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OFFICIAL PUBLICATION OF THE AMERICAN WATCHMAKERS INSTITUTE

| voLUME 3, NUNBER9 |
| :--- |
| The Best <br> of |
| J.E. Coleman |
| $32,33,48$ |

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AWI NEWS
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SCHOLASTICALLY SPEAKING
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[^0]Oditorial
The age-old rule of supply and demand will assert itself in the very near future. The supply of competent trade watchmakers, if not diminished in number, has lost ground in the overall picture via population growth. Many consumers today own more than one watch and want them all operating so that one can be used whenever an occasion may warrant.

The \$19.95 Elgin Starlite began the trend toward inexpensive jeweled-lever movements, and most all the other manufacturers obligingly fell in line. Unfortunately, the jeweler may have "made his bed" by stocking this item. Now the supply of watchmakers is no longer proportionate to the whole, and the cost of repair may have reached the ultimate on the retail level.

The size of the pie will not increase greatly in the near future. How the pie will be divided between the jeweler and the trade watchmaker will change.

The tradesman cannot keystone his cost increase of equipment, supplies, maintenance, and materials. Most often, the jewelers' merchandise is keystoned, and the invested dollar of the jeweler in watch repair as compared to inventory sales is almost in reverse. The jeweler pays for his inventory before the item is sold. The result is money invested. At the end of the fiscal year, he pays tax on his remaining inventory. The result is money lost.

Now compare his repair situation. He has no inventory. The result is no money invested. At the end of the fiscal year, he has no inventory. The result is "no tax due." He generally sells the repair prior to paying for it. The result is useful cash on hand.

The division of the whole will change in percentage. The jeweler will take a smaller portion and the trade watchmaker will take a larger portion. It is fair. It is the law of supply and demand.

## Editorial Reprint from Horological Times-April, 1977

The "division of the whole" has changed in many instances. But now, thirty months later, some retail jewelers still insist on a keystone mark-up on repairs. The final result is that many customers reject having their watches repaired. These customers are driven to purchase the very inexpensive "throw away" timepieces.

The entire industry suffers.


## About the Cover

Our September cover features a beautiful late summer scene in the foothills of the Rocky Mountains.


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

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# Electronic Watchmaking A Necessity for the Successful Watchmaker 

Nearly twenty-five years ago, the first electric watch appeared on the American market looking more like a Rube Goldberg contraption than something to be taken seriously. This strange watch was scoffed at by most watchmakers. Little did anyone realize just what the electric or electronic watch would mean to the future of watchmaking and watchmakers. Those who repaired these new timepieces did it rather reluctantly with little or no interest in how or why they worked. Interestingly, most of the electronic principles used in today's quartz watches were incorporated in that first electric watch: Electromagnets (coils), permanent magnets, shunting plates, and the same electromotive force which drove the balance now drives the step motor.

Today, no one questions the future role of the electronic watch. To doubt the tremendous impact implicit on future watch repairs is not facing reality. Dominance over the industry, particularly the area of mens' watches, is obvious, and yet there are still too many fine watchmakers who haven't seen the need to get deeply involved in the repair of these timepieces.

Some of the remarks which I hear around the country are, "Well, I'm fifty-five years old, and there is no need to learn these watches," or, "There'll be plenty of mechanical watches to repair as long as I plan to be in the business." There is some validity to these remarks, but there are also serious drawbacks. Where will the watch repairs be taken in the future? To the watchmaker who can only do mechanicals, or will the customer seek out those progressive watchmakers who can service all kinds? To my way of thinking, the customer will swing over to the up-to-date watchmaker and the reason is simple: Most families own both mechanical and electronic watches. This means they will seek out the watchmaker who can offer a complete service. It's unlikely that the
customer will take the time to deliver the mechanical watch to the watchmaker who does only mechanicals, and then take the electronic one to the electronic watchmaker. The welltrained watchmaker will most likely get both, and the outdated watchmaker will find less and less work to do. Also, the reasoning that a watchmaker of fifty-five or sixty will soon be retiring might not be as valid as it first appears, unless the person in question has been fortunate enough to build an exceptional retirement nest egg. With inflation what it is today, and with the likelihood of it continuing for years to come, the possibility of a complete retirement becomes somewhat questionable. We are all looking forward to the time when we will be able to let up a bit and work at a more leisurely pace. However, to do this and still earn a little extra money to enjoy our leisure years, we must stay on top of this business. To be able to do these modern watches is the best insurance we can have of future employment,

As most of you know, for the past several years the American Watchmakers Institute has provided the most intense, comprehensive training programs ever seen in watchmaking. Those watchmakers who have taken advantage of this training are as confident with electronic watches as they are with mechanicals, and have assured their success in the future. Those who are laying back, waiting, thinking they will be able to get this training sometime in the future, are going to be disappointed. These programs might not be available when you finally decide you need them.

If you are one of those watchmakers who hasn't yet committed yourself to electronic watchmaking, you should get involved now. Set aside the time to attend the workshops and seminars. Do the necessary homework to learn electronics as applied to watchmaking. Assure yourself of a future in this field for as long as you wish.
> "If you are one of those watchmakers who hasn't yet committed yourself to electronic watchmaking, you should get involved now."

# Enstrument 



# The One Multi-Function Timing Instrument That Does It All. 

L'Instrument is an appropriate name for the unique new Vibrograf MU-700. For the MU-700 is truly the ultimate watch tester. It measures the rate, beat and amplitude of all mechanical watches, as well as the rate of all quartz and electronic watches. And it does it with an accuracy exceeding that of the most advanced quartz watches made.

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of scales and functions is push-button simple, too.

## WHAT DOES ALL THIS MEAN TO YOU?

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Now, we're not about to suggest that you discard your newly purchased or functioning analyzer, gradoscop or timer and replace them with the Vibrograf MU-700.

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## Our Readers Write

## Useful Information

I did not receive my July copy of Horological Times. There is so much useful information in each issue, I hate to miss one. Especially liked the previous articles by Jim Tigner, and the current ones by Archie Perkins. They are just excellent-as is the whole magazine. Hope you will continue the high quality.

Donald L. Empson
St. Paul, MN
Editor's note-Sorry about your July issue. It is on the way!

## REPRINT OF PAT MONK

Your article on modern clock repair in the March issue of Horological Times was very informative. It was well written by Sean Monk. We believe this article would be valuable for our dealers and service agents.

We would like your permission to reprint this article for use and distribution to our service agents, salesmen, etc.

Please let us know your decision. Thank you very much.
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Write for Findings and Tool Catalogs

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# THE SHIP'S CHRONOMETER ${ }^{\text {© } 1979}$ 

by Marvin E. Whitney
смс смw


## Making a Detent

At the outset of World War II, when our Navy was adding new ships each day to the various fleets, a serious shortage of chronometers developed which was not remedied until February 27, 1942 when Hamilton began delivering its fine chronometers. To alleviate this grave emergency, the Navy appealed to the general public, for it was a well-known fact that many jewelers and watch/clockmakers had chronometers which they used as their regulators. The Navy offered to either purchase them outright or to take them on loan, and a the completion of the war, the chronometers would be returned, overhauled, and adjusted. Several companies were even formed whose representatives traveled the countryside, buying up chronometers in any condition. Again, as has so often been the case with the American people during a national emergency, the response was overwhelming.

Most of the chronometers received from individuals were in very good condition, needing only to be overhauled and adjusted before being put into service. At first, this was also true of those purchased from the several companies that had embarked on purchasing them from the citizenry, but after the initial drive, those received were in need of substantial repairs, the detent being the part most often in need of attention. This common problem was probably the result of a repairman temoving the balance without first blocking the train.

Although the detent per se is a rather simple device, because of its fragility it is highly susceptible to damage if not treated with respect and care. See Figure 1. A spring detent is not all that difficult for a skilled repairman to make. It requires patience and skill with files and polishing slips. A polishing error can be rather demoralizing and time consuming, for in most cases, there is little that can be done to salvage your work.

The detent must be made from high grade carbon steel stock (although in all of the late model Hamiltons the


Figure 1. Spring Detent Nomenclature
detents were made of beryllium copper and the trip spring of Hamilton Elinvar) so when finished it will have the proper resiliency. At the Observatory, we used Brown and Sharpe's flat-ground, carbon steel stock which came in several sizes, 18 inches in length and varying from $1 / 64 \mathrm{in}$. to $1 / 2 \mathrm{in}$. in width. This was first-quality tool steel which was already annealed uniformly by a special process and was found to be easily worked. First secure or file a piece of steel stock square so the width or height of the blank is equal to the distance between the top plate and the threads of the banking screw and slightly longer than the required length of the finished detent. See Figure 2A. Even if the old detent is damaged, it can usually be straightened out to where it can be used as a template. However, if the detent is missing, take a pair of dividers and measure the distance from just behind the
( continued on page 10)

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Figure 2. Method of Making a Spring Detent
hole in the top plate for the steady pin to the edge of the unlocking roller and then add $1 / 16$ to $1 / 8$ of an inch to this measurement. This will give you a blank of sufficient length to be worked with comfortably.

There are several configurations of detents and means of attaching them to the top plate and/or mounting or support block. The foot may be flat without a step while with others, the flat foot is tapered and fits into a dovetailed slot in the mounting block. In these latter types, the detent is attached to the side of the mounting block.

In the step-type detent, the mounting block which holds the banking screw that regulates the depth of locking or the amount of engagement between the locking jewel and escape wheel tooth is a small, right-angle formed piece of brass (potence) fitted to the top plate with a countersunk screw under the balance wheel. See Figure 3. Others have an extended arm projecting straight out from where the block is attached with the banking screw fitted near the far end of the arm. The detent is attached to the side of the mounting block and lies parallel to the arm.

This treatise will deal with the making of a detent employing a step type of foot. Any skilled repairman, by noting the design and placement of the mounting block, can easily alter the design of the foot so it can be fitted to the mounting block.

If necessary, temper the blank to a rich blue color and then proceed to file the foot or step leaving it thick enough to insure that when the screw hole is drilled and tapped, sufficient threads will be available for the detent foot screw. After the foot has been filed perfectly flat and square, (See Figure 2B) with edges either straight or beveled, drill the foot screw hole and tap to suit the screw. If the screw is missing or you cannot match the screw threads, make or select a new screw. The screw securing the detent may or may not have a shoulder. If it does, the shoulder fits through a rectangular slot in the plate.

When using a shoulder screw, be certain that the shoulder of the screw fits with a minimum amount of clearance in the slot. If a slot is required, drill two small holes
adjacent to each other in the foot, With a fine micro-round file placed in one of the holes, file out the connecting piece. The holes should be centered and the sides kept straight. A fine square file is used to square up the ends and sides.

Next file down the sides of the blade so that it is centered from the foot shoulder and will pass between the head of the banking screw and the mounting block, but leave it thick enough for the pipe for the locking jewel. See Figure 2 C . To check, with the mounting block and banking screw positioned on the top plate, insert the blade. The blade must pass freely between the head of the banking screw and mounting block and under the threaded portion of the banking screw.

Now turn the detent blade over and, beginning with the far end, file on the underside a straight and square step just deep enough to clear the escape wheel. See Figure 2D. With the escape wheel in place, a continuous check is possible


Figure 3. Right-Angled Support Block for Banking Screw.


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## THE SHIP'S CHRONOMETER

( continued from page 10)
(with care) as to when the depth and clearance are sufficient.
The next step is to reduce the length of the blade so that the end is even with the edge of the lower balance hole jewel. In order to determine the correct length, install the detent. Then very carefully set the balance staff complete with rollers, but without the hairspring and balance wheel in position. During this pre-trial fit, do not place the balance bridge in position. By righting the balance staff with your tweezers, you can readily determine if the end of the blade will clear the unlocking roller. If not, remove the staff and detent and shorten the detent blade accordingly. If you are satisfied that the length of the blade is correct, then place the balance bridge in position. Care is the watch word here, for I have seen on more than one occasion when the detent was still a trifle too long and the staff was uprighted by the balance bridge and the screw secured, that the force resulting from the contact between the edge of the roller and end of the blade would bend or break a balance pivot.

Now determine the proper position of the locking jewel hole. If the old detent is not available, there are two methods one can use to correctly locate the jewel hole. First, place the escape wheel, staff with rollers, and the detent blank in their respective positions. By looking through the aperture in the top plate, you can see their relationship. With a pointed piece of pegwood, move the escape wheel so that a tooth is brought in contact with the edge of the impulse
roller. While holding the tooth in this position, scribe a mark on the blade opposite the tooth in front of the one being held against the roller edge. Then slowly move the escape wheel in a clockwise direction and when this tooth whose position was just marked is moved as far as it will go, scribe another line. Between these two scribed lines the hole is drilled for the locking jewel. Drill the hole so it is perfectly upright and just large enough to accommodate the locking jewel.

The other method is to take a pair of dividers and lay off from the shoulder of the detent foot a measurement which is just a trifle more than the diameter of the escape wheel. There is no set rule but these two are pretty good "rules of thumb" to go by.

To the right and left of the hole, file the side and top down so a square projects from the side and top of the blade. See Figure 2E. It is rather difficult to file up this square into a round pipe, so a simple template can be made to assist you in this operation. Take a long-headed watch bridge screw (See Figure 2F) whose threaded end will just fit the pipe hole, and harden the head so it will resist a file when the pipe is chucked up to be filed. At the Observatory, when we had many to make, we made a round nut to go on the lower threaded end to hold it securely in place. Since it may be difficult to make a nut with mating threads and it is seldom necessary for the repairman to have a production set-up, you can simply select a screw that fits the pipe and follow this procedure: Harden the head, and after inserting it in the pipe, grasp the pipe with your combination tool. Heat and

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## Quality Clock Movements




## COMPLICATED CLOCK

From Manuscript and Photo Library of Orville R. Hagans, CMW, CMC, FBHI

This complicated and intriguing clock was made by Paul Durnell of St. Marys, Ohio.

The clock is eight feet high, 32 inches wide, and 22 inches deep. It weighs 500 pounds.

It shows the time in the four different zones of North America. All these clocks are controlled by one pendulum.

There is a globe of the world which revolves once every 24 hours. In addition, there is an illuminated sun which shines on the globe in the position which the sun holds at the time the clock indicates.

The small door below "Father Time" opens as the clock chimes and statues of the 12 apostles march around the globe. As St. Peter comes out, a small wooden rooster flaps its wings three times.

The clock is equipped with a set of tubular chimes which play the Westminster chimes every quarter hour.

It has a Swiss music box in the case which plays a tune each hour and changes tunes each hour for eight hours.

The case is of solid American walnut with burl walnut panels.

