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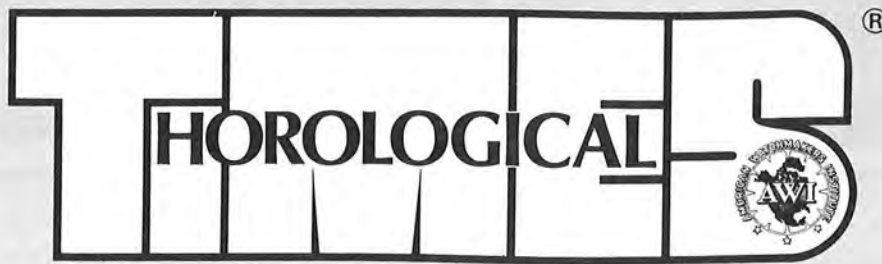
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# Editorial

The watchmaker's lathe is an essential part of the watchmaker's daily business. Some of the common uses of the lathe, using only the collets and not special attachments are: cutting broken balance staffs from wheels for easier truing and poising; altering stems; removing frozen cannon pinions; drilling broken spring bar nibs from lugs; manufacturing special tools for the watchmaker's bench; altering jewel settings; burnishing a loose barrel cap onto the barrel; altering pendant pipes to fit cases; polishing pivots; wire brushing rust from parts; altering pivot sizes, as well as balance staff roller shoulders, collet shoulders, and balance seat shoulders; removing broken ratchet wheel screws from barrel arbors; and grinding screw driver blades.

If the lathe is not among the repertoire of the watchmaker, the following situations will most likely occur. Watches might not be accepted for repairs because the estimator or watchmaker thought the lathe was necessary to complete the repair when, in fact, it was not. Watches which are brought in by customers for repair that require lathe work to complete the job properly must be refused. Watches that were accepted for repair and 90% processed cannot be finished because the watchmaker realizes that lathe work is necessary to complete the servicing. All of these situations cause a loss of money to the watchmaker, as well as disappointment and a lack of confidence by the customer.

Since everyone looks to the bottom line profit, there should be no doubt that an important part of a watchmaker's well-being is the watchmaker's lathe.

## On the Front

Our cover pictures the lush greenery of the Hoh Rain Forest in Olympic National Park, Washington. The area was set aside in 1938 to preserve the natural beauty of the virgin "rain forests" in the Pacific Northwest.

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## Executive Committee Meeting

The AWI Executive Committee recently met in Cambridge, Massachusetts, to discuss the Institute's progress midway through its fiscal year. Treasurer, Marvin Whitney, reported that while we are making every effort to cut expenses, it appears that increased measures need to be taken if we are to remain within our budget projection for the remainder of this fiscal year. Mr. Whitney did point out that most members responded promptly to this year's billing for annual dues, and have paid upon receiving their first notice. This response has saved AWI hundreds of dollars in postage, printing, and labor costs. The entire Executive Committee wishes to express its thanks to the membership for their cooperation.

In keeping with additional "belt

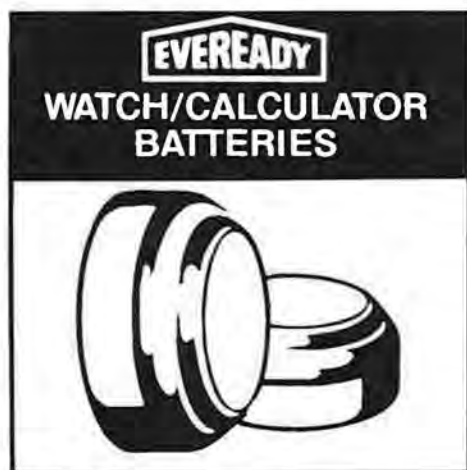
tightening" measures, the Executive Committee approved recommendations that all AWI office equipment and personnel be housed on the main floor of AWI Central. This will necessitate moving the AWI museum to the second floor and the *Horological Times* offices to the main floor. By so doing, a considerable savings will be made in the cost of utilities, and will result in more efficient operation of the AWI office in general. At the same time, the museum will gain additional floor and wall space which has been desperately needed.

While in Boston we decided to make use of the talent on hand, so we presented a workshop on Sunday, February 1, 1982. More than sixty attended to hear Henry B. Fried discuss the "Emerging Horological Industry in The People's

Republic of China." I substituted for Dr. Joseph Baier, who was ill, and presented the "Bench Tips" program. Mr. Marvin F. Whitney presented his program on "Marine Chronometers."

Henry Fried's report was of special interest, as he was the first Westerner to be permitted to enter the various watch and clock factories in Red China. (He was also given permission to take color slides which were included in his presentation.) Mr. Fried reported that much of the equipment he saw in the factories was quite old, but being put to very good use. He even recognized some items that he believed to have been in the factory of the old Hampden Watch Company. Many of the watch calibers shown on Mr. Fried's slides seemed to be  
*(Continued on page 50)*

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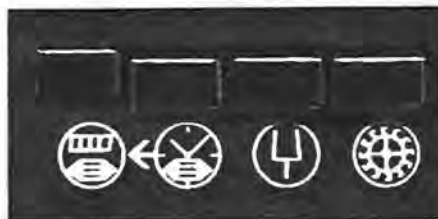


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# Our Readers Write

## A Contented Member

I'd like to take this opportunity to thank you for a wonderful magazine and commend you for your continuous hard work in the field of horology.

I'd like to take this chance to publicly thank Mr. Jacques Reymond of WOSIC. Mr. Reymond has helped me several times by sending technical sheets on new quartz modules and by offering good advice. The fact that he takes time out of his busy schedule to help the individual watchmaker is what impressed me most.

I felt that after five years of membership in AWI, I should write in and express my gratitude. Thank you, and continue your excellent work.

