvania Convention; Hershey, PA

7-10—International Investment Gemstone Conference; Century Plaza Hotel, Los Angeles, CA

20-22—World Jewelry Trade Show; Las Vegas Convention Center, Las Vegas, NV

22-25—AWI Research and Education Council (REC) Instructors Meeting; Americana Hotel, Cincinnati, OH

26—AWI Affiliate Chapters Meeting; Americana Hotel, Cincinnati, OH

27-28—AWI Annual Meetings and Board of Directors Meeting; Americana Hotel, Cincinnati, OH

JULY

4-10—Christmas in July Gift and Jewelry Show; Dallas Market Center, Dallas, TX

11-18—Pacific Northwest Jewelers Association, and Washington, Alaska, and Oregon State Jewelers Association Quadrennial Western Jewelers Conference; M/V Sun Princess, Inside Passage, British Columbia and Alaska

19-24—93rd California Gift Show; Los Angeles Convention and Exhibition Center, the Los Angeles Mart, Los Angeles, CA

19-22—SJTA Atlanta Show; Hyatt Regency Hotel, Atlanta, GA

25-29—JA Fall International Jewelry Trade Show & Convention; Sheraton Centre & New York Hilton Hotels, New York, NY

AUGUST

9-11—Jewelers of America/Central USA International Jewelry Trade Show and Conference; Expocenter and Mart Plaza Hotel, Chicago, IL

15-17—Fall Pacific Jewelry Show; Century Plaza Hotel, Los Angeles, CA

22-25—74th Denver Gift and Jewelry Show; Denver Merchandise Mart and Exposition Center, Denver, CO

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