## BOOK CASE ACTION CLOCK

by
Orville R. Hagans, CMW, CMC, FBHI
Mr. J. Koniecznv of Rochester, New York, devoted 34 years of his life to the crafting of fine, inlaid furniture for his home. One of the 45 pieces which he made is this large clock that required about 4 years of painstaking labor. Using 7 different varieties of wood in 8 different colors, Mr. Koniecznv created his clock out of 22,000 individual pieces of wood. It includes a book case on the bottom, and a merry-go-round above the book case. The other openings or stages present action scenes. The clock in the tower is an 8 -day chime.


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# The Briggs Rotary Pendulum Clock 

As Charles Terwilliger states, the first time this clock was ever referred to as the Briggs Rotary, it was by our former friend and clock expert, the late Jesse Coleman, (Mr. Clockwise \& Otherwise) who did so in an article published in American Horologist \& Jeweler in August, 1946.

Our current subject, the Briggs Rotary, is the last of a series of clock reproductions made in Germany by Charles Terwilliger. Apart from his well-known work on the service of the 400 -day clock, Terwilliger has also contemporized his reputation through his work on and redevelopment of the exasperating Ignatz (flying pendulum) clock, the Plato clock (originated by the man who developed the first typewriter patent), the Dickory Dickory Dock clock, and the Columbus clock.

Who was John C. Briggs whose name was appendaged (by J. Coleman) to the rotary pendulum? Quoting from Terwilliger's researched history, Briggs was merely the man "who received the first United States patent for the application of the conical pendulum timekeepers." This, however, certainly did not give Briggs the initial credit for actually making a clock with this device. Indeed, there were others on the European continent (mainly in France) who had not only used this device, but had applied it to the actual manufacture of timepieces.

John C. Briggs was well-known in his native Concord, New Hampshire, where his reputation as a civil engineer was fully equalled by his reknown as a skilled and tasteful landscape gardener. However, in spite of the fact that he emerged in 1855 and 1856 with his famous conical pendulum patents, there exists no evidence that he was ever involved in the manufacture of timepieces. It is almost certain that he was advised by his friend, Abiel Chandler, in regards to the industrial surveying equipment which Briggs used in his civil engineering and landscape gardening projects, and Chandler was indeed a clockmaker as well as a manufacturer of scientific instruments. Nevertheless, there is no record of this latter gentleman ever having produced an actual working conical pendulum clock, or of him having obtained any special patent for such. It is interesting to note, however, that Terwilliger says, "The two must have discussed clocks, as Charles Crossman (who wrote a complete history of watch and clockmaking in America) says that Abiel Chandler developed the Briggs Clock in 1858 and 1859."

One would assume that John Briggs finally aban-
doned the idea of a conical pendulum clock. Also, his patents of 1855 and 1856 might have remained in limbo in the U.S. had it not been for the E.N. Welch Company. In the early 1870's, E.N. Welch introduced their own versions of the conical pendulum clock based upon the Briggs patent. According to Terwilliger, there are probably not more than 300 or 400 in existence today. Also, the Welch Company was obviously aware of the Briggs patents. We know this because the Welch Model I of the conical pendulum clocks is clearly marked on the top plate as, "Pat. Aug 1855, July 1856." Once again, however, one must remember that these two patents relate only to the conical pendulum as a means of regulating a clock. According to Terwilliger, Welch probably arrived at their design from a clock made in France around 1850 or 1860 . The maker of this French clock appears to have been Antoine Redier of Paris, as one such clock recently unearthed is stamped "AR" on the bottom plate.

At this point, we must presume that neither Briggs, who seems to have lost interest, nor the Welch Co., which did not proceed beyond Brigg's conical pendulum knowledge and design, (which they undoubtedly pirated from the French) further advanced the production of this type of timepiece. One may also presume, along with Terwilliger, that one of the problems with these original clocks was that they were prone to easy stoppage when disturbed slightly. Also, they were primarily of the 30 -hour variety. According to Charles Terwilliger, there was never a rotary pendulum clock bearing a manufacturer's name before 1970 .

The Briggs Rotary Pendulum Clock was introduced in 1975 by Charles Terwilliger's company, Clock Trade Enterprise, of Bronxville, New York. As our entrepreneur states, "Its most unusual feature is in the action of its pendulum; a cord and brass ball hanging from the arm above the dial." This, of course, is merely a slight modification of the old conical pendulum escapements. Certainly, there is an escapement in the clock; but it is not of the nature found in any other horological device. We shall explain shortly.

However, before we leave the vast amount of knowledge and history available to those interested, ("John C. Briggs \& Rotary Pendulum Clocks," by Charles Terwilliger)
( continued on page 20 )


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## ESSENCE OF CLOCK REPAIR

( continued from page 20)
we must not forget the experimental work done in the U.S. by Briggs, Abiel Chandler, Gilbert Blakesley, E.N. Welch, the William L. Gilbert Company of Winsted, Connecticut, the F. Kroeber Clock Company of New York, and others.

Charles Terwilliger's reproduction is an 8 -day, keywound from the base with a four-armed steel attached key. The clock is made slightly larger than the originals and is made by a precision time recorder manufacturer in Germany. Figure 1 shows our model of the clock with its protective glass dome removed.


Figure 1.
Mechanically, the clock is made to function with what might be called an 8 -arbor wheel train. However, the 8th "wheel" is not really a wheel, but a rotating pinion carrying an arm above the top plate, which engages the rotating pendulum ball. Immediately above the winding key in the base, is situated the 8 -day mainspring. The latter, by the way, is a surprising 17 feet long!

The mainspring, which is housed inside the wooden base, powers a ratcheted mainwheel situated immediately above it. See Figure 2, (a). This mainwheel powers the 2nd wheel, (See Figure 1,[b]) and next, the 3rd wheel. See Figure 2, (c). If we look closely at Figure 2, we will observe that an extension of the arbor of this 3rd wheel carries a horizontal pinion wheel (d) which meshes with the minute wheel (e) to move the dial train, thereby moving the hands.

The 3rd wheel, motivating the dial train, is also geared between the plates to the 4 th wheel. See Figure 3, (f). The remainder of the train follows in order; the 5th (g), 6th (h), 7th (i), on to the 8th ( j ) arbor. This last carries the horizontal driving arm. One might say that the driving arm takes the place of the pallet which is normally engineered into clocks and watches. The driving arm, rotating at a somewhat high speed, engages an extension of the brass threadsuspended pendulum ball. This combination produces a rotary motion to the pendulum. However, a comparatively slow motion is amply sufficient to impart sufficient velocity to the pendulum.

The pendulum, as mentioned, is merely a cord and brass ball hanging from an arm above the dial. This is espe-



Figure 2.
cially obvious in Figure 1. The speed at which the pendulum is allowed to rotate is controlled by the weight of the pendulum and by the length of its nylon suspension cord. A time adjusting nut at the top of the suspension arm can be clearly seen in both Figures 1 and 2. Gallileo's theory still applies: The longer the arc of motion, the slower the pendulum speed and vice versa. Therefore, the shorter the cord length, the faster the clock will go.

Disassembly of the clock for cleaning can be per-


Figure 3.
formed in the usual way for a non-striking train. The mainspring ratchet should first be released. The top plate is pinned onto three brass pillars. The securing pins are tapered and may be removed after mainspring tension is released. A replacement cord can be obtained from C.T.E., Bronxville, NY 10708.

The Briggs Rotary reproduction is a most interesting mechanism, as well as being both silent and reasonably accurate. It is certainly worth preserving.


Otto Benesh, CMC

## "Cloch HATIER" <br> (all rights reserved by the author)

## One of Those Small Jobs!

Recently I received a letter from a good friend in which he stated, among other things, ". . . one bitch of a job-to replace rack, rack hook, strike lifter plus the gathering pallet on an English grandfather movement. The plate studs are all there but someone has thrown out all of the controls. I have made a rack, a hook, a lifter, and a gathering pallet, but in spite of following all the rules I could find, it still doesn't work right. One trouble I feel is a basic design fault-that the stud for the rack hook is much too high-too far above the arc of swing of the top of the rack. I have examined about ten similar movements and all of them have the rack hook very close above the rack arc. I think I shall try relocating the rack hook stud. Do you have any rules of thumb for such a reconstruction? How many degrees of arc for each tooth on the rack? Is De Carle's geometry in Practical Clock Repairing about designing a rack tail correct or are there some nasty exceptions to his rules? Goodrich says two degrees of arc for each tooth on the rack, but does that vary with the length of the rack shaft-with the overall radius of the rack? I have put the job to one side for the moment and would very much appreciate your advice."
"Dear Friend:
My sympathy with regard to the easy job that fell your way. First, let me say that I have yet to see an English grandfather clock of that vintage that had a faulty design. That does not mean that some features could not be improved, but by and large, they all worked and have given years of good service. I ask myself, "What have I not done or what have I overlooked when something does not go right?" I find that I am usually at fault and not the design. So with that in mind I'll outline the steps that I would take in replacing the missing
pieces. I think your questions will be answered in the following description, with the exception of the two degrees of arc. That figure will only hold if the rack teeth are equal to a total arc of 24 degrees for the twelve teeth. Also, you will see that De Carle is absolutely right.

The following steps in this order are the ones I would suggest be followed to replace the missing parts:

1. Making the hour strike lifting piece.
a. Scribe a center line on a piece of steel 2.0 to 2.5 mm thick, a little over half the length of the warning slot in width, and as long as the distance from the stud to the center of the slot. To this, add enough to be bent through the slot and engage the pin on the warning wheel. Allow about 8.0 mm for the portion in back of the stud. Any excess can be trimmed off later.
b. On the center line mark off a distance equal to the distance from the center of the stud to the center of the slot. At this mark draw a line parallel to the angle of the slot's length. On this line make a mark one quarter of the length of the slot above the center line and make a mark one quarter of the length below the center line. This gives you the width of the warning tail and the location and angle for the $90^{\circ}$ bend.
c. Scribe a center line on a piece of brass 0.5 to 1.0 mm thick and scribe another center line with an angle $60^{\circ}-65^{\circ}$ to the left of the first line. On this last line mark off a distance one quarter to one third the length of the steel warning arm. On the first center line mark off a distance equal to that from the stud to the center of the warning slot. Leave enough on the back of the mark for the stud hole and to make a rounded portion exactly the same as the warning arm.
d. Cut and trim the two pieces to a design that will match a similar design of the period. Some examples are shown in Figure 1. The lifting arm on the lower right-hand piece is a repair and, while the design is not particularly good, it is functionally sound.


Figure 1.
e. The end of the arm that engages the lifting pin on the hour strike (motion) wheel is usually 4.0 mm wide.

f. The collet is made from brass and is shaped similarly to the wheel collets. The two arms are placed on the collet and rivetted. The short brass arm is placed on top of the steel arm and screwed or rivetted about three quarters of the distance to its end.
2. Making the rack.
a. On a piece of steel about 60.0 to 70.0 mm wide, 2.0 mm thick, and as long as the distance from the rack stud to the center of the gathering pallet arbor plus enough for a tail that the rack spring can act upon, draw a center line.
b. On this center line strike an arc 3.0 or 4.0 mm less than the distance between the rack stud and the center of the strike gathering pallet arbor. Cut this arc with the saw.
c. From the center line of your rack arm on the arc struck, using the depth of one step of your snail, make one mark to the left and twelve marks to the right. This will give you fourteen marks or points on the arc. A steel punch can be made, (See Figure 2) which will speed up the transfer of marks.
d. Strike another arc 3.0 or 4.0 mm below the first arc. This is the bottom of the teeth.
e. Drop perpendiculars from the points on the top arc to the lower arc. These are the lifting edges of the rack teeth.
f. Connect the top points to the next forward perpendicular at the lower arc.
g. Cut the teeth. They may be cut with a piercing


Figure 2.
saw and finished by filing. The leading edge may be filed with a crossing file to provide the concave shape. This will allow extra clearance for the gathering pallet.
h. Set the gathering pallet's tail stop pin two to three

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teeth to the right of the last tooth at the left of the rack and about half way between the tooth arcs. Allow an extra space equal to two or three teeth beyond the stop pin so that the pin does not fall at the extreme end of the rack.
i. The rack arm usually tapers from 3.0 to 4.0 mm at the teeth end to 8.0 to 10.0 mm at the stud.
j. The design can vary from fancy curves to plain arcs according to the period of the clock. A few examples are shown in Figure 3.


Figure 3.
3. Making the rack tail.
a. On a piece of paper draw a straight line about five


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inches long.
b. On this line measure the distance from the center of the rack stud to the top of the rack teeth and mark these points "A" and "B."
c. Using dividers, measure the distance required for twelve teeth of the rack and set this off to the right of the top mark " B " on the five-inch line and mark it "C," Connect this point "C" to point "A." You should now have a triangle with two equal sides and "B-C" equal to twelve teeth of the rack.
d. Measure the length of the deepest step on the snail ( 12 to 1 o'clock) and mark as points "D" and "E" where this measurement spans " AB " and " AC ." This will form a smaller triangle with the base line equal to the deepest step on the snail. The distance " AD " is the length of the rack tail from the center of the rack stud to the stop pin at the end of the rack tail.
e. On a piece of brass 0.5 to 1.0 mm thick and 10.0 mm wide and long enough for the line " AD " plus 2.5 to 3.0 mm beyond the stud for rivetting, draw a center line.
f. Mark " AD " on the center line and drill and mount the rack tail stop pin.
g. Cut and file the rack tail to the desired shape and

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## Good Clock Tips!

Some AWI members, who are watchmakers, write that they do not read clock tips. Other members, who are clockmakers, state that they are not interested in watch tips. Then there are the clockmakers who say they like watch tips and the watchmakers who say they like clock tips. Lastly, there are the watchmaker-clockmakers who enjoy any Bench Tips that will save them time and money.

This is why we will try to keep the Bench Tip column diversified and print the new tips our readers send in about any type of mechanism that is designed to keep time, even if it's a method to use sun dials on a cloudy day.

We have two, extra-good clock tips this month which I feel should go to the head of the list.

## Quick Method to Adjust Brocot Escapements

By Mr. S.T. Jenssen, C M.W., Fairfax, VA
Many years ago I found myself running out of patience in adjusting pallet stones or pins in Brocot escapements. It grew very tiresome taking the pallet assembly out, making an adjustment, resetting and trying again until a decent escapement was achieved.

Now I have a method that makes it much easier and can be done in a matter of minutes. Of course, the pallet pins I am referring to are the ones that are cemented in with shellac.

With the pallet assembly out of the clock, I install the pins as I think they should be and cement them. I then install the assembly in the clock and, of course, they will be wrong. To make adjustments in clocks, I use a pencil soldering iron, let it get hot and wipe all lead off of the iron tip so as not to leave any lead on pallet arms.