Randall M. Nelson  
San Antonio, Texas

## ... AND MORE FLATTERY

I would like to compliment you on your magazine *Horological Times* and the very good service you provide regarding your technical hotline.

The articles in your magazine are extremely well written, always very informative, and provide an excellent background for the novice or expert.

The technical hotline has helped me tremendously, and I will continue to use this service as long as it is available.

Please keep up the good work and I will try to recruit new members to what I feel is an organization vital to not only watch and clock repair, but to the history of our field. Each month I look forward to receiving my *Horological Times* and read each issue cover to cover. Thank you.

Jack G. Rebennack  
Batavia, Ohio

## FROM THE HOOSIER STATE

Thank you very much for providing us with the slide presentation on bench tips. We found it to be very interesting and helpful.

The East Central Indiana Watchmakers Guild wants to thank your organization for their never-ending help to watchmakers and the watchmaking industry. We are very proud to be a part of such a valuable organization.

David Sweigart  
New Castle, Indiana

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

# NEW! No. 16 "O" Ring Assortment

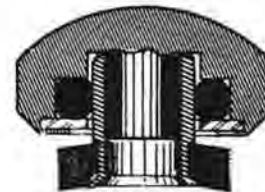
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4	YGF	3.75mm	10	2.0mm	MEDIUM	16	YGF	4.5mm	8	2.0mm	MEDIUM
5	STEEL	3.75mm	8	2.0mm	FLUSH	17	STEEL	5.0mm	6	2.0mm	FLUSH
6	STEEL	3.75mm	8	2.0mm	MEDIUM	18	STEEL	5.0mm	6	2.0mm	MEDIUM
7	YGF	3.75mm	8	2.0mm	FLUSH	19	YGF	5.0mm	6	2.0mm	FLUSH
8	YGF	3.75mm	8	2.0mm	MEDIUM	20	YGF	5.0mm	6	2.0mm	MEDIUM
9	STEEL	4.5mm	10	2.0mm	FLUSH	21	STEEL	6.0mm	6	2.5mm	FLUSH
10	STEEL	4.5mm	10	2.0mm	MEDIUM	22	STEEL	6.0mm	6	2.5mm	MEDIUM
11	YGF	4.5mm	10	2.0mm	FLUSH	23	YGF	6.0mm	6	2.5mm	FLUSH
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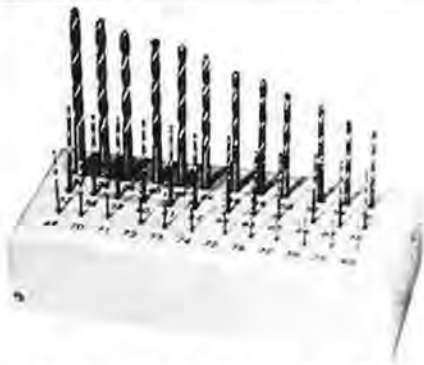
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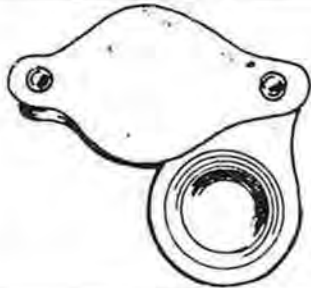


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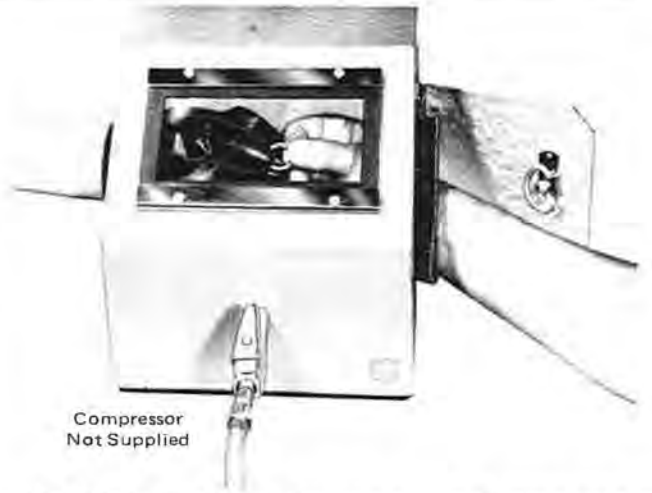
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## The Modern Watchmakers Lathe © 1982

### Part VIII

**T**wo very important attachments for the watchmaker's lathe, which are mounted on top of the slide rest, are the gear cutting attachment and the combination gear cutting and milling attachment.

Figure 1 shows an early style of a gear cutting attachment. The spindle of this attachment is pointed on each end, and the points turn in female centers. A description of this attachment is as follows: A is the frame of the attachment which bolts onto the top slide of the slide rest; B is the spindle; C is the pulley; D is a brass collar fastened permanently to the spindle for the cutter to rest against; E is the nut to hold the cutter tightly on the spindle; F is the upper bearing screw; G is the upper lock nut for the bearing screw; H shows the lower bearing screw; and the lower locking nut is shown at I. A special spindle which has a cross hole can be used to hold fly cutters for gear cutting. To adjust the cutter on center, the bearing screws can be adjusted up or down, and then locked into position by the lock nuts.

Figure 2 shows a specially made gear cutting attachment. This attachment was made to screw into the hole on the top slide of the Moseley slide rest. Some of these attachments were made with a locking bolt in their bases to fit the "T" slot on the other makes of slide rests. A few of these attachments were made by a watchmaker-machinist, and were not for sale on the market as far as known. However, sometimes one of

these might show up in used equipment.