To adjust pins, I take hold of the pallet with a pair of tweezers and place the soldering iron against the arm. As soon as I am able to move the pallet, I remove the heat and set the jewel where it should be and let cool. Then I go to the other pallet and adjust in the same procedure. Do not leave the iron against the arm too long as all the shellac will run. If you have jewel pins, observe closely as too much heat will change them from a cherry red to dark maroon or black. After a little practice, you will be able to set up an escapement in minutes where it used to take a great deal of time.

How To Saye Time Duplicating a Missing Pendulum Rod Without Mathematics

A new member of AWI, Mr, N.F. Stammer, clockmaker and owner of The Ordinary Clock Shop, 11th Street and Chestnut Avenue, Bowie, Maryland, shares this good
clock tip with us, along with some kind words for The Horological Times. Thank you, Nelson!

Here's a tip that has helped me to easily duplicate a missing suspension spring and rod.

I cut the replacement suspension unit and wrap a wire around the rod as shown in the attached drawing; this allows me to slide the pendulum bob connection point to the correct length (without a lot of mathematics, etc.) before it is cut and shaped to the correct length.


## Editor's note;

I gave your tip to an old-timer clockmaker friend and he remarked, "All these hundreds of years I've been restoring clocks, and I never thought of that tip. Anyhow, most of the clocks I repair are so old the shadow from the pendulum bob wears a slot in the back of the case and I use it to determine the length of the suspension unit."

Send your Bench Tips with name and address to: "Jingle Joe," 265 North Main St., Mooresville, NC 28115.


# Open Letter from Bustitito the Watchmaker 

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Due to the enormous cost of preparing, developing, and printing catalogs, it is no longer practical to continue publishing volumes such as the Bestfit Encyclopedias 111 and 111A. In order to provide the WATCHMAKER-JEWELER vital information for the servicing of watches and clocks, we have devised the Bestfit Micro-Fiche information system. This is the very same system for selecting and storing watch and clock parts that the watch material supply house and we at Bestfit use. If it is your intention to continue as a watch repairman, then it is of the utmost importance that you have an everflowing source of current information. This is the life blood of our industry. Only with our new system will this be possible.

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by Fred S. Burckhardt

# Cubic Zirconia and Other Diamond Substitutes 

## Part I

The other day, a woman who had purchased a fine-quality, one-and-a-half-carat diamond from me came into the store, She was very upset. She had been to another jewelry store and some joker had told her the so-called diamond was a cubic zirconia. Not only did he tell her that she had been taken, but also that he would even be willing to bet it wasn't a diamond. Now this fellow has been in the business many years, and has always been considered very knowledgeable. After talking with her for a few minutes, and then showing her some tests proving that it was a diamond, I could see she still wasn't fully convinced. I gave her the names of two other jewelry stores, both of which have Gemologists on their staffs. I recommended she take it to one, or both, and ask their opinion of the stone in question. Within a half hour, she called and was very happy because she had been told she had a very fine diamond. Now her mind was at ease. She also must have called the other fellow and told him what she thought of him, because he called a few minutes later and apoligized. However, the end result was that his reputation was tarnished and, knowing how this woman talks, I'm sure many people will hear about his mistake. He is also in first place on my "D.D." list. This stands for ding-dong. (That isn't what it really stands for, but it is a little more dignified)!

It's sad to say, but these mistakes have been happening quite often to quite a few people in our business; probably to more than care to admit it. There is little doubt that cubic zirconia will take the place of the other diamond substitutes because it is the best imitation thus far. Therefore, it is important that we learn how to distinguish it from diamond. There are several instruments on the market created especially for this purpose, Of course, they will also detect the other imitations as well.

The first instrument, one which we have used for about a month, is the Ceres Diamond Probe. This instrument relies on the diamond's ability to conduct heat, which is many times greater than that of any of the substitutes. The penlike probe, with a spring loaded tip, is placed perpendicular to a facet of a clean stone. A small electric current heats up the copper tip and then the current is cut off. The instru-
ment measures how quickly the temperature falls. If the stone is a diamond, the heat will be conducted away rapidly. This is repeated once each second. The needle on the instrument dial will indicate high or low conductivity-high for diamond, low for the substitutes. There are also flashing lights which indicate a diamond or one of the substitutes. There are small squares for checking the calibration and making sure the instrument is working properly. It takes only a few seconds to check a stone or even a cluster ring containing many melee. This is much faster than by any other method. If you do a volume of work, the time saved justifies the cost which is about $\$ 650.00$.

Another, less expensive instrument is the GEM Diamond Pen. This instrument bases detection on the particular surface tension of diamonds-another unique property not possessed by any of the substitutes. When the pen is drawn across the stone, a diamond will show a solid ink line while, on a substitute, the line will bead up. Before preforming this test, the stone must be cleaned with a mild abrasive to remove any surface coating.

A rumor was started that any type of felt-tip pen would work. This is not true. It depends on the formula of the ink. Some manufacturers change their formulas, so a pen that worked one time may not work when a new one is purchased. It is also known that some stones are coated in order to give a false reaction. If you are going to use this test, get the GEM DIAMOND PEN which was developed for this purpose. The kit also includes an abrasive for cleaning the stones to be tested. It is available from GEM Instruments, 1660 Stewart St., Santa Monica, California 90406, P.O. Box 2147.

Specific Gravity is another conclusive test. Specific gravity is the ratio of the weight of a stone in air to the weight of an equal amount of water by volume at $4^{\circ} \mathrm{C}$. The specific gravity of diamond is 3.52 , which means that it is a little over three and a half times heavier than water. The S.G. of the substitutes are :

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Synthetic Rutile-4.26

As you can see, all the substitutes are heavier than diamond.
This test can be performed only on loose stones. It is a simple matter to measure a stone's diameter, look at whatever chart you use to see what the approximate weight of a diamond of that diameter should be, set your diamond scales to that figure, and weigh the stone. If the scales balance, or very nearly so, the stone is a diamond. If the stone is much too heavy, it is one of the substitutes.


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## Questions and Answers

by Henry B. Fried<br>CMW CMC FBHI

## Illinois Springfield Watch Company

ment which I would like some help in identification if possible.

The movement is solid brass and measures $71 / 2 " \times 8$ " $\times 21 / 2$ ", The dial side has a No. 705 and on the pendulum side, is marked "Made in Baden".

The clock is in excellent condition and shows very little wear.
Could you help me identify the manufacturer, age and possibly how many of these clocks were made? Any help you could give me would be greatly appreciated.

Sam F. Millsap
Houston, TX
A. From the photo, $I$ would say that the movement is circa 1920, German, Westminster chime, probably manufactured by Badische Uhrenfabrik, Furtwangen, Badenia, Germany. The dial and casework should provide more positive identification.

Sean C. Monk


## GRANDMOTHER CLOCK

Q. I am enclosing two photos of a grandmother clock move-

## (Continued on page 59)

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| 325 | . 96 | . 86 | . 76 |
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| 354 | . 96 | . 86 | . 76 |
| 355 | 1.09 | . 99 | . 91 |
| 357 | . 85 | . 75 | . 65 |
| 362 | 1.50 | 1.39 | 1.24 |
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| 393 | . 79 | . 69 | . 59 |
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To insure your low-numbered copy for collection purposes, send your check or money order in the amount of $\$ 30.00$ payable to AWI Press, addressed to The Best of Coleman, AWI Central, 3700 Harrison Avenue, Cincinnati, Ohio 45211. Delivery of the advance copies began August 20, 1979.

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# AFFILIATE CHAPTER COLUMN 

By Robert F. Bishop

## Activities of Affiliate Chapters

One of the responsibilities of the Vice-Chairman of the Affiliate Chapter Committee is to record the minutes of the annual Affiliate Chapter Meeting. This is not an easy job, since it involves listening to hours of tape, sorting out essentials, making sure that nothing of an official nature is overlooked, and condensing the annual report of each Affiliate Chapter as submitted at the meeting. Digesting these reports has been a valuable experience-one that I can heartily recommend to Joe Perkins, my successor as Vice Chairman, and to all others who have access to these reports. This year, twentysix chapters submitted reports. Some were one page, others much longer, but all were interesting and a gold mine to those who want to see their association improve. I am going to share with you some of the things I have learned from these reports, along with messages brought by the delegates to the meeting last June.

One activity common to all chapters is the use of AWI's Workshops. These include lecture programs and slidetape programs. All chapters are involved with the Workshops to some extent, though some more than others. This is one of AWI's most valuable services to the Affiliate, and I am glad that so many are taking advantage of these programs. However, not only AWI programs are used. Many associations make use of the talent within their membership, such as the Accutron training given to small groups by Certified Accutron Technicians within the Bay Area Watchmakers Guild. Ideas like this can be used by your group to make your member a better watchmaker.

Not all programs are technical training, however. Many use lectures and programs presented by the various companies involved in our field-usually at little or no cost. Some Guilds help their members in associated fields through programs on selling, consumer rights, success and motivation, gem cutting, window trimming, and other pertinent subjects,

The social life of the watchmaker is not ignored either. Practically all chapters hold at least one social event during the year, usually a banquet or dinner-dance. This
has been found to be an excellent way to encourage participation by the membership.

The Annual Convention is the big event for most organizations. These conventions require a great deal of effort by those involved, but the results are worthwhile. Most chapters combine their Annual Meeting with a bench course or two, lectures, displays and a banquet, but the Washington State Watchmakers Association has added a "Round Table" feature. Several tables are set up, featuring training, demonstration or discussion, and each person can choose those activities which most interest him. The Michigan Watchmakers Guild held its 25 th convention this year, while the Arizona Horological Association and the Watchmakers Association of Pennsylvania, Inc. both held their first annual conventions.

There is another very important function of the watchmakers association. Many states that have had licensing laws protecting the public and the professional watchmaker, are re-examining or repealing them. In most cases, the only support the laws have is the association. In some cases, the associations have been successful in their efforts to save the laws. One group, the Watchmakers Association of Pennsylvania, will begin a Registered Watchmaker program this year, in the hope that it will instill prestige and public confidence in the professional watchmaker. Communication between chapters having similar problems with licensing is most helpful in putting forth the best possible defense.

Space does not permit me to list all the varied activities, nor give credit to the chapter involved. One, however, must be mentioned-a paradox. In a period of a shortage of watchmakers, at least two chapters which are trying to get watchmaking schools established are encountering much difficulty. In Indiana, money and equipment are the problem; in Virginia, the plans have been cancelled because of the "lack of job opportunities."

Your delegate has copies of all the chapter reports, and was present at the Affiliate Chapter Meeting to learn firsthand the things I have written about in this message. Make sure he shares this information with you. You will be the better for it.


## IOWA

The Iowa Jewelers and Watchmakers Association is making ready for the Convention/Trade show scheduled for September 22 and 23, 1979. It will take place at the new Airport Inn, 1810 Army Post Road, Des Moines, Iowa 50315.

The Saturday night event will be a banquet followed by a dance. A social hour will precede the annual banquet with a "Cash Bar," which will be poolside. Dancing will follow the banquet. During the evening, gifts furnished by the salesmen and two $\$ 50,00$ bills will be given away, compliments of the Iowa Jewelers and Watchmakers Association.

Show hours will be from 12:00 noon on Saturday and from 10:00 A.M. Sunday to 5:00 P.M. each day. Sandwiches for the Sunday noon lunch will be compliments of Jewelers Mutual Insurance Company.

## CALIFORNIA

The Tuesday, July 17, 1979, meeting of the Horological Association of California attracted another fine attendance of members to see and hear about the newest technological innovations from Portescap U.S. (Vibrograf Machine Division). Norman Levine (Portescap Sales) conducted the meeting with Bob Kelley (Portescap Service) and Terry Donavan (Portescap Micro Motor Division) assisting.

Portescap has been a long time friend of the horologist by helping the watchmaker to make more accurate, faster and more profitable watch repairs through the many machines and tools available from the Vibrograf Machine Division.

Norman Levine had on display for HAC members, for the first time shown anywhere, the first Servo Electronic Watch Cleaning Instrument and an Electronic Water Resistant Testing Device. In addition to the many other instruments displayed, the audience also had the opportunity to view Portescap's newest multi-function timer L'Instrument (Model MU700).

During the course of the program an excellent slide series was shown


Prices subject to change without notice.
describing Portescap's Incabloc shock absorber found in lever watches. Although millions of people worldwide are familiar with the name Incabloc, the majority may not be sure just what it is or how it is made. These slides answered the questions.

The presentation of many fine door prizes concluded the evening, This meeting brought forth the realization to the watchmaker that Portescap is, without any doubt, behind
them one hundred percent and continues to strive for new and improved methods of making the watchmaking profession a profitable livelihood.

Future meetings for 1979 include: Union Carbide in September, B. Jadow \& Sons in October, and Jay Foreman presenting the repair techniques of the Atmos clock in November.

For meeting and membership information contact: HAC Secretary Bill Givens, 6270 California Avenue, Long Beach, California 90805.

## NORTH CAROLINA

The Cape Fear Guild held its fourth annual Auction and Pig-Picking July 15 in Sanford. There were approximately 110 present, with some coming from South Carolina and Virginia. Approximately $\$ 4,100$ worth of tools were sold in the course of the auction. This year the auctioneer, Bob Skurla, was helped by Timmy Evans, an alumnus of Wayne Community College Watchmaking department and also a licensed auctioneer.

The Piedmont Guild had a very interesting meeting in Mooresville this month. Besides presenting the available information on the microfiche material that B. Jadow is planning. they instituted a material exchange program for older watches and parts that do not yet fit in the antique category, but are difficult to obtain. This is an in-guild project at present and involves the acquisition of movements or parts from one who has that particular model in stock and is willing to help his fellow watchmaker by providing the needed item for a nominal fee. The tentative price is $\$ 5.00$ a part or $\$ 10.00$ a movement, on a trial basis.

The Land of the Sky Guild presented at their July meeting the slide presentation "The Packard Watch Collection" which they obtained from AWI. Also, they held a discussion on the recent loss of our license law.

The Triangle Guild met in Cary with Owen Dewar presenting a program and demonstration on the refractometer, using the refractory index to identify stones.

The Coastal Plain Guild held a cook-out, attended by Guild members and their families. A short business meeting was held during which plans were formulated for the 1980 Convention which the Coastal Plain Guild is scheduled to host.

## PENNSYLVANIA

The Delaware Valley Watchmakers Guild held eventful meetings during May and June. At the May meeting, Mr. Ray Hopkins from Ray-O-Vac and Al Schwartz from Barton \& Chase gave a very interesting talk concerning cells. Mike Jenner then gave a very informative talk about LED and LCD watches and their functions. He also demonstrated some testing equipment he uses in his work.

Mr. Ed Pedzy, president of the Zenith Mfg. and Chemical Corporation, gave a demonstration of his latest clean-


Cape Fear Guild Annual Auction


7 om Lange (right) presents door prize to Adam Farnich (left).


Larry Katz (right) presents door prize to Joe Hrabosky.
ing machine at the June meeting. Mr. Pedzy donated a door prize which was an ultrasonic cleaning tank. One of the newest members of our group, Al Zeiger, won the prize.

Among other topics discussed at these meetings was a Citizen Watch Company bench course in Philadelphia in the fall, a tour of the Swiss watch technical center in Lititz, Pennsylvania, and the State Convention held in Sewickley, Pennsylvania.

Some 50 watchmakers and their wives recently attended the annual State Convention of the Watchmakers Association of Pennsylvania held at the Sewickley Holiday Inn on June 9 and 10. State President Robert Bishop of Pittsburgh presided over the conclave which attracted watchmakers from all corners of the state.

New directors elected for a one year term were Shirley McDonald, Cannonsburg, Pennsylvania; William A. Hilliard, Philadelphia, Pennsylvania; Jack Glusman, Philadelphia, Pennsylvania; Eugene Eckstein, Pittsburgh, Pennsylvania; Mario Bocchicchio, Pittsburgh, Pennsylvania. The newly elected members voted to implement a "Registered Watchmaker" program for members.

In addition to the annual business meeting the convention featured many interesting and informative technical sessions. Mr. Paul Fisk, Certified Master Clockmaker from Charlottesville, Virginia presented a program on antique clock restoration, and Mr. Leslie L. Smith, Certified Master Watchmaker from Cincinnati, Ohio conducted a Bench Seminar on the servicing of Quartz LCD Seiko A159 (Liquid Crystal Display) Chronograph Alarm. Both men are nationally recognized in their field, and are on the staff of the American Watchmakers Institute.

Sunday afternoon featured a panel discussion. Panel members included Les Smith, AWI President; Al Eger, President of Retail Jewelers Association of Pennsylvania; Paul Fisk, CMC from AWI; Tom Lange, Assistant to the President of the L \& R Mfg. Company; Larry Katz, Sales Manager of Martin Gluck and Son, Seiko distributor; and Bob Bishop, moderator. The audience posed many questions regarding problems facing watchmakers of today which were capably answered by the panel members.

The Pennsylvania organization, which was founded in 1934, is an Affiliate Chapter of the American Watchmakers Institute, the only professional organization of watchmakers in the United States.

## NEW MEMBERS

ALSOBROOK, Charles H. - Tampa, IL ANDERSON, Dan L.-Northville, MI ANDERSON, Herbert A.-Madison, IN ANDERSON, Ronald A.--New Brighton, MN BENTON, Julius D.-Kissimmee, lL CASSIDY, James P.-Canton, OH COLONNA, Lawrence-Austin, TX DEBO, Philip I -Tarzana, CA DOEDYNS, Andrew G.-Beaver Falls, PA IISH, EJbert C., Jr.- Whites Creek, TN PONNER, Alan D.-Arlingion, TX FOSHEE, Clyde R.-Lakeland, FL HOADLEY, John C.-St. Petersburg, 1-L HOBBS, James R.-Milpitas, CA HOLDER, George-Bridgetown, Barbados, West Indies HORN, Erik H.-Santa Barbara, CA HOWELL, James W. -Madill, OK KORN, A.M.- East Elmhurst, NY KOSKI, Dennis-Sterling Heights, MI KIJGLER, Kenneth F.-Medford, OR McCURLEY, William L.-Smithville, TX MILLS, Clyde W.-BountifuI, UT MOELLER, Hans-Attica, NY PATRICK, James-Largo, IL PETERSMANN, Wilbur F.-Cincinnati, OH REED, Dennis-Tolono, IL SAUNDERS, Frank-Los Angeles, CA SCAZO, Russ-Mendham, NJ SIEBERT, Richard H., J J - -Allentown, PA SHEPARD, Ralph J.-San Diego, CA SHIEVER, A.J--Moreland Hills, OH SILVEIRA, Joe-San I'rancisco, CA STROUGH, Robert 1.-Glastonbury, CT VOWLES, Terence L,-Green River, WY WALLER, Diane E.-San Antonio, TX WALLINDER, A.L.-Minneapolis, MN WALTERS, Harold E.-Rogers, AR WATTS, Clyde A-Hopeland, PA ZERKLE, Gerald H.-Butler, IN

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Bestfit Watch and Clock Materials, Division of B. Jadow and Sons Inc., is pleased to announce to the watch repair trade the availability of the newly-styled, updated Bestfit MicroFiche System of watch and clock materials.

Due to the enormous cost of preparing, developing and printing catalogs, it is no longer practical to continue publishing volumes, such as the Bestfit Encyclopedias 111 and 111 A . In order to provide the Watchmaker/Jeweler with vital information for the servicing of watches and clocks, they have devised the Bestfit Micro-Fiche information system. This is the same system for selecting and sorting watch and clock parts in use at the watch material supply house at Bestfit. If it is the intention to continue as a walch repairman, then it is of the utmost importance that there be an everflowing source of current information. This is the lifeblood of the industry. Only with the new system will this be possible.

The new, completely up-to-date Bestfit Encyclopedia of Watch and Clock material is being prepared in this new modern form. Microfiche is a type of microfilm which is in common use and which can be enlarged for easy viewing through a reader.

Bestfit breaks precedent by making this offer directly to the watchmaker in order to keep costs down.

The Bestfit Micro-Fiche System has these many advantages:

1. It completely updates the Bestfit Encyclopedias 111 and 111A on Microfiche.
2. The Bestfit Micro-Fiche System completely details interchangeable information on over 8000 watch and clock calibers. No longer will you be purchasing parts that you have on hand. Each photo lists parts for the complete movement. A position number for each part is shown on the card. No longer will it be necessary to describe the part. Merely order by system position number. Since the wholesaler has the same system and stocks by these numbers, he will be able to fill orders in the least possible time.
3. It provides a systematic method of delivering new information in a continuing way, so that you will be completely informed and up-to-date at all times. The first year's up-dating will be free. Thereafter, new supplementary information will be supplied to maintain the system for an annual fee of $\$ 75.00$.
4. Bestfit guarantees that information will be supplied regularly so that the system will be "alive" at all times.
5. Information supplied by other manufacturers using Microfiche can be viewed on the reader.
6. A high fidelity Microfiche reader will be supplied. The reader will require approximately 12 square inches of space and can easily fit in the corner of the work bench.
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Cost of the complete unit is $\$ 350.00$. A $\$ 50.00$ deposit must accompany your order. If order is not received by December 31, 1979, it will not be possible to participate in this once-in-a-lifetime opportunity. Delivery of system will be approximately June/July 1980.

Should there be any further questions or more information required, write directly to Bestfit at B. Jadow \& Sons Inc., 53 West 23rd Street, New York, NY 10010, or call Mr. Schwartz or Mr. Berman at 212-741-9500.

## TWO BULOVA EXECUTIVE CHANGES

It has been announced by the executive committee of the Bulova Watch Company, headquartered at Bulova Park in Jackson Heights, NY, that Robert Schwebel and Robert Weber, both senior executives at Bulova, have been assigned expanded responsibilities. "Both executives," noted Mr, P.R. Tisch, Bulova's executive committee chairman, "have played key roles in the operations of the company, and have made significant contributions to the company's recent successful turnaround."

Mr. Schwebel, a top executive with the company, will play an even larger role in the organization in his expanded position as vice president of planning. Mr. Tisch observed that "Mr. Schwebel brings to his new position a wealth of knowledge acquired through his over twenty years of service in various capacities within Bulova. In his new position, Mr. Schwebel will be responsible to the executive committee for special projects, and will aid in the development of task forces to study all phases of the company."

Mr. Schwebel began his career with Bulova in 1955 in the market research department and was promoted a year later to director of marketing administration. He then served as General Manager, in 1957, of the William Langer Jewel Bearing Plant in Rolla, ND, the nation's sole producer of jewel bearings which is still operated by Bulova for the U.S. Government's Genera! Services Administration. From 1960 through 1969 he served as vice president of American Time Products, first director of Bulova's Technical Sales \& Services Division, and assistant to Harry B. Henshel, then president of the organization. In 1969, he assumed the position of vice president of requirements planining. Mr. Schwebel will continue to be responsible for requirements planning as well as overseeing the operations of the William Langer Jewel Bearing Plant in Rolla, ND, once again.

Mr. Schweber, a 1948 graduate of Columbia College in New York, served in the U.S. Army Signal Corps during World War II and resides with his wife and children in Glen Rock, NJ.

Mr. Weber, 38, began his career with Bulova 14 years ago as an industrial engineer and was subsequently promoted to chief engineer.

Mr. James Waterwash, vice president of manufacturing, noted that Mr. Weber "rose rapidly through the ranks"

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\section*{Watch Cases and Their Accessories \({ }^{\text {®1979 }}\)}

\section*{Part III}

One important part of watch and watch case work is the fitting of stems and crowns. If stems are available, the selection or buying of a stem isn't nearly as difficult as selecting or buying the proper crown. To select or purchase a stem, the only information needed is the make, the model or caliber of the watch, and the thread size. Crowns are not always available for the particular make and model of watch, in which case there is need for further information. In order to get this information, the watchmaker must study the watch case to determine its design and the type of crown needed.

The following information is necessary when selecting
or ordering a crown: Style of case, type of case, water resistance, color of case, type of metal used in the case, and whether it is a ladie's or gent's case. The information needed for the crown is as follows: Color, quality, style, outside diameter, inside diameter, tap size, and length of pipe. It is very important to select the correct crown. Otherwise the crown will not perform as it should, and the watch could be damaged as a result.

For an example of some of the most-used crowns and how they work, see Figure 1. View A shows a water-resistant crown with a flat rubber or plastic gasket which fits very

closely around the tube of the case to help prevent water from entering the case. For this crown to be effective, the case tube must be in good condition. It must be round and smooth and the gasket must fit the tube correctly with sufficient tension. View B shows another waterproof crown with an O-Ring gasket. This is a very popular water-resistant type. The O-Ring seems to work very will since it is very flexible and conforms well to the case tube.

Another type of water-resistant case and crown assembly is shown in View C. This arrangement does not have the gasket in the crown. Instead, the gasket fits into the pendant of the case against a seat, and is held in place with an adjustable threaded nut. This nut has a cross slot in its end to accommodate a screwdriver or wrench for tightening the gasket against its seat. The pipe of the crown goes through the hole in the gasket, and as the pipe or gasket wears, the nut can be screwed down tighter against the gasket. This spreads the gasket, causing it to fit closer around the pipe and thus readjusting the tension of the gasket against the pipe of the crown.

View D shows a regular water-resistant crown with a different type of gasket. This is a thin, flat, plastic gasket held in place by a metal washer which is burnished into place. When the crown is placed onto the tube, the gasket is formed up into the crown around the tube of the case.

A special water-resistant crown is shown in View E. This crown has a threaded nut that holds the gasket against its seat. By screwing the nut tighter against the gasket, the gasket expands, causing it to fit tighter on the case tube. Thus, the tension of the gasket can be tightened or adjusted to compensate for wear on the gasket or case tube. This is a very good arrangement because of this feature.

A more modern method used to make the case and crown water resistant is shown in View F. In this arrangement, there is a groove which extends completely around the edge of the case that holds an O-Ring gasket. There is a section of the gasket that extends from the O-Ring that has a hole in it for the pipe of the crown to go through. See View F, a. It is very important that, when fitting a new crown, the pipe on the crown should fit the hole in the gasket close enough so that it has sufficient drag. It is also important that the crown be turned to assure that the system will be water resistant, and that the pipe on the crown is smooth and in good condition.

There is another modern method (not shown) of making the crown water resistant. In this method, a groove is turned around the pipe of the crown to accommodate an O-Ring gasket. This O-Ring is the proper size to fit snugly inside the case tube to help prevent water from entering the case through the case tube.

Sometimes the case tube is damaged or even missing and needs to be replaced. The procedure would be to select the proper tube from an assortment that can be bought from a watch material house. These come in assorted lengths and diameters. The diameters of the tube where the crown fits come in \(2.00 \mathrm{~mm}, 2.25 \mathrm{~mm}, 2.40 \mathrm{~mm}\), and 2.50 mm sizes. The tubes come in different diameters for the portions that fit the hole in the case; such as \(1.80 \mathrm{~mm}, 1.90 \mathrm{~mm}, 2.00 \mathrm{~mm}\), \(2.10 \mathrm{~mm}, 2.20 \mathrm{~mm}\), and 2.30 mm . The length of the portion that the crown fits onto comes in 1.15 mm and 1.50 mm . If the proper tube cannot be located, then one can be made in the lathe from a brass rod or, better yet, from a piece of nickel-silver clock-chime rod. The part of the tube that fits in the hole of the case should be of such a size as to be almost a press fit. Before mounting the tube in the case, a wheel countersink or dental burt should be used to countersink


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around the hole on the inside of the case as in Figure 2. Then use the same countersink or burr to bevel the inside of the hole in the tube (the part of the tube that goes into the hole in the case). See Figure 3. The tube can be held in the lathe or in a pin vise while this is being done. Then insert the tube into the hole in the case, making sure the shoulder on the tube goes all the way to the body of the case. Now support the tube on a hard wood block, such as boxwood. Then the tube can be riveted in with a round-ended punch, or burnished in with a burnisher made from a round clock broach that has had its end ground smooth and polished to a \(45^{\circ}\) angle as shown in Figure 4. The broach should have a handle on it so pressure can be exerted downward on the broach as it is turned on the inside corner of the tube. This burnishes the tube over onto the bevel previously cut in the hole by the countersink.

Figure 1, views G, H, and I, show examples of dustresistant systems. View G shows a spring-loaded crown. This crown works in the following manner. The dust cap "A"
continually presses against the outside of the case. Behind this dust cap is a coil spring which holds tension outward against the dust cap. When the stem is pushed into the winding position, the cap should be compressed almost as far as it will go into the crown. When the stem is pulled into setting position, the dust cap should still be pressing against the case. This type of crown is a very good one to help keep dust from entering the case around the stem through the opening in the case.

View H shows another dust-resistant assembly. The crown has a sleeve that fits around the pipe of the crown and is free to turn and slide in and out on the pipe of the crown. This sleeve cannot come completely off of the pipe because the end of the pipe is slightly spread. This sleeve has a groove cut around it which forms a rim at its end. This rim fits into a circular groove in the case that is formed around the stem opening. The sleeve is held in place by the bezel of the case when it is snapped on. When the stem is moved in and out for winding and setting the watch, the


Figure 2.