The following is a description of the attachment. The frame of the attachment is shown at A, Figure 2. The hub B of the frame is threaded internally like a micrometer. Of course, the threaded hole is larger than that of a micrometer. This hole is approximately 1/2 in. in diameter. View C shows the thimble on the threaded spindle that screws through the hub B. The live spindle that carries the wheel cutter is constructed inside this threaded spindle. The live spindle and its bearings are constructed very similar to the ones on a regular lathe spindle. The pulley D is fastened to the live spindle. The end of the live spindle has a tapered hole to receive the cutter arbors, which have a matching taper. The cutter arbor shown at E has a threaded hole in its end to receive the threaded end of the draw-in spindle, which keeps the cutter spindle drawn tightly into its tapered hole. The head of the draw-in spindle is shown at F, Figure 2. To adjust the height of the cutter to center it, thimble C is turned. When thimble C is turned, the threaded spindle containing the live spindle moves up or down, having an action like a micrometer. The hub B of the attachment has graduated lines on it like a micrometer. The thimble C has graduated lines around it also like a micrometer. The threaded spindle can be locked in any position with the eccentric locking bolt shown at G, Figure 2. The taper center shown at H, which is used to center up the wheel cutter,

goes through an eccentric sleeve I, which can be turned to any position to center the taper center to the lathe center. This eccentric sleeve is necessary since different makes of lathes have different center heights. The eccentric sleeve is locked into position with a set screw. The lever shown at J is used to lock the gear cutting attachment to the slide rest.

Figure 3 shows a close-up view of this gear cutting attachment. View A shows the threaded bolt that screws into the Moseley slide rest. This bolt can also be moved up or down with the locking lever. When the bolt is screwed into the slide rest until the attachment is almost tight, then the locking lever is turned to finish tightening the attachment to the slide rest. The threaded spindle of the attachment is shown at B, the live spindle inside the threaded spindle is shown at C, and the cutter arbor is shown at D. The taper center for centering the cutter is shown at E, the graduated scale on the hub is shown at F, and the graduated scale on the thimble is shown at G. This particular attachment is graduated in thousandths of an inch. One turn of the thimble equals 0.025 in.

Figure 4 shows a combination gear cutting and milling attachment. This attachment was made by Wolf-Jahn in Germany about 1930, but is not made anymore. These attachments were made in the WW and Moseley styles. The bearings are of the hard steel cone type, like the bearing in the headstock

Figure 1

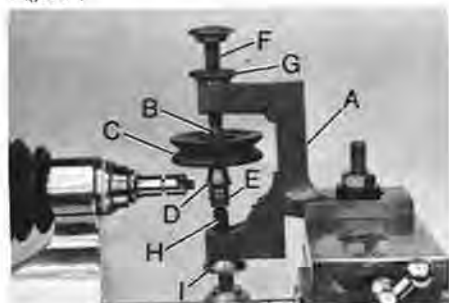


Figure 2

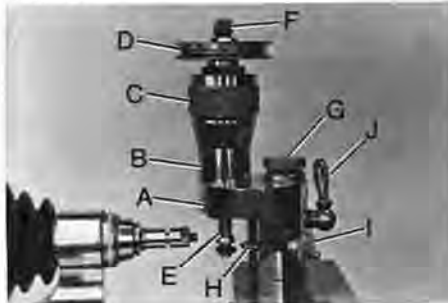
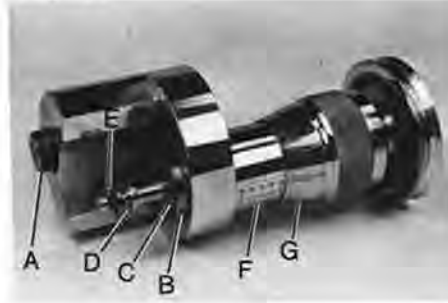


Figure 3



of the lathe. The spindle of this attachment can be set to any angular position. The spindle is shown set in a vertical position in Figure 4. When the spindle is set in this position, bevel gears can be cut as well as other types of gears. Also, when the spindle is set in this position, an end mill can be used in the spindle to mill a square or other shapes on a piece of material chucked in the headstock of the lathe. This attachment is held on the top slide of the slide rest by a bolt that has a head that fits the "T" slot of the slide rest. It is best whenever possible to use two bolts. This helps to prevent the attachment from twisting on the slide rest when it is used. The base of the frame containing the spindle has a hole in its center, which pivots around a stud that is fastened into the slide of the attachment. The base of the frame also has two circular slots, one on each side of the spindle. Two screws are used in these slots to bind the frame in any angular position. There are four threaded holes in the slide at the 3, 6, 9, and 12 o'clock positions. This allows the spindle to be held in the horizontal as well as the vertical position, or any degree angle in between these two positions.

Figure 5 shows the Wolf-Jahn attachment with the spindle set in a horizontal position. When set in this position, a better view of what the gear cutter is doing can be seen. However, there are two disadvantages in setting the attachment in this position. One is that bevel gears cannot be cut. The other

is that the slide rest needs to be set from the back side of the lathe bed, and this necessitates the swiveling of the top slides 180° on the base slide in order to be able to center the wheel cutter with the work.

Figure 6 shows the Wolf-Jahn attachment set up for milling a music box worm. One can notice that the base of the attachment is not set squarely on the slide rest, but is turned slightly so the cutter will cut the proper width groove in the worm. The amount the spindle is set out of square depends on the pitch of the worm and the width of the cutter used to cut the worm. It can also be noted that a thread cutting attachment with the proper change gears will need to be used in order to advance the cutter at the proper ratio. The Wolf-Jahn milling attachment can also be set so the end of its spindle faces straight into the lathe spindle for drilling lantern pinions, or doing end milling on other types of jobs.

Although the Wolf-Jahn gear cutting and milling attachment is not made anymore, other brands of attachments are still available such as Levin, Derbyshire, Boley, Bergeon, and Favorite.

A specially made gear cutting and milling attachment is shown in Figure 7. This attachment fits on top of a C & E Marshall Company slide rest. The base of the attachment has two guides that fit the "T" slots of the top slide. Articles to be milled can be fastened to the slide of the attachment by the use of the two "T" slots milled in the slide and bolts

or hold-downs. Also, a milling vise can be fastened to the slide for holding articles to be milled. A milling head can also be mounted on the slide for gear cutting. Figure 7, View A shows the milling attachment, View B shows the milling vise, and View C shows the live milling spindle.

Figure 8 shows the milling attachment set up on the slide rest with the milling head mounted on the milling attachment for cutting gears. The milling head can also be set in a vertical position, or at any angle between horizontal and vertical.

Figure 9 shows the attachment set up with the milling vise for doing milling jobs with an end mill fastened in the lathe spindle. The vise can also be swiveled to any angle.

Figure 10 shows how a watch plate can be mounted on top of the vise by the use of four screws or studs, so milling operations can be performed on it.

When using the gear cutting and milling attachment, some form of indexing is needed to lock the lathe headstock into position at different points while milling is being done. The indexing system used can be of the simple form or more complicated. The most simple indexing system to use is the row of index holes in the lathe pulley and the lathe index pin. However, this system is somewhat restricted because of the limited number of holes in the pulley. Usually the pulley has 60 holes. Therefore, only the numbers that will go into 60 evenly can

Figure 4



Figure 5

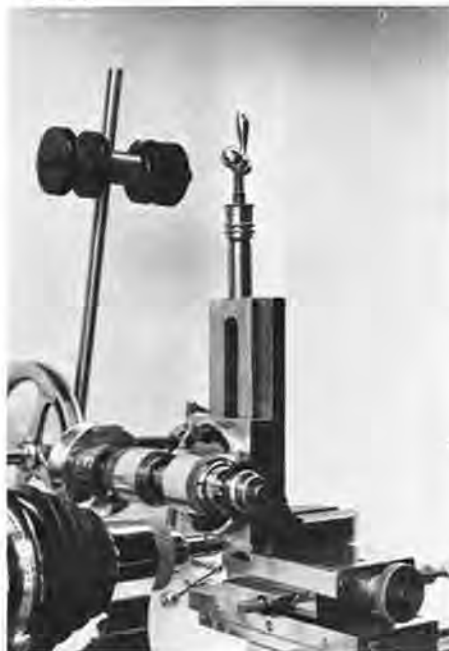
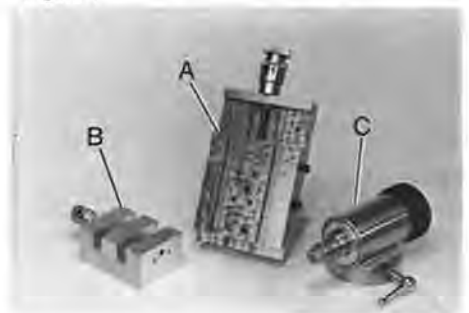


Figure 6



Figure 7



be indexed. The following numbers can be indexed with a 60 hole pulley: 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, and 60. As can be seen, this would not be adequate for all indexing operations.

The Paulson lathe has three rows of holes on the pulley and an adjustable index pin. This three-row system offers more choices in indexing but it still is not adequate for all indexing situations. A better indexing system is to have individual index plates, and an index latch such as that shown in Figure 11. A good set of index plates should contain at least 40 index plates. It should include plates for every number from 50 to 80, and also have the following additional numbers: 82, 84, 86, 88, 90, 92, 94, 96, 98, and 100. Also these numbers should be added to make the set complete: 102, 104, 106, 108, 110, 112, 114, 118, 122, 136, 142, and 144. Figure 11, View A shows one of the index plates. These plates are bored out so they fit the lathe draw-in spindle very closely at the shoulder of the draw-in spindle. This is so that the plate will run true when it is tightened up as the chuck is tightened in the lathe spindle. The hole size in the index plate usually is a different size for each make of lathe. When index plates are made, the center hole should be too small, and then the plate should be chucked up so the outside edge runs true. The hole is to be bored out with the

slide rest, until it is the proper size for that particular lathe. Figure 11, View B shows the index latch which is fastened in the "T" slot of the lathe bed by the use of two allen head set screws. This index latch can be made up by the watchmaker or machinist. A lathe with tailstock and a 3 or 4 jaw chuck is needed for turning operations, and a drill press would be desirable to drill the holes, although the drilling can be done on the lathe.

To make this index latch, the following materials are needed: one piece of brass rod 5/8 in. diameter and 1 1/2 in. long, one brass rod 1/2 in. diameter and 2 1/2 in. long, one brass rod 1/4 in. diameter and 1 1/2 in. long, one 7/32 in. steel rod 1/2 in. long, two steel taper pins clock size for rivets, one piece of heavy clock mainspring 0.025 in. thick, 3/8 in. wide, and 2 1/2 in. long, two 8-32 allen head set screws 1/4 in. long, two 8-32 allen head set screws 1/8 in. long, one 1/4 in. twist drill, one No. 30 twist drill, one 8-32 tap, and one tap wrench.

When making this index latch, refer to Figure 12. View A shows a drawing of the complete index latch. The base block is shown at "a," and one of the base set screws is shown at "b." The adjustable extension arm is shown at "c," and the extension arm set screw is shown at "d." View "e" shows the base of the index arm, View "f" shows the spring index arm, and View "g" shows the index

pin or wedge.