Figure 3.


Figure 4.

sleeve stays stationary in the case and the pipe on the crown slides in and out inside the sleeve. This is an excellent dustresistant device.

Another dust-resistant system is shown in View I. This system has a dust shield with a tube that fits through the stem opening in the case. The part of the dust shield that joins this tube is a flat piece of metal that fits inside the back of the case and is held in place by the watch movement. The crown is cut out inside to go over the tube on the dust shield. The pipe on the crown goes inside the tube on the dust shield. Some watchmakers make a mistake when fitting a new crown to this arrangement, since sometimes this dust shield is missing and the watchmaker may not know that there ever was one. The opening in the case is extra large to accommodate the tube on the dust shield. Therefore, when the watchmaker fits a new crown with a regular diameter pipe to the case, there is considerable space left for dust to enter
the case around the crown pipe. When fitting a crown to a case such as this, if the dust shield is missing and another is not available, then a tube can be made to fit the opening in the case with a hole large enough to accommodate the pipe on the crown. The crown selected should have an opening to fit over the tube.

When selecting and fitting regular-type crowns, there are some important points to check. If the case has a tube, then the crown needs to have an opening to fit correctly over the tube. If there is no tube, then the crown does not need to have an opening. The diameter of the crown is important because if it is too small, the watch will be hard to wind and if it is too large, it will cut into the customer's wrist or arm. The rule on diameter is to select one as large
( continued on page 54)


Figure 5.


Figure 6.


Figure 7.


\section*{Wairch ADJJUSIIMIENTIS}

\author{
by Joseph Rugole, CMW
}

Although several of my articles have dealt with problems which would more accurately come under the subject heading of general watch repair, I felt that their inclusion in these discussions was justified for two reasons: First, it is not possible to adjust a watch to any kind of acceptable standards unless it is properly serviced and is in generally good mechanical condition. Second, the adjustments and the compensations necessary to improve the performance of a watch are directly related to mechanical conditions, especially those found around the escapement and the balance wheel. It is important for every watchmaker attempting to improve the performance of a watch to critically examine every mechanical aspect of the escapement and the balance wheel before any adjustments on the hairspring are performed. Since some of the essential problems have been discussed in the last article on a more or less theoretical basis, it may be appropriate at this time to give some practical suggestions for checking the functioning of the escapement and the balance.

Depending on the quality of the watch, the tolerances allowed in manufacturing are quite narrow. Those of better quality watches are always smaller than the standard quality, but we should keep in mind that most watches are massproduced and therefore subject to errors. Watches that have been repaired could also have minor or major problems around the balance wheel and the escapement. Therefore, it is prudent to check them all and where necessary, make corrections.

The basic checks that should be made on the balance wheel, and the tolerances that should therein be allowed are: Side shake of balance pivots -0.01 mm ; end shake of the balance staff -0.02 to 0.04 mm , or maximum not to excede \(1 / 2\) the thickness of the balance staff pivot. The balance wheel
must turn smoothly in all positions without any encumbrances. The pivot ends should be slightly rounded, the pivots highly polished, and the burr removed. All jewels must be clean and properly fitted.

The checking of the escapement should start with the corner freedoms. This is one test a watchmaker should never overlook. Although there are a few methods for adjusting the escapement, the setting up of fork and roller action seems to me to be the most logical starting point. The corner freedom test is made in the following manner: With the balance wheel and the hairspring in the watch and close to be in beat, push the pallet fork toward one of the banking pins. The balance wheel is deflected away from the line of centers, but the tension of the hairspring is keeping it in contact with the pallet fork (See Figure 1). The other corner of the roller


Figure 1. Corner freedom test step one. Holding the pallet against the banking pin and bringing the roller jewel to engage the fork slot.
jewel and the corner of the fork slot are in a position opposite to one another, but not touching. The balance wheel should now be stopped by very gentle finger pressure from the side of the movement. Care must be taken that it does not turn in either direction. If it does, the comer freedom will not be the same unless the flat face of the roller jewel is curved. With a fine escapement tool or with a pair of tweezers, move the fork away from the banking pin while holding the balance wheel in the position described. The comer of the fork slot will now contact the corner of the roller jewel as in Figure 2. This clearance should be as close as possible to 0.02 mm . In this instance, the term "as close as possible" warrents further explanation. Since it is next to impossible to measure this clearance exactly, we must be satisfied with an approximate measurement. Unfortunately, approximate measurements vary widely from person to person. Since corner freedom happens to be a very critical dimension, it ought to be fully understood, and explaining why this measurement should not be any larger or smaller than 0.02 mm furthers such an understanding.

The clearance should not be less than 0.02 mm because the pallet pivots must have a side shake of 0.01 mm , as must the balance pivots. If the pallet pivots were placed


Figure 2．Corner freedom test step two．Holding the balance wheel and pushing the pallet against the roller jewel．
in the exact center of the jewel hole，then the clearance to any point of the jewel hole would be 0.005 mm ，or \(1 / 2\) the total side shake．The same would be true for the balance staff pivots．When the watch is placed in any one of the vertical positions，the balance and the pallet pivots move to the side of the jewel，each for \(1 / 2\) of the total side shake．In this way， 0.01 mm of the corner freedom can be taken up if the watch is turned in the appropriate direction so that the pallet and the ba＇ance lean toward one another．The remaining 0.01 mm is just sufficient to prevent contact between the corner of the fork slot and the roller jewel when the jewel is entering the frork．If the watch is turned in the opposite direction from the one described，the total clearance remains 0.02 mm ．During the corner freedom test，force is applied to the balance wheel as well as to the pallet．This has an effect similar to pushing both pivots as far apart as they can go under normal operating conditions．The comer freedom as described above is the functional minimum i．e．，it is the smallest clearance that will let the watch balance wheel function without interference in any position．If it is made smaller，it may function in all but a few critical positions in which the pallet and the balance wheel lean toward each other．In those positions，a rasping or clicking sound could be detected and the amplitude would be reduced．

By realizing the critical nature of the minimum corner freedom，we are sometimes tempted to increase it beyond the necessary minimum．The consequences of such an action are many．When the banking pins or screws are bent or turned outward，the following changes take place：
1．The corner freedoms become larger．
2．The angular motion of the pallet is increased．
3．The total lock on pallet stones is increased．
4．The angular engagement with the balance is increased．
5．The unlocking sequence begins earlier and further from the line of centers．
6．The corner freedoms are often different between the two dial positions．

My calculations show that on an average man＇s wrist watch，（ \(10^{1 / 2}\) ligne to 12 ligne）the angular motion of

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the pallet increases by \(1^{\circ}\) if each banking pin is bent outwards for approximately 0.02 mm . It follows that the total lock in this case would increase by \(1 / 2^{0}\) on each pallet stone. Further calculations show that when the angular motion of the pallet is increased by \(1^{\circ}\), the angular engagement with the balance increases by about \(4^{\circ}\), and the unlocking takes place approximately \(2^{\circ}\) earlier on each side of the line of centers.

It was pointed out in previous articles that the larger angular motion of the pallet, the greater total lock, and the earlier unlocking, make greater demands on the kinetic energy of the balance wheel. It follows, therefore, that the ability of the watch balance to maintain a reasonably constant frequency will be adversely affected.

Bending the banking pins to any appreciable extent further complicates position timing of watches. If the pins are bent outward, the angular motion of the pallet as well as the corner freedom will be smaller when the watch is in dial down position and larger in dial up position. Consequently, all the forementioned relationships change every time the watch is moved from one to the other position. This effect is especially noticeable if the end shake on pallet arbor excedes the recommended maximum of 0.02 mm . Bending the banking pins for a very small amount is acceptable, but if one can detect a tilt to the pin, the dial position rates will be affected. It is essential to have the pins upright at the point where the pallet fork comes in contact with them. Caution and good judgement must be used when adjusting corner freedoms. After the corner freedoms are adjusted THE BANKING PINS SHOULD NOT BE MOVED FOR ANY REASON. ALL SUBSEQUENT CHANGES ON THE ESCAPEMENT MUST BE MADE ELSEWHERE. Sometimes after setting up corner freedoms, one or both pallet stones will

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Figure 4.



\section*{AWI NEWS}

\author{
By Milton C. Stevens
}

\title{
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}

\author{
The Best of J.E. Coleman: Clockmaker
}

The American Watchmakers Institute has published what we believe to be one of the most significant books ever released concerning clock repairing and related horological subjects. This book, The Best of J.E Coleman: Clockmaker, represents more than twenty-eight years of writing by Jess Coleman, one of this country's most respected horologists. The book is a virtual encyclopedia of horological information with an emphasis on clock repairing. Its easy-to-use, cross-reference index makes finding whatever item the reader needs a simple task.

Jess Coleman, an outstanding craftsman, was best known for his willingness to help his fellow " 144 's" with everyday problems in the field of clock repair. Through his column "Clockwise and Otherwise" which appeared each month in the American Horologist \& Jeweler, he shared the knowledge which he had gained as a practical bench man, and as an avid researcher. His column attracted direct mail and phone inquiries from benchmen across the country. Jess Coleman spent many hours a day pounding the typewriter to lend assistance to clock repairmen in distress. He received no payment for these hours of research and answering mail; in fact, often, he hardly received a thank-you. His postage bills, mostly from his own pocket, must have been considerable. When asked why he did it, Coleman would simply reply,"Someone had to."

The Best of J.E. Coleman: Clockmaker was prepared for publication by Orville R. Hagans. Hagans and his wife Josephine are also responsible for the unique, cross-reference index which makes the book so valuable. Mr. Hagans owns the copyrights to the materials published in this book. He has made the copy available to the American Watchmakers Insti-
tute Press at no charge to AWI. The profit derived from the sale of this book has been designated by Mr. Hagans to apply to the retirement of the AWI building mortgage. Once the mortgage is retired, the remainder of the book's proceeds will revert directly to the AWI Education, Library and Museum Trust (ELM Trust).

The five hundred and forty page Best of J.E. Coleman: Clockmaker is attractively bound in hard back and smartly covered with a protective jacket. The book retails for \(\$ 30\) per copy postpaid.

The first 500 copies of this book are presently being sold as a preview release exclusively by AWI. The preview release books are serially numbered; they will become collectors' items. Once the preview release is sold, the book will be open for general distribution by AWI and book dealers across the country and world-wide. To date, the sale of this preview release has been brisk. However, there is still time to obtain one of the collectors' numbered copies. Numbers are assigned in the order received, and by postmark date. A check for \(\$ 30\) made to AWI Press and addressed to "The Best of Coleman," AWI Central, 3700 Harrison Avenue, Cincinnati, Ohio 45221, will insure prompt delivery of your copy.

When Jess Coleman died, he left a void for those of us who called on him repeatedly whenever a clock repair problem seemed unsolvable. Now that Orville Hagans has prepared this book for AWI to publish, each of us is once again given the opportunity to consult with Coleman. In my opinion, this is the most important book to be published for clock repairers in a quarter of a century, It should be a valuable addition to the library of " 144 's" everywhere.

For More of
The Best of J.E. Coleman: Clockmaker See Pages 32 \& 33.

\section*{The 1979 AWI Horological Tour}

The fifth A.W.I. horological tour was a huge success with twenty-seven participants. During the nineteen days of the tour, the group visited Switzerland, France, Spain and Portugal. After arriving in Zurich by Swissair, the group, led by Henry B. Fried, motor-coached to Mulhouse in France's Alsace-Lorraine. This was followed by a visit to the L'Epee clock factory. Here the group

of the tour, taking advantage of tour options, motored to Switzerland's Wintertuhr, scene of the Rhine Falls.

A later visit to the La Chaux d'Fonds Horological Museum was followed with a fine luncheon and appropriate toasts by Paul Tschudin of Ebauches S.A., Orville R. Hagans, president of the A.W.I., Dr. Warner D. Bundens, president of the National Association of Watch and Clock Collectors, regular A.W.I. tour member, and charter member of Chapter 102 A.W.I.,N.A.W.C.C., and by Henry B. Fried. After the luncheon, the group visited the new ETA factory after which refreshments and timing souvenirs were given to each member-tourist.

Going back into France, the next stop was Besancon, capitol of France's horological industry. A visit to the Yema factory was made with our friend and its president, Henry L. Belmont, who showed us the factory operations

\section*{Assembling French Carraige Clocks}
at L'Epee Factory
saw French mantle and carriage clock plates, wheels and pinions, cases, and other parts being made from the raw material. The display of hundreds of such movements, bright and shiny on their timing racks and tables, was a most educational experience. Some of the group bought carriage clocks at special courtesy prices.

A visit to the Basle trade fair, the largest watch and jewelry show in the world with over 1200 exhibitors, revealed the latest technological and style designs in watches, clocks and jewelry. Those of us at the fair were greeted with an official reception, luncheon and wine. Other members

Carraige Clock Movements at L'Epee Factory


as well as his own collection of old, horological tools. Especially interesting were those tools devoted to the making of cylinder escapements which are no longer produced. Later that day, we visited CETEHOR, France's horological research center. Here the latest in technological developments were revealed. The next day was devoted to a visit to the horological museum, guided by Mr. Blanc, executive secretary of the ANCAHA, the French watch and clock collectors association. A visit to the famous Verite clock in the Besancon Cathedral was followed by a cocktail party at CETEHOR.

Clock at the Basle Fair

of Cordoba and Toledo, and a threeday stay in Seville with its picturesque attractions. Other visits included a tour to the Mediterranean city of Cadiz with its wonderful flower gardens and semi-tropical vegetation.

A special delight was a tour to Jerez, famous for its Sherry wines. ("Sherry" is derived from the pronunciation of that city's name). The famous winery (bodega) of Zoilo Ruiz-Mateos at Jerez De La Frontera, houses a beautiful horological museum. Our special hostess, Miss Fatima Ruiz-Lasaleta, provided each member with a large book describing each exhibit and the personal guidance of the resident horologist. Later, a reception was held for the group where all types of wines and sherries were tasted with our repast. There were special discounts on purchases and appropriate souvenir gifts for all.

The last leg of the tour took us by motorcoach through Portugal to a fine Lisbon hotel. Side tours were taken to Sintra, Estoris, Cascais and


At the Yema Faciory


Mr. Blanc (second from left), Executive Secretary of the French Watch \& Clock Collectors

\section*{Group Photo at CETEHOR, France's}

Research Center for the

\section*{Horological Industry}

Fatima. The trip to Fatima was especially interesting as it took place four days prior to the anniversary of the day, sixty years earlier, when three children witnessed a religious miracle. Already, thousands of pilgrims had arrived at this shrine, walking numerous miles, some on their knees for the last miles. Fatima, now a bustling city, previously was but a relatively uninhabited farmland area.