To make the index latch, first make the base block shown at B in Figure 12. Determine the dimensions of "a" and "b" of View B. This can be determined by measuring the "T" slot of the lathe bed that this latch is to fit into. Next, the base block is filed down to the proper size to fit the "T" slot of the lathe bed. When filing the block down to fit the "T" slot, equal amounts should be removed from both sides of the base block, so the part that goes into the "T" slot will be on center with the rest of the block. See "a" of View B, Figure 12. To assist the reader in doing this, the following plan has been devised. For an explanation of this plan, refer to View E of Figure 12. Measure the outside diameter of the material "a," and then determine how thick the material is to be left at "b." Use the following formula to determine what the material should measure at "c," when the proper amount of material has been filed from one side:  $a + b \div 2 = c$ . For example:  $a = 16.00\text{mm}$  and  $b = 3.00\text{mm}$ ,  $3.00 + 16.00 = 19.00\text{mm}$ ,  $19.00\text{mm} \div 2 = 9.50\text{mm} = c$ .

The block can be held in a bench vise for filing. After filing the required amount from one side, then file the material from the other side until the section "a" of View B is the correct thick-

*(Continued on page 20)*

Figure 8

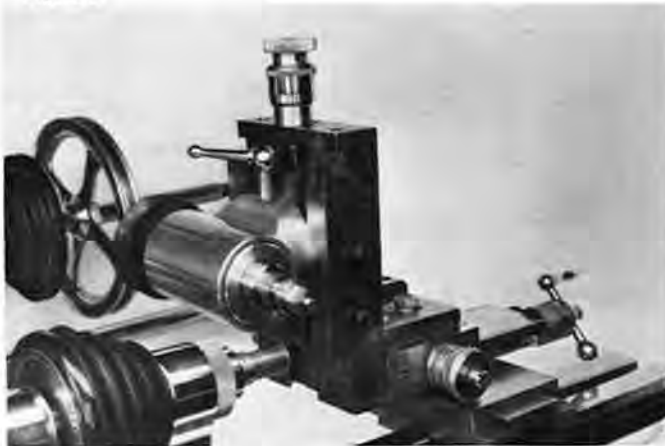


Figure 9

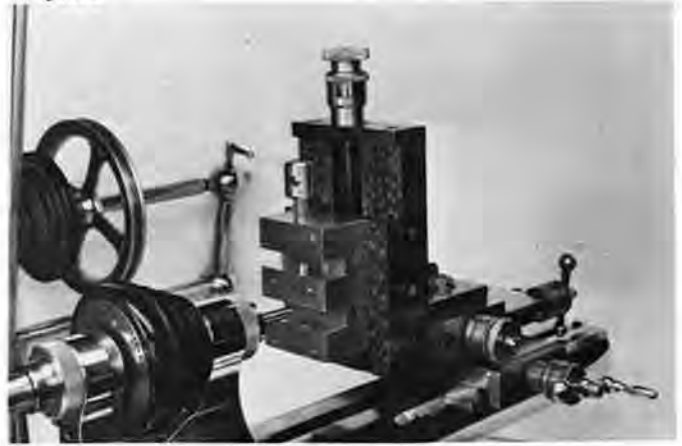
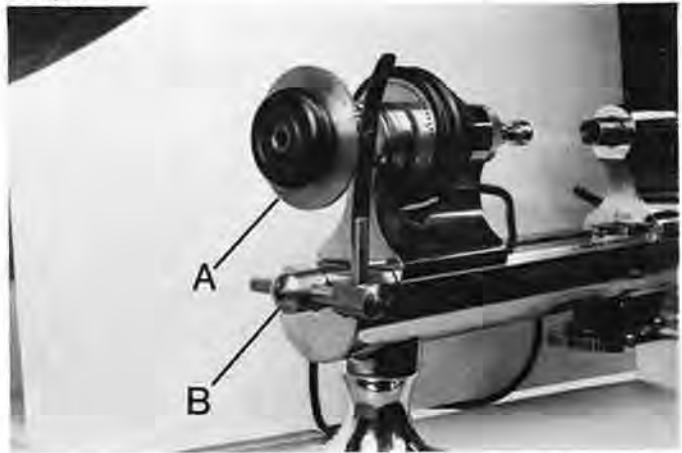


Figure 10



Figure 11





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# Seth Thomas Pillar and Scroll-Top Clock

## *Its History And Restoration*

### Part I

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

*The Seth Thomas Pillar and Scroll-Top Clock, which forms the basis for these articles was donated to the Museum of the American Watchmakers Institute in June, 1981, by Howard D. Woodward, of St. Paul, Minnesota. It is being restored by Joseph G. Baier, Ph.D., of Phoenix, Arizona. The American Watchmakers Institute, and its Museum, appreciates the thoughtfulness of the donor in making this contribution, and appreciates the efforts of the restorer, as well, in bringing the clock back to its original state, also as a gift to the Institute.*

*Orville R. Hagans, Curator*

The American Watchmakers Institute has obtained a new clock for its collection. It is new for the museum, but in history, it dates back to the early nineteenth century. It is an unusual time-piece with a movement made almost entirely of wood, except for a few pieces of brass and steel. The case is also made of wood, except for metal hinges, a lock and key, and brass finials. There is a door glass over the dial, and a lower tablet with a reverse painting on the glass. At the time the clock was made, brass and steel were very scarce, and the cost of manufacturing a brass movement clock was too expensive for all but the wealthy to own. Originally the clock sold for fifteen dollars, permitting a handsome profit for the maker, and still bringing it into the homes of middle income families. Although thousands were made, the clock is now a horological rarity. It is sought by the serious collector, because this clock has an early "strap" movement, and a label which makes no reference to Eli Terry, who held the patent on the movement.

The clock, before restoration, is shown in Figure 1, and after restoration, in Figure 2. The clock will soon be on display at the AWI Museum.

In this article we will concentrate on the clock's history. The case and movement was made by Seth Thomas sometime between 1816 and 1822, in Plymouth, Connecticut. The movement was designed

and patented by Eli Terry, but made by Thomas under a license agreement with him. Thomas was to pay Terry fifty cents for all movements made after the first eight hundred were completed. In a later agreement, however, Thomas paid Terry one thousand dollars for all the movements he made. First, let us review some background information on Terry.

Eli Terry was born in East Windsor, Connecticut, on April 13, 1772, and died in Terryville, February 24, 1852. He began building excellent tall-cased clocks in 1792, with brass movements having "Eli Terry, E. Windsor" inscribed on the dials. After 1793, when he moved to Plymouth, the dial inscription was changed accordingly. Many tall-cased clocks with wood movements have been found with the dial inscription reading "Eli Terry, Plymouth."

In 1807, Terry began making a large number of movements for tall-cased clocks to be sold by the Porter brothers of Waterbury. Included along with the clocks in their packing boxes, were instructions for setting up the movements, as well as labels with the imprint, "Clocks Made by Eli Terry for Levi G. and E. Porter." Around 1810, Terry began to develop his 30-hour wood movement shelf clock, receiving his first patent in 1816. Four experimental models were developed for his clocks until he produced the fifth and final model, the Standard Production Model. The earlier models are less known, and as stated before, are scarcer. The clock that is the basis for this series of articles has the second of the five movements developed, but has been made by Seth Thomas. Thomas also made its case.

The history of the Terry, wood movement, 30-hour clock has been covered extensively by several horological historians, and will be given here in brief for background purposes. This will enable us to place this Seth Thomas Pillar and Scroll-Top Clock in the proper perspective. A brief bibliography for further reading follows this historical review.

The first model, time and strike with rack and snail strike, had a front plate made of narrow straps of wood, usually of cherry. The two vertical side

straps were longer than the horizontal top and bottom straps, all forming the outline of a vertically placed rectangle. The rear plate was a single piece of oak running crosswise along the full width of the case, and forming part of the total backboard. The rectangular set of straps forming the front plate was pinned to the four pillar posts arising from the rear plate. Between these plates were placed several wheels, with their respective arbors and pinions, as well as the strike control levers. The pivots were of steel, running in the wood bushings of both plates. The driving weights were small, with their suspending cords compounded, and one running down each side of the movement within the interior of the case. The pendulum was 9.8 in. long, beating half-seconds, and suspended from the movement, so as to be off-center. The case was a simple box case, without a dial, having the characters reverse-painted on the inside of the door glass. This clock

Figure 1. Clock case with dial, before restoration.



was made by Terry beginning in 1814-1815, and later some were made by Seth Thomas.

The second model movement, also a wood strap movement, with a solid rear plate (usually made of cherry or oak), had a modified front plate. However, the two horizontal straps were longer than the vertical side straps. The rack and snail strike mechanism was replaced by a count wheel. The count wheel was centrally placed, turning on a hollow post, which surrounded the center arbor and the hour pipe. In early models the case was also a simple box with the dial painted on the door glass. Again, the pendulum was off-center, 9.8 in. long, beating half-seconds, with the cords compounded, and running thirty hours on one winding. This model was made by Terry in 1816-1817. It was made by Seth Thomas from that time until about 1821-1822.

The Pillar and Scroll-Top Clock donated to AWI has a model number two strap movement. However, it has a painted wood dial fastened directly to the case. Figure 3 shows the movement before restoration with the label pasted onto the backboard. It clearly reads, "Patent Clocks Made and Sold by Seth Thomas And Warranted if Well Used." Note that there is no reference to Terry on this label.

The third model Terry movement had the escapement centered in the movement. The clock case had a new feature—a wood dial with the escape

Figure 2. Clock case, dial, and tablet, after restoration.



wheel in front of the dial. The plates were now single pieces of oak, and no longer was the rear plate running the full width of the case. Also, the dial and front plate were pinned together, and the count wheel was positioned between the plates. In the first productions of the movement, the case was the early box type, but later the Pillar and Scroll-Top case was used. This model movement was put into limited production by Terry in 1817-1818. So far as known, Seth Thomas did not make this movement.

The fourth model is known as the inside-outside movement. It also had solid oak plates with many of the same features as the third model, and the weights were still compounded. At first, the case was the box type, but later was changed to the Pillar and Scroll-Top design. The escapement was placed between the front plate of the movement and the dial. It also included a seconds hand, with a seconds bit painted on the dial. This model was designed by Terry in 1818-1819. So far as known, it was not made by Seth Thomas.

The fifth and last model of the 30-hour shelf clock movement, the Standard Production Model, is the one usually brought to mind when referring to Terry and his clocks. The pendulum is still 9.8 in. long with a half-seconds beat. The count wheel is placed before the front plate for the first time, and the weight cords are not compounded because of a major change from four to five arbors, and a resulting change in wheel to pinion ratios. Also in this model, the dial train is located between the plates permitting a shallower case. The movement is now fastened to two vertical slats of wood forming a part of the case. Because of this change in design, the movement is not needed as a part of the case backboard, nor is it fastened to the dial. This model was designed by Terry around 1818-1819, and was made by Seth Thomas beginning in 1821.

The success of the Standard Production Model in the Pillar and Scroll-Top Case is attested to by its production record, being made and sold in large numbers until the late 1830's. It was copied by many clockmakers with modifications in size, changes in wheel and pinion counts, fitted with pendulums of varying lengths to fit variations in cases, and even turned upside down. With all these changes in his design taking place, Terry seemed to care little. The financial woes of the 1837 depression, and the advent of the cheap 30-hour rolled brass movement introduced by Chauncey Jerome, ended the success of the 30-hour or 8-day, wood movement clock.