Hotels and food were excellent. Our European guide, Fred Richter, was superb! Plans for the 1980 tour are already in the making, with a tentative tour planned through England, Wales, Scotland and Ireland. Norway may be substituted for Ireland. Other considerations are the Far East, including China. Interested members are urged to voice their opinions and choices. Tour arrangements were, as in the past, handled by Kuoni Travel.


\section*{THE SHIP'S CHRONOMETER \\ (continued from page 14)}
shellac the lower threaded end in the hole. This will hold the screwhead template so you can file up the pipe.

If you are unable to find a suitable screw, select a piece of round steel stock, and turn the head down to the required size of the pipe. Select a post that will fit and extend through the hole; then harden. Next select a small, round piece of brass or bushing wire and either drill or broach a small hole so when cut off, this small washer will fit the lower end of the template post friction tight. Place the template in the hole and, with a small, hollow, flat-face staking punch, tap the washer down in place. After the template has been positioned and secured in the hole, carefully file up the pipe flush with the template head. This will give you a perfectly round pipe.

Next file away the excess metal on both sides of the detent blade. File up the horn-that portion of the blade in front of the pipe against which the far end of the trip spring rests. See Figure 2G. The horn should be filed thin to a point where it will respond to bending should this be necessary when adjusting the escapement.

Starting from the shoulder, for a distance of approximately one-third the length of the detent, file both sides down so they are much thinner. This portion of the detent is referred to as the detent spring and when completely finished should run from .0015 to .0030 inches thick-thinner nearer the shoulder. However, do not take it down to those dimensions at this time. File down the blade on the side where the trip spring lies, leaving a small square boss for the seat to which the trip spring is attached. Then drill and tap the small screw hole for the trip spring. At the Observatory, we used a tap from the Elgin watch screw set, for then we were able to use a \(16 / \mathrm{s}\) Elgin flat-headed jewel screw. See Figure 4.

The next step is to make and fit the trip spring. A replacement trip spring is usually made from thin, 10 K gold sheets. Other alloys have been tried and Hamilton had very excellent success with its Hamilton Elinvar. Hamilton also tried beryllium copper, but the tripping end wore off to such an extent that the balance wheel could be moved back and forth and not even unlock the escapement.


Figure 4. Trip Spring Screw Hole is drilled and tapped and the Detent is nearing its exact size.

The trip spring is approximately .003 inches thick at the outer end and diminishes in thickness from .0015 to .0020 inches thick at the screw end. The Hamilton Elinvar
trip spring measured .0019 inches in thickness and the reduced thickness at the flexing region of the spring was completely elininated.

With a pair of shears, (Brookstone's angled wire and sheet metal snips are ideally suited for this job) cut out a golf club-shaped piece so it will extend a trifle beyond the detent horn. On some models, the trip spring is perfectly straight. Then dress up the edges, square off the screw end to fit the square boss of the detent, and stone down the thickness so the point of flexion occurs at the screw end. Next drill a small hole and elongate same with a round micro file so it may be adjusted backwards and forwards as necessary. Remove all burrs. When the trip spring is positioned and attached to the detent, the end should point to the center of the balance hole jewel.

Some repairmen, instead of drilling a hole in the trip spring, opt to slot the end, their reasoning being that it lessens the continuous removal of the trip spring in order to elongate the hole when adjusting the spring backwards and forwards. I have found, however, that with such a slot there is a greater chance of the spring becoming "cocked" when the screw is tightened down. Hence, the spring does not lie parallel to the horn. Once the trip spring is screwed down tightly onto the detent, file down the reverse side of the detent blade flush with the end of the trip spring screw. At this stage, the detent is becoming thinner and therefore is more susceptible to damage if not handled carefully.

The next operation is the fitting of the locking jewel. The locking jewel may either be D-shaped or a modified V (cuneiform shaped). The D-shaped jewel used in the early Hamiltons measured .65 mm in diameter and later on, when they made a design change to the cuneiform-shaped jewel, the width across the jewel measured .38 mm .


Since the fitting of the locking jewel into the pipe can be a rather tedious job, at the Observatory we altered a small, flat-jawed pin vise so it would hold the detent while
the jewel was being fitted. Take a small Lowell Pattern style pin vise and, after smoothing the inside jaws, grind one of the outside jaws down so it measures approximately .02 to .03 inches thick. See Figure 5. Then through this ground jaw, drill a small hole just large enough to accommodate the pipe. To facilitate the setting of the jewel, the detent is placed in the pin vise with the pipe protruding through the hole.

The locking jewel is held in the pipe by a slightly tapered, D-shaped brass wedge. To make the wedge, take a piece of round brass stock that will pass through the pipe and file it flat on one side and slightly tapered on the other until it will enter the pipe with the locking jewel in place. Do not force the fit or the jewel may crack. While the piece is in the pipe, take a safety razor blade which has been placed

\section*{WATCH ADJUSTMENTS ( continued from page 46 )}
to make sure that it is the same at every point. If this shake is proper at one point and either too large or too small at some other point, it means that something is wrong with the balance assembly. Either the safety roller is not perfectly round, or the bottom pivot is bent. The same test must be made on both sides of the line of centers. Should it be found that the shake is larger on one side than the other, the guard pin is either bent to one side, or the end is not finished equally on both sides. At times, the guard pin is found a little shorter than the ideal length and one is tempted to leave it that way. Before we can safely do that, another test should be done to determine if its length is satisfactory. When the pallet is moved to engage the guard pin and safety roller, we should check the lock on the pallet stone. If not more than \(1 / 2\) of the total lock is lost on the pallet stone in lock position, the length of the guard pin is satisfactory. If there is even the slightest chance that the locking corner of any one of the escape wheel teeth might slip past the locking corner of the pailet stone when the guard pin is in contact with the safety roller, the watch will not perform properly. Although such a condition will not show up on the timing machine, in actual wear and under the usual shocks which the watch receives, the per-
on a file and struck, serrating the blade, and mark off the total length of the wedge. Both ends of the wedge must be even with the pipe. Then remove the wedge stock, shorten the top end, and finish it flat and smooth. Saw the other end partly through with the serrated razor blade. Reposition the locking jewel and insert the wedge. Turn the wedge and jewel in unison until the face of the locking jewel reaches an angle of approximately \(8^{\circ}\) (draw). This assures us that when a tooth comes to rest on the locking jewel, the detent will draw into the tooth. Then remove the detent from the pin vise and grasp the pipe with a watch combination tool, heat, and apply a dab of shellac on the underside of the jewel and wedge.

\author{
(Continued next month)
}
formance of the watch and its time keeping will be greatly affected. Even when only \(1 / 2\) of the total lock is lost during the test just described, the guard pin length is not quite satisfactory on all counts. In many watches so adjusted, if the shock takes place just at the point when the roller jewel is entering the fork horns, the roller jewel will butt at the end of the horn and the balance will reverberate back without entering the fork slot. Every time this happens, the watch will lose \(2 / 5\) of a second. If the wearer operates any equipment which vibrates substantially, the chances of it happening are much greater.

The point of the guard pin should also receive our attention. It should be filed or ground in such a way that the two sides make a \(90^{\circ}\) angle at the tip, and the ridge should be perpendicular to the pillar plate (See Figure 4). When shaped this way, the side of the angle makes contact with the safety roller as a tangent to the circle and creates the minimum amount of friction.

With the end of the guard pin properly shaped and the guard pin shake adjusted to 0.02 mm , the chances of a watch performing well under all wearing conditions are considerably improved. With the escapement tested and adjusted as described above, the adjustments made on the hairspring will be effective and the performance of the watch will approach the optimum possible for the particular model and design.

\section*{TECHNICALLY WATCHES}

\author{
( continued from page 43 )
}
as possible without the crown coming past flush with the back of the case. This can be checked with a straight edge held flat on the back of the case. There are exceptions to this rule on diameter. Sometimes the case is cut out around the opening which limits the diameter of the crown. In this case, select a crown of maximum diameter to work freely inside this opening.

The new crown must have the proper thread size to fit the stem and must have the proper length pipe to be the correct distance from the case when screwed onto the stem. When the distance from the outside of the case to the inside of the case at the stem opening is great, then the crown should have a long pipe to reach almost all the way through the case so as to give support to the stem. This helps prevent the stem from getting broken, should the crown get bumped. This could also help keep dust from getting into the case around the stem.

The color and quality of the crown are also important. It would not look good to use a white crown on a yellow case or vice verse. Also, if a crown is needed on a solid gold case, the crown should also be solid gold. Likewise, a platinum case needs a platinum crown.

When fitting the crown to a new stem, in most cases the stem must be shortened, because it came from the manufacturer longer than necessary. A satisfactory method of doing this is with a pair of cutting pliers that are designed to cut metal as hard as a stem. This can be done after it is determined where the stem is to be cut. The stem is shown being cut in Figure 5. It is a good idea to cut the stem slightly longer than needed at first, taking off more as needed. When cutting the stem off, it is better to hold it with the fingers, because if held rigid in a chuck or pin vise while being cut, the stem could be broken at its weakest point, that being the slot where the set lever fits.

After the stem is cut off, it can be placed in a pin vise and filed to the proper shape to be screwed into the
crown. To do this, take a hardwood block and place it in the bench vise. Then make assorted-size grooves in the block running parallel to the vise jaws. Now the stem can be supported in one of the grooves while the end is being filed to a \(60^{\circ}\) point. The technique used to file this point is a skill that is acquired only through practice. See Figure 6. As the file is pushed forward, the pin vise holding the stem is rotated toward and against the action of the file. Then, as the file is pulled back toward the operator, the stem is rotated in the opposite direction. This is repeated until the stem has been pointed.

Now the point on the stem is taken off with the file so the very end of the stem is flat. See Figure 7. After the point on the stem is removed, the crown is screwed onto the stem and the stem tried in the watch and case for length. To screw the crown onto the stem, the stem can be held in a pin vise by the square as in Figure 8. If the crown doesn't screw on straight, the stem can be chucked in the lathe and the high side of the crown tapped lightly with a rawhide mallet to true it up as in Figure 9. If the crown is too far from the case, then some more would need to be removed from the end of the stem until the crown is the correct distance from the case. See Figure 10. There are times when the crown is hard to hold onto while winding the watch, especially if the crown is a thin one and is set close to the case as it should be. If this is the case, then a crown can be substituted that is beveled and has the knurling further out from the pipe of the crown as in Figure 11. This style crown makes the winding of the watch much easier and still looks acceptable. The ease of winding the watch is very important to older customers who may have trouble using their hands.

Another method of cutting a stem off is to chuck the stem in the lathe through the back of the chuck. Let the thread extend far enough so that it can be cut off at the proper place. Then take a carbide graver and cut the stem off at a \(60^{\circ}\) angle as in Figure 12. Next, take an India stone slip and grind the point of the stem off square so that about onehalf of the length of the point is ground away. See Figure 13. Then remove the stem and hold it in a chuck by the hub, or in a pin vise by the square to screw on the crown.

In next month's article, watch case repair will be discussed.


Figure 8.


Figure 11.


Figure 9.


Figure 12.


Figure 10.


Figure 13.


\title{
Scholastically Speaking
}

\author{
by Joseph Rugole, CMW
}

Chairman, Research and Education Council

\section*{Tacoma School District No. 10 Newest Member of the REC}

There are few occasions more satisfying to the chairman of the REC than to hear that another school has joined the organization. Although I have not yet received the details of the application, I am happy to welcome the Tacoma School District No. 10 of Tacoma, Washington, as the newest member of the REC. I sincerely hope that they will find the many services offered by AWI and REC beneficial to students and staff alike. Those of us who have been members for some time have always found that the more we put into the organization as active members, the greater are our rewards. I hope that we have gained another active member to whom we can offer our help and assistance, and who in turn can help us to become a better organization serving new generations of watchmakers.

Reflecting on the history of REC, it appears that we have reached a stage where we should re-examine our role within the AWI and redefine our priorities, I believe that our first priority should be to assist one another in creating the optimum learning conditions in our schools in order to produce the best possible future watchmakers. In the 1970's, the very existance of watchmaking as an occupation was challenged by the electronic industry. The general concensus of those who have taken a stand in this challenge is that we have weathered the threat and come up winners. Instead of collapsing, we have been proven flexible and adaptable to new situations. We have not escaped the challenge without scars, however, although they may not be too visible yet. Our strongest weapon in the fight was education, and we must continue to rely on it for a sustained effort in readjustment to new conditions as they develop.

The challenge to our schools is to adopt the new technology into the program of studies. As far as I can see, there are at least three basic areas which could create substantial difficulties. They are TIME, MONEY, and KNOWLEDGE.

Teaching the new technology must come after the students have mastered the basics of mechanical watchmaking. It is difficult to visualize any reductions of the courses presently offered without seriously impairing the quality of the program. The only viable alternative is to lengthen the program to the time needed to teach a comprehensive course in electronic watch servicing.

Given the financial problems most of us have to live with in our schools, it may be difficult for many to find the additional funds necessary to buy the equipment and the supplies needed for the program. We must somehow be able
to sell the program to school administrations. If we present a good case with proper documentation, we could make it a priority for allocations of available funds.

Finally we must show that we are capable teachers of the new technology. Those who need assistance in this respect should contact the AWI or the REC. I am certain that we can be of some help in solving this problem.

Tempus Fugit!

\section*{STUDENTS RECEIVE SCHOLARSHIPS}


Five students of the North Seattle Community College received Marcus Mayer Scholarships, awarded by the Mayer Brothers Wholesale Jewelers Company. Presenting the checks from Mayer Bros. was Mr. Fred Horand of the material department,

The students pictured from left to right are Theodore Cheha, Stephanie Davis, Ralph Campbell, John Runciman, and Charles Duncan.

This sholarship established by Mrs. Marcus Mayer, is to be awarded annually to worthy and needy students at North Seattle Community College.

\section*{CLOCK CHATTER}
( continued from page 25 )
mount on collet. The collet should be just long enough to rivet the rack on the bottom and the rack tail at the top so that the rack tail pin just falls on the steps of the snail while remaining parallel to the front plate.
4. Making the tack hook.
a. Obtain a piece of steel 5.0 mm thick, one third longer than the distance from the rack stud to the center of the hour warning slot, and as wide as the height of three rack teeth.
b. Cut the rack hook to shape. See Figure 4. The center of the foot is equal to the distance from the rack hook stud to the top of the first tooth in the rack when the rack tail is on the one o'clock position of the snail. The foot should be as long as double the height of a rack tooth and as wide as the height of two teeth.