In this brief historical review, I will now discuss the several individuals

mentioned so far, including an additional person, all of whom were involved together in their respective clockmaking efforts. Eli Terry, Seth Thomas, Chauncey Jerome, and Silas Hoadley worked together in the beginning of their careers, and later each achieved success individually. In 1807 Silas Hoadley and Seth Thomas (both of Plymouth, Connecticut and both "carpenter-joiners"), were employed by Terry to assist in the production of the four thousand tall-cased wood movements being made by Terry for the Porter brothers. At that time, Terry's needs were for qualified wood workers, not clockmakers, to build the various jigs and fixtures for making movements under his direction. After completion of the Porter contract, Terry sold his clock shop to his workers, Thomas and Hoadley, who produced tall clock movements until 1813. In December, 1813, Thomas purchased the factory and land located in Plymouth Hollow from Heman Clark, a former apprentice of Terry. At the time, Hoadley continued independently in his former partner's shop. Terry continued his business alone, purchasing a grist mill, which he modified for his clockmaking work. Chauncey Jerome was an "apprentice joiner," who was employed by Terry in 1815 as a casemaker. In his *History of the American Clock Business*, Jerome claimed to have made the first Pillar and Scroll-Top Case under the direction of Terry during that year. It was also copied and modified,

(Continued on page 37)

Figure 3. Terry 30-hour movement, strap model, number 2, before restoration; showing the label fastened to the backboard.



# A Horological Treasure From The Sea

BY S.T. JENSSEN

I recently had the exciting opportunity to visit the photographic studio of the National Geographic Society to examine a clock that had been under forty feet of ocean water for approximately 250 years. This clock was part of the artifacts recovered from a shipwreck in the Somona Bay in 1976.

Following is a brief history of the events which led to this shipping disaster. Two Spanish galleons, the *Conde de Tolosa* and the *Nuestra de Senora de Guadalupe*, set sail from Cadiz in July 1724, bound for Veracruz, Mexico. There were 1200 people aboard these ships, and the cargo consisted of 400 tons of quicksilver (mercury), irons and braces for shipbuilding, fine jewelry, and other luxury items for Mexican life. On August 24, off the coast of Hispanola (Dominican Republic), at the mouth of the Somona Bay, the ships were overtaken by a violent hurricane, were driven into the bay, and consequently sank.

The dial of the recovered clock is eight inches square and has a broken arch. All steel parts are gone due to rust, such as mainsprings, screws, levers, arbors, and pinions. All that remains are the brass or bronze parts. The engraving on the clock is "Windmills London." See Figure 1. Upon checking with Britten's *Old Clocks and Watches and Their Makers*, I find that there are six people listed under that name. It is unknown at this time which of these clockmakers made this clock.

The clock is a two-train strike, chime and alarm with the day of the month. There must have been a shut-off lever of some kind, judging by the notch in the side of the dial in Figure 2. It is a crown-wheel verge, typical of that period. The same type of escapement is in the alarm assembly. I could not readily determine whether it was of a pivoted or knife-edge escapement. The back cock is missing, but the apron is in evidence, and I believe that if it were a knife edge, the apron would have a 90° bend at the tip to prevent the verge from disengaging the escape wheel. The lower potence is there, as it is the one with an adjusting screw to change the escape wheel depth with the verge. The upper potence is missing. The clock is a six bell chime clock as can be seen by the pins in the chime drum. The rows of pins are all in a descending or ascending scale, probably the former. Complete and incomplete parts of five bells are visible. The clock also had a Dutch strike, which consisted of two different pitched bells, striking the hour on the lower pitched  
(Continued on page 31)



Figure 1

Photographs by Robert S. Oakes

Figure 2





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- Pendulum length: up to 42 1/2" from center shaft to tip of pendulum



## New Haven Wall Regulator

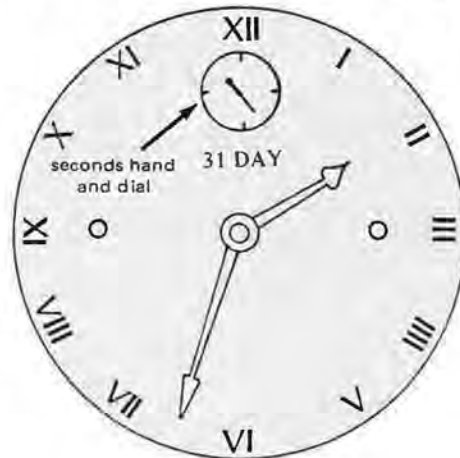
**Q** Would you please help me in trying to determine the age, history, and place of manufacture of a clock I am presently restoring?

The clock in question is a New Haven Wall Regulator, approximately 45" long, 14" wide, with a 6" deep case. It has the usual finial, etc., embellishments. I have found the clock (except for a slight difference in the top finial arrangement) referred to in the New Haven Clock Co. Catalog of 1900 (page 68) as the "Trojan." However, I can find no information regarding the fact that my clock has a 31-day dial notation and movement as outlined in the sketch.

Was this clock perhaps made in England? By notations on the case, I am led to believe it was sold in 1896 or thereabouts.

Could you please tell me anything you might know about the New Haven Clock Co. 31-day movement so that I might be able to better restore and maintain it?

John P. Bowen  
Rochester, New York



**A** I have searched through the New Haven catalogs in my library for 1885, 1890, 1900, and 1907. I do not come up with anything of the 31-day nature. However, in the 1900 catalogs as well as the later ones and in some other clock catalogs of the same period of wholesalers' catalogs, I do come up with 30-day clocks from New Haven that probably have the same movement as yours. I believe that yours was made for export to the English trade, and since the 30-day clock movement could run for 31 days when in good condition, it was marked so. Since there are more 31-day months than 30-day months, it is only logical to surmise that this could have been a selling point. The 1900 catalog on page 65 has such a movement—the "Vanirose" model. There is little more I can add.

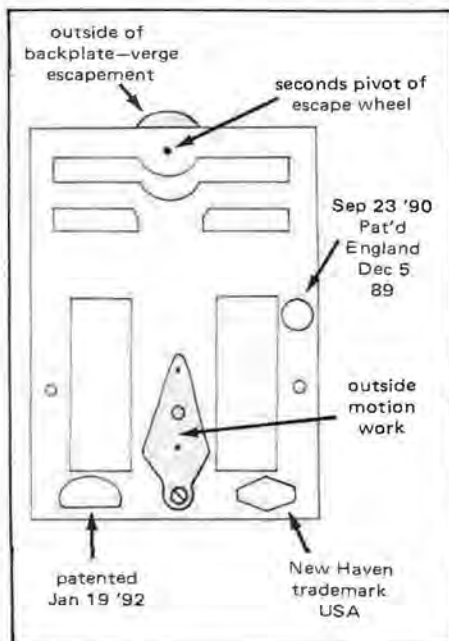
**Q** I have in the shop for repair a clock quite unlike any other that I have seen. The present owners acquired the clock from relatives in the East, but know little of its history.

The movement is a wood, 30-hour, time and strike, sturdily constructed of what appears to be striped oak. Two pieces (4 1/2" x 6 1/2" x 1/2") forming the top and bottom, are joined by four vertical pieces (5 3/4" x 3/4" x 1/2") near the corners. The joints are similar

to mortise and tenon, except the projection is round rather than rectangular. The front plate (5 3/4" x 3 3/4" x 5/16") is secured to the top and bottom plates by mortise and tenon. Two pieces (5 3/4" x 1 5/16" x 5/16") form the rear support for the trains and are removable to permit disassembly of the clock. The wheels are brass with wooden arbors and have lantern pinions formed by reducing the arbor size at the proper location and driving in steel pins. The pivots appear to have been driven into the ends of the arbors and are supported in the plates by brass bushings. The bushings appear to have been added later. Power is provided by two, 2 3/4 lb. weights and chain over sprockets. The escapement appears to be of the recoil type, with a pendulum rod including suspension 34 1/2" long. The suspension point is of the wire loop type similar to that found in cuckoo clocks. One curious point is that the pendulum bob is threaded directly to the rod and must be rotated to provide adjustment. Striking is accomplished by a hammer and bell on top of the movement. Warning and release of the strike train is by a wire linkage which engages one of two pins fixed to a wheel on the front of the movement and driven by a friction cup on the shaft of the first wheel in the going train. The center shaft which carries the cannon pinion is fixed to the front plate.

The dial is a wooden break arch dial, approximately 18" x 12 1/2", painted with flowers and geometric designs. It is attached to the movement by three sharpened hooks which engage three holes recessed into the rear of the dial. The dial is shaped so that the chapter ring portion is about twice as thick as the rest of the dial and is slightly dished in at the center. The chapter ring has roman numerals with arabic 15, 30, 45, and 60 appearing at the appropriate positions on the periphery. The hands are cast iron.

The case is apparently cherry or black walnut (the exact nature is difficult to discern because of the finish) about  
*(Continued on page 49)*

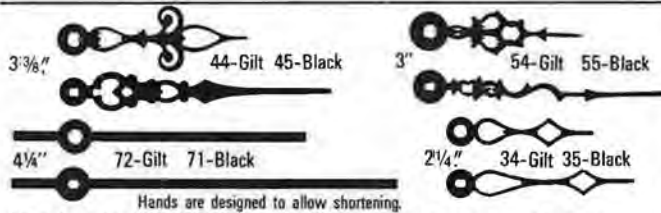


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# THE PICKLE BARREL

By Marshall F. Richmond, CMW



## Tool and Equipment Maintenance

**W**atchmakers and jewelry repairmen rely primarily on the maintenance and repair of watches and jewelry for their livelihood, thereby proving that they have the ability to maintain and repair most of their own tools and equipment. Tools used by watchmakers and jewelers need maintenance and repair just as the articles brought in by customers need maintenance and repair. As we all know, a penny saved is a penny earned, so the more we can do for ourselves the more we can save. We can save by avoiding the charges of a service call or shop charge if our equipment is sent to a shop for service. Probably the most costly aspect of the repair is not being able to use the equipment while it is being repaired. Preventative maintenance is, of course, important since it will make the equipment operate trouble free for a long time without repairs. But when equipment breaks down a watchmaker/jeweler that has been trained to work on electric watches can, by using good common sense and logic, repair his own timing and cleaning machines, as well as any other equipment in the shop. Material and parts for your equipment are usually available from the manufacturer and a phone call will usually have it on its way to you immediately.

Preventative maintenance requires cleaning, oiling where needed, and replacement of worn parts that could cause a breakdown. Many of the old lathe and flex shaft motors require periodic oiling, but more modern electric motors have bearings made of a material with a pressed in lubricant that never needs to be oiled or they may have sealed bearings that are lifetime lubricated. You can easily tell if a moving part needs oil by observing the oil holes that are positioned over the bearing. If cleaning is done at regular intervals, the condition of parts can be observed for wear and condition. After cleaning, oil can be added where needed, enabling the equipment to continue performing the job it was designed to perform.

Most of the equipment found in jewelry or watch repair shops has an enamel finish on the outside, which can be cleaned with a damp cloth. If a film develops on the finish, it can be easily removed by using a soap or detergent solution with a cloth or soft bristle brush. It should then be wiped with a damp and dry cloth, respectively