Figure 4.
c. Bend the arm into a curve of the same radius as that of the rack teeth but in reverse. The rack should be convex and the rack hook concave. Laying out the arc on a piece of aluminum (such as that used for flashing on houses) makes an excellent guide for checking the hot metal against the required curve. The metal should be red-hot for easy bending.
d. Draw an are on the rack hook foot with a radius equal to the distance from the rack hook stud to the bottom of the second rack tooth when the rack tail is resting on the first step of the snail (one o'clock position). The rack stud hole is the center for this arc.


Figure 5.
e. Draw a second arc the width of two rack teeth behind the first arc.
f. Draw an arc with the radius equal to the width of the foot \((5.0 \mathrm{~mm})\) to intersect the bottom of the front arc of the foot with a point on the back arc on rack tooth higher than the foot.
g. Make a collet to match the one for the hour lifting piece and rivet the rack hook thereon. Cut, file, and polish the rack hook. Some examples of rack hook design are shown in Figure 5.
5. Making the gathering pallet.
a. Rough blanks can be purchased which will simplify the work slightly. If a blank is used, pick up the procedure at the point of making the square hole.
b. Obtain a piece of steel as long as from the stop pin


Figure 6.


Figure 7.


Figure 8.
on the rack to the gathering arbor plus the distance from the gathering arbor to the bottom of a rack tooth from the right side of the blank. Make another mark 2.0 mm to the right of this mark leaving a tail 1.5 mm thick. See Figure 6.
c. Drill a hole the diameter of the width of the square on the gathering arbor at its outer end (smallest width), through the blank at the center dot. The arbor is tapered, so be sure to use the smaller measurement. Miniature tapered files are obtainable from suppliers and are used in filing the drilled hole square. The filing is done from the side that will go next to the front plate of the clock. This allows a tapered square hole to be filed that will match the taper on the arbor. It is a matter of filing, trying the fit, filing and trying, until the proper fit is achieved. File the back, top, and bottom around the square hole until it will clear the rack teeth when it is rotated by turning it on the arbor. Cut the front edge down until the gathering lip is approximately 1.0 mm thick. See Figure 7.
d. Shorten the lip, by filing, until it clears the top of the rack teeth when rotated and picks up one tooth to a tooth and a half measured by watching the action of the end of the rack hook as it engages the teeth. A tooth and a half is considered ideal.
e. Round the back of the tail so that the bottom just rests on the stop pin on the rack. The rounding should be just enough to give a slight impetus as the strike warns and gets ready to strike. The tail is usually tapered from the outer end to the arbor with the bottom edge being left straight. See Figure 8.
f. Continue to file for clearances, polish, and mount on the arbor.

The dimensions and data provided above are a short version and are not the only way of making these parts. Each of the workmen had his notebook and drawings that were the result of his apprenticeship and, for the most part, a copy of that of his master. As a result, many of the clocks resemble one another in their layout. By the beginning of the nineteenth century there was enough similarity that you could almost consider it standardization.
". . . I hope that the foregoing is of some assistance in helping you with your little job. Keep me in mind when you get one of the really tough ones."
\[
\begin{gathered}
\text { "Warm regards, } \\
\text { Otto" }
\end{gathered}
\]

\section*{NEWS IN THE TRADE \\ ( continued from page 39)}
and served as manager of production standards, watch assembly, distribution and manufacturing from 1969 through 1979. Weber has now been designated director of watch assembly and operation services, and will take on expanded responsibility for Bulova's industrial engineering function.

Mr. Weber is a 1974 PMD graduate of the Harvard Graduate School of Business Administration, Boston, MA, and a 1962 graduate of City College, New York. He served with the U. S. Marine Corps Reserves and resides in Glen Rock, NJ with his wife and children.

Bulova, a 103 -year-old American company, founded in New York in 1875, is headquartered at Bulova Park, overlooking Grand Central Parkway across from LaGuardia Airport in Jackson Heights, Queens. For more than 40 years, the company has been the largest marketer of fine quality watches in the United States. Its major postwar growth took place after 1960 when Bulova introduced the world's first electronic consumer timepiece, the Accutron tuning-fork watch, in the United States.

The company now markets three brand lines of watches and clocks-Accutron Quartz, Bulova, and Caravellethrough 20,000 retail jewelers in the U.S. and Canada.
"MONTRES ET BIJOUX" 1979
TO BE HELD IN PARIS OCTOBER 22-31

It is now official: 'Montre et Bijoux de Geneve," the world's premier watch and jewelry fashion show, will take place in Paris from October 22 to 31, 1979, at the George V Hotel. For the first time ever, this famed exhibition opens on French soil.

This year's seventeen exhibitors include some of the most distinguished names in Swiss watchmaking and jewelry; Audemars Piguet \& Cie S.A.
L.U. Chopard \& Cie S.A.

Corum
Ries, Bannwart \& Cie
Ebel S.A.
Jean-Pierre Ecoffey
Eterna S.A.
Gay Freres S.A.
Girard-Perregaux S.A.
Gubelin S.A.
Jaeger-LeCoultre S.A.
Cie des Montres Longines
Patek Philippe S,A.

Montres Rolex S.A.
Stern Freres
Universal
Vacheron Constantin
Weber \& Cie S.A.
There could be no more suitable setting for "Montres et Bijoux" than the elegant decor of Paris's George V Hotel. Every design on display at the exhibition must be an original creation never before shown publicly and made of noble metal. Collectively, the designs introduced at "Montres et Bijoux" are the starting point for the industry's "ready-towear' collections the following year.

Set up in 1942 as part of the ceremonies marking the two-thousandth anniversary of the city of Geneva, the Montres et Bijoux Association's purpose was and remains the organization of an annual public show of its member's finest designs. In 1973 it was decided to stage the exhibition abroad every other year. Since then, "Montres et Bijoux" has toured the Far East, South America, and the United States. In Europe, it has opened in Turin, London, and Munich, It was indeed time this dazzling show opened in the City of Lights.

\section*{OKI SEMICONDUCTOR \\ NAMES LARRY CHALFAN VICE-PRESIDENT OF MANUFACTURING}

In a major management staffing move, OKI Semiconductor has announced that Larry Chalfan has become the firm's Vice-President of Manufacturing, reporting directly to OKI President Jerry Crowley.

Chalfan's initial responsibility will be management of OKI's subcontractor wafer processing programs. He will also be responsible for establishing an OKI Semiconductor manufacturing and testing facility in the United States in anticipation of future capacity needs.

The OKI subcontractor wafer processing programs involve the company's complete line of CMOS and LSI components for LCD watch, digital clock, and digital radio applications. These programs represent the initial phase of OKI's move to create a domestic manufacturing capability.

Chalfan brings to his new position in-depth experience with CMOS and LSI components and technology gained as co-founder, Vice-President and General Manager of Frontier Manufacturing, Inc., and as Linear Integrated
(continued on page 62 )

\section*{New Products}

\section*{New Princess Jewelry Cleaner}

The new, personal size Princess Jewelry Cleaner for home use safely removes dirt, body oils, grime and tarnish from gem stones and other fine jewelry items in seconds. Gems and jewelry come out sparkling clean and like new in appearance. The unit is manufactured by McJaf Enterprises, Costa Mesa, CA.

Featuring Electro-Sonic cleaning action and a special gem cleaning liquid, the Princess Jewelry Cleaner will safely clean diamonds, colored stones, gold, silver, platinum, and even cultured pearls. It's an ideal cleaner for rings, bracelets, chains, earrings, charms, pins and other favorite pieces of fine jewelry.

Convenient and easy to use, jewelry items are placed in the cleaning liquid in the special jewelry basket. The Princess Jewelry Cleaner is plugged in and in seconds the items are sparkling clean and ready for wear.

The Princess makes an ideal gift for both men and women. The personal size unit is made of silver-tone impact resistant plastic. Its beautiful sculptured jewel box design will enhance the decor of any bathroom or boudoir counter top.

Attractively packaged in a display carton that invites customers, the Princess Jewelry Cleaner has a suggested retail price of \(\$ 24.95\) which includes a 4 oz . bottle of gem cleaning liquid along with the unit.

For profitable details write: McJaf Enterprises, 4341 Birch St., Suite 100, Newport Beach, CA 92660. Telephone: (714)979-3642.

\section*{PICCO INTRODUCES NEW "MUPPETS" CHARACTER WATCH COLLECTION}

These six models comprise the initial "Muppets" character watch collection by PICCO, introduced at the Retail Jewelers of America Trade Fair in New York City, July 28 -August 1 (Booth 200, South Corridor, N.Y. Hilton Hotel). Each of these high quality, 7 -jewel lever movement watches produced under exclusive license from Jim


Hensen, creator of the "Muppets," - has a suggested retail price of \$19.95.

Shown are (left to right) Kermit the Frog illustrated in green on a white dial, yellow plastic case, and green/yellow striped nylon strap; Miss Piggy in yellow on a white dial, purple plastic case, and purple/white striped nylon strap; Fozzie Bear in brown on a white dial, blue plastic case, and red/white/blue striped nylon strap; Miss Piggy in yellow on a white dial, white plastic case and purple/white striped nylon strap; Kermit the Frog in green on a white dial, green plastic case and two-tone green striped strap; and Fozzie Bear in brown on a white dial, red plastic case and red/white striped nylon strap. Each is attractively portrayed in a beautiful selfdisplay see through plastic box.
PICCO, leader producer of quality character watches and quartz clocks, is headquartered at 540 West 58th Street, New York, New York 10019.

\section*{Windert Watch Co., Inc. Wins the Design \& Engineering Award at CES}

Singled out at the Consumer Electronics Show in Chicago, Windert Watch Co., Inc. was the only watch manufacturer to win the CES Design and Engineering Award.

Chosen by a distinguished panel of judges: Mark Andrews, High Fidelity Trade News; Robert Gerson, Television Digest; Susan Griffin, Audio Trade News; Art Levis, Consumer Electronics Monthly; and Craig Stark of Stereo Review, the Windert Wrist Secretary was considered one of the most innovative consumer electronic products from those submitted.

The Windert Timelog Alarm Chronograph, model no. 69-999 features full calendar-month display for 10 years on command, countdown timer, 24 -hour alarm, full-feature chronograph with date, day of week, hours, minutes and seconds.

Also displayed at the CES was Windert's new concept for the "Talking Watch." The patented technology will be able to verbally announce the hours, minutes, and seconds, plus it will include a verbal alarm message.

This all stainless steel watch will
be no larger than an ordinary watch. It will be solar powered with rechargeable silver oxide batteries. Other LCD functions include hours, minutes, seconds, month, day and date.

The Talking Watch will be available in four languages: English, French, German and Spanish. Windert will back the Talking Watch with a 3 -year guarantee. The suggested retail will be under \(\$ 100.00\).

For more technical information, on the East Coast, contact Mr. Harry Fox, Vice President of Marketing, Windert Watch Co. Inc., 1 West 39th Street, New York, NY 10018 or call (212) 391-2024; and on the West Coast, contact Mr. Alex Weiss, Vice President of Sales, 448 South Hill Street, Los Angeles, California 90013 or call (213) 626-7688.

\section*{Union Carbide Offers Calculator Battery Replacement Guide and Cross Reference Chart}
able free from the Battery Products Division of Union Carbide Corporation.

The plasticized \(51 / 2\) inch by 11 inch card lists 44 manufacturers' calculator models and the correct quantity and type of "Eveready" batteries needed for battery replacement. As a further aid, it also cross references "Eveready" to other brands of minjature watch and calculator batteries based on size, voltage, and drain compatibility. A metal chain is attached for securing the chart in a handy location. Further information can be obtained from "Eveready" representatives.

\section*{Seiko Introduces Four New \$100-\$150 Men's LC Digital Quartz Day/Date Watches}

Seiko Time Corp today introduced four new men's LC Digital Quartz day/date watches in the \(\$ 100-\$ 150\) retail price range for the Fall.

Comprising the new "GK" series, these five-function models feature continuous readout in hours on a 12 hour basis, minutes and seconds. At the push of a button, day and date are instantly displayed. Each has Seiko's exclusive "Hardlex" mar-resist crystal, is water tested to 100 feet ( 30 meters), and has built-in illumination, and a battery life indicator.

Model GK013M (pictured), one of two new stainless steel bracelet models at a suggested retail price of \(\$ 100\), features a black dial frame. The other stainless steel model (GK015M), sports a blue dial frame. The yellow versions, with a suggested retail price of \(\$ 150\), offer choices of brown or blue dial frames.

\section*{QUESTIONS \& ANSWERS}
(Continued from page 30 )

\section*{NARROW MAINSPRING}
Q. I am in need of a mainspring. I need a size (in metrics) \(.55 \times 11 \times 91 / 2\). Can you supply or advise please?

\author{
Ken Jacobs Miami, FL
}
A. I have made some inquiries for you. On the phone finally with B. Jadow, they told me that they have only a few mainsprings left that guage \(58 \times 10 \times 81 / 2\). This furthermore is tongue-end and you would have to make the hole yourself. Nothing else is available. That measurement is close enough for your wants. I would suggest that you quickly order from your jobber no. 4011 C mainspring (B. Jadow \& Sons, Inc. does not sell them except to regular material jobbers).

\section*{16,200 BEAT}
Q. I have an \(18 / \mathrm{s}\) Elgin key wound and key set pocket watch for which I had a new hairspring vibrated because the old one was rusted and the watch was losing excessive time.

The watch runs fine but gains about 2 hours and 15 minutes in a 24 hour period. I get a nice reading on the Watchmaster at the 18,000 beat setting. I presume that this will have to have another hairspring for a different beat. This is my problem: What should the beat of this watch be?

Serial no. on this watch is 678357 . Inside back cover is en-
graved in a double circle. It is identified by Fahys, Oresilver, No. 1 and also Pat. Feb. 19th 1884. Underneath the double circle is the number N 7034.

Any help you can give will be sincerely appreciated.

> Louis Szymanski
> Chicago, IL
A. According to my records, Elgin movement number 678357 was grade 7. Class 6, full plate key wound hunting, 1st madel, gilded plates and had seven jewels.

However, what should be of interest to you was that it was a SLOW TRAIN watch. That is, it did not beat the modern 18,000 times an hour but rather only 16,200 or \(41 / 2\) beats a second compared to the five beats per second to which you had your balance vibrated.

Therefore, your hairspring is a bit too strong and since it gains half a beat a second or 30 beats a minute, at 18,000 VPH, 6 seconds/m, 360/an hour. It should gain much more than what you report. In fact, it should gain about 160 minutes a day.

The Elgin Slow Train watches have train wheels of Conter wheel of 64 teeth enmeshing with the third pinion of 8 leaves. The third wheel has 60 teeth and a pinion of 8 leaves. The fourth wheel has 63 teeth and the escape pinion has 7 leaves. Figured out this reckons tc \(64 \times 60 / 8 \times 63 / 8 \times 15 / 7\) (es, teeth) \(x 2\) (pallet \()=16,200\) or \(41 / 2\) vibrations a second. Therefore, \(a\) 43,200 vibrations faster beat should be divided by 41/2. You get 160 minutes fast or 2 hours and 40 minutes fast.

Have the spring vibrated to 16,200 and have the hairspring fitter regulate the watch while he has it.

\section*{CLASSIFIED ADS}

\section*{Regulations and Rates}

Ads are payable in advance \(\$ .35\) per word, \(\$ .45\) per word in bold type. Ads are not commissionable or discountable. The publisher reserves the right to edit all copy. Price lists of services will not be accepted. Confidential ads are \(\$ 4.00\) additional for postage and handling. The first of the month is issue date. Copy must be received 30 days in advance.

Horological Times, P.O. Box 11011, Cincinnati, OH 45211, (513) 661-3838

\section*{Tradesman}

ELECTRONIC WATCH REPAIR SPECIALIST. Digital (LED \& LCD) and Analog. Tuxedo Electric-Quartz Watch Repair Div. P.O. Box 561, Tuxedo, NY 10987, (914) 351-2282

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

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.

Wheels, pinions, barrels or whatever, repaired or made new. Repivot arbors. Parts made to order. Send sample for free estimates. On all watch parts, inquire first, Brass, rod \& tubing cut to your length. Small orders welcome. SASE for price list. Ken Lecseberg, Ken-Way Inc., 311 Chestnut St. Addison, Illinois 60101.

Digital Watch Repair. Specialists in digital watch repair for the trade. Eight years of experience in digital watch design and service. Zantech, Inc., 13 Greentree Rd., Trenton, N.J. 08619 (609) S86-5088.

Superior Tweezer Resharpening \(\$ 2.00\) 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.

Watch-Repair For The Trade: Quartz, (LED, LCD, Step Motor), and Mechanical. Careful work \& thorough-going repairs plus ultrasonic cleaning and electronic timing. The WatchRepair Shop. C.K. Goshman. 1219 Mound St., Madison, Wisconsin 53715, 1-608-255-3247.

\section*{Wanted To Buy}

Young Clockmaker desires to purchase back issues of AHJ, BHJ, Bulletins, \& Horological books for research \& study. Chris Rauch 105 S.W. 99th Ave., Portland, Oregon 97225, 1-503-297-5003,

BONUS PAID for usable jewclry. Gold, platinum, silver, gold fill scrap, gold and gold fill watch chains, pearls, colored stones, bro\(\mathrm{ken} / \mathrm{old}\) cut diamonds, watch movements wanted. Capital Premiums, 2210 Welshire Blvd., Suite 110, Santa Monica, CA 90403, (213) 399-7426.

WANTED TO BUY-precious metal scrap. Highest prices for bench sweeps, buttons and sprues, watch and optical scrap, etc. Request Refining Purchase Schedule. Dept. A4, SWEST, INC, 10803 Composite Drive, Dallas, Texas 75220.

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 Cu., St. Andrews Branch, P.O. Box 30009 H, Charleston, SC 29407.

WANTED: JULES JERGENSEN, PATEK PHILLIPPE, ADOLPHE LANGE and other High Grade Foreign or American Watches. Will buy individually or quantity. Describe condition and price. Dick Ziebell, Box 427, Ipswich, MA 01938. 617-356-5756.

\section*{Help Wanted}

A-1 Watchmaker, only perfectionist need apply. Will accept recent graduate willing to learn. Hot, Dry, climate. Lots of gas. Monies according to abilities. 1325 4th Ave. Yuma, AZ Ph. 602-783-9371.

Experienced Jeweler - Fine jewelry store in beautiful Palm Springs, California has opening for mature benchman. General jewelry repair and diamond setting required. Paid vacation, medical, and liberal benefits. If you are earning less than \(\$ 18,000\) to \(\$ 20,000\) annually you must apply. T. Weiner (714) 327-5912.

Experienced tool and supply department help needed. Salary and benetits commensurate with experience. Dynamic company in fastest growing area in the Southwest. Please call; Arizona 1-800-352-0398. All other 1-800-528-6165.

Watchmaker who enjoys working on fine watches. We will accept graduate student who needs help and experience. Send photo and resume to Erwin's Jewelers, 223 West Mission, Bellevue, NE 68005.

\section*{For Sale}

Well established, high quality retail clock storc in Cincinnati. Large repair business, antique to modern. Import directly from Europe. Good location. Recently decorated. Assume lease, fixtures, inventory. Call (513) 793-6941 after 7 p.m. EDT.

For Sale-Timing Machines, Watchmaster Timers Vibrograf Timers. Factory rebuilt. All machines guaranteed. Terms available. Also available Ultrasonic Watch Cleaning Machines. Write Vibrograf sales representative Robert Swensgard, 2630-A Jett Hill Road, New Richmond Ohio 45157. Or phone (513) 553-2113. Territory: Southern Indiana, Kentucky, Michigan, Ohio, Tennesee, and West Virginia.

ESEMBL-O-GRAF LIBRARY in 28 volumes, Pittsburgh, 1955. Chronograph repairing is made easy by Step-by-Step procedure. Each small step of removing and replacing each part and making adjustments is clearly illustrated. No concentrated study is necessary. Write EOG, PO Box 11011, Cincinnati. Ohio 45211.

CLOCK SHOP: Plenty of watch and clock repair from antique to modern. Retail business. Income property, store and 2 apartments Asking \(\$ 65,000\). Upstate New York. Good fishing and hunting. Established 10 years. Owner relocating. Please call: (518) 677-3696.

Used Boley Lathe, motor, slide, trail stock 13 chucks. \(\$ 240.00\). Allen E. Schraut, R.R. 2, Box 173, Hillman, Minnesota, 56338.

Gone out of Business. Vibrograf M-80 Timer, used for only six months. Approximately half price. Watch Repair, Box 31, Browning, IIl. 62624. 217-323-3164.

Clockmakers' Buying Guide. New 80-page Second Edition lists over 1000 spare parts and repair services available from over 400 suppliers. \(\$ 5\) postpaid. 30-day satisfaction or refund. Box 171-T, Bronxville, NY 10708.

Watch, Clock and Jeweiry Sales and Repair Shop. Established for 10 yrs. Excellent location in sunny San Diego, CA. Heavy traffic. Store \(18 \times 40\) feet, store front. 5 yr. lease. \(\$ 212.00\) monthly rent. Present inventory \(\$ 20.000\). Sell for \(\$ 35,000\). Retiring. Evos.-714-488-3503.

\section*{Miscellaneous}

Digital Watch Service Training. Zantech, Inc. offers training and instruments for servicing all types of digital watches. Course includes diagnosis of watch malfunctions and repair methods, including techniques in wire bond repairs using silver epoxy. Louis A. Zanoni, Zantech, Inc., 13 Greentree Rd., Trenton, NJ 08619 (609)586-5088.

Ask for free folders to learn watchmaking and jewelry. Watchmaking Institute of Canada, Ltd. 1012 Mt. Royal East, Montreal, Quebec, H2J 1X6, Quebec, Canada. Telephone 5237623.
HOROLOGICAL TIMES
P.O. Box 11011
Cincinnati, Ohio 45211
Print or type out your ad as you want it to appear in the magazine.
\(\qquad\)
\(\qquad\)

\section*{Count the words and multiply that number by \(\$ .35\) a word. (Remember. \(\$ .45\) a word for bold type). \\ Enclose your ad and payment in an envelope and mail to: \\ ar}

\section*{}


\section*{NEWS IN THE TRADE}
(continued from page 57 )

Gircuits Product Manager and Senior Design Engineer with Motorola's Semiconductor Division in Mesa, AZ.

Chalfan, who holds both BSEE and MSEE degrees from Oregon State University, is relocating from Irvine, CA to the San Francisco Bay Area with his wife and two children.

\section*{MIKE L. HOREN JOINS PULSAR AS MARKETING SERVICES MANAGER}

Mike L. Horen has joined Pulsar Time, Inc., as marketing services manager, it was announced by Arthur Schwartz, president.

Mr. Horen had been director of advertising for the consumer products division of Springs Mills, Inc., for the past two years.

In the newly-created position at Pulsar, Mr. Horen will be involved in marketing analysis and dealer support programs for the Pulsar brand. The company markets the only complete line of analog and digital quartz watches in the \(\$ 60.00\) to \(\$ 135.00\) retail price range.

Mr. Horen's earlier experience included eight years at Londontown Corporation, manufacturer of London Fog rainwear and outerwear, where he was vice-president of advertising and marketing services; and eight years at Puritan Sportswear Co., a major men's sportswear company, serving as international marketing services manager. He had also been with Sears Roebuck \& Co. as assistant advertising manager for its eastern region.

The new Pulsar executive graduated with a BA Degree in Journalism and Advertising from Penn State University. He has authored articles for trade and statistical magazines and lectured on advertising subjects.

\section*{ROBERT STEVENS \\ JOINS SEIKO TIME CORPORATION AS AN ADVERTISING MANAGER}

Robert J. Stevens has joined Seiko Time Corporation as an advertising manager, it was announced today by David Strousse, vice president of advertising and public relations. The new appointment reflects the expanding scope of the advertising and public relations programs supporting Seiko brand watches and clocks.

Mr. Stevens will be responsible for consumer broadcast media and production, budget control and administration, co-op advertising administration and public relations.

Prior to joining the company, he had been advertising and publicity manager for eight years at Sperry Remington Consumer Products, Bridgeport, CT. Earlier, he held executive positions in the advertising departments at RH Macy, Sears Roebuck \& Co., and the Bridgeport Herald Press.

A graduate of Fairfield University, Mr. Stevens resides in Newtown, CT with his wife and their two children.

\section*{DONALD W. MALEY \\ JOINS SEIKO TIME CORPORATION \\ AS NEW GENERAL MANAGER OF ITS SERVICE DIVISION}

Donald W. Maley has joined Seiko Time Corporation in the newly-created position of general manager of its service

division, it was announced here today by Robert Pliskin, Seiko Time Corporation president.

Mr. Maley will be responsible for the operations of all of Seiko's service centers, as well as materials and parts distribution. Seiko has the watch industry's largest service center network in the U.S. with centers located in New York, Los Angeles, Chicago, Atlanta, Dallas and Honolulu.

Prior to joining Seiko, Mr. Maley was director of administration for Olivetti Corporation's service division. He had been with Olivetti for the last 13 years, having also served as director of field service operations, and Manhattan (NY) district sales manager.

Earlier, he had been assistant to the president at St. Joe Minerals; assistant to the director of industrial and public relations at Gardner Board and Carton Co., now a division of Diamond International; and manager of industrial relations at the Chapman Valve Division of Crane Co.

Mr. Maley, 49 , resides with his wife and their children in Darien, Connecticut.


\section*{Dates To Remember}

\section*{September}

2-4-Dallas Fall Gift, Jewelry, and Housewares Show; Anatole Hotel; Dallas, Texas.

8-11-Las Vegas Gift Show; Aladdin Hotel; Las Vegas, Nevada.
8-11-National Merchandise Show; New York Coliseum; New York, New York.

9-13-Boston Gift Show; John B. Hynes Veterans Auditorium and Sheraton Boston Hotel; Boston, Massachusetts.

11-12-Jewelry Management Institute; Inventory Control and Management Workshop; Toronto, Ontario.

13-14-Nebraska and South Dakota Jewelers Association; Annual Convention

13-14-Jewelry Management Institute; New Advertising and Sales Promotion Workshop; Toronto, Ontario.

13-15-AJA Annual Meeting and Convention; Skyline Resort Country Club; Tuscon, Arizona.

14-16-Nebraska and South Dakota Jewelers Association; Annual Convention; Holiday Inn; Kearney, Nebraska.

14-16-Southwest Jewelry and Coin Show; Bassett Rodeway Inn; El Paso, Texas.

15-30-GIA Travel Seminar to Japan, Singapore, Bangkok, and Hong Kong; from Los Angeles.

16-18-Phoenix Gift and Jewelry Show; Civic Plaza; Phoenix, Arizona.

16-19-Philadelphia Gift \& Jewelry Show; Holiday Inn-City Line; Philadelphia, Pennsylvania.

17-The Golden Circle Club Meeting; The Warwick Hotel: New York, New York.

22-23-lowa Jewelers and Watchmakers Association; Convention and Tradeshow; Airport Inn; Des Moines, Jowa.

22-23-Bay Area Watchmakers Guild; Convention; Monterey, California.

24-25-Jewelry Management Institute; Inventory Control and Management Workshop; Philadelphia, Pennsylvania.

26-27-Jewelry Management Institute; New Advertising and Sales Promotion Workshop; Philadelphia, Pennsylvania.

28-29-Jewelry Management Institute; Financial Management Workshop; Philadelphia, Pennsylvania.

28-30-Florida Jewelers Association Convention; Sarasota Hyatt House; Sarasota, Florida.

29-Oct. 3-National Exhibition of Gems, Fossils, Gem Tools, Machinery, \& Precious Stones Equipment; Vicenza, Italy.

\section*{October}

9-10-Jewelry Mangement Institute; New Advertising and Sales Promotion Workshop; Boston, Massachusetts.

11-12-Jewelry Management Institute; Financial Management Workshop; Boston, Massachusetts.

26-28-Florida State Watchmakers Association Convention; Henry Fried Keynote Speaker; Daytona Beach, Florida.

13-14-Pennsylvania Retail Jewelers Association 90th Annual Convention; Host Town; Lancaster, Pennsylvania.

15-Golden Circle Club Meeting; The Warwick Hotel; New York, New York.
20-21-Central Illinois Watchmakers Convention; Holiday Inn; Decatur, Illinois.
21-23-Miami Beach Close Out Show; Miami Beach Convention Hall; Miami Beach, Florida.

\section*{November}

3-Watchmakers Association of New Jersey; 40th Anniversary Dinner Dance; Big Stash's; Linden, New Jersey.

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Now in its sixth year, and with attendees over the 800 mark, we are currently sponsoring in a separate location at 34 West 6 th Street in Cincinnati, five day seminars in jewelry making and repair. Equipment used is the most modern available. Seminars are as follows:
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2. Five days of advanced jewelry work for those who have attended the primary seminar.
3. Five day seminars in casting rings, pins, and pendants by the lost wax process. Wax modeling, carving, and design.

\section*{WRITE FOR BROCHURE}

The E. \& J. Swigart Co.```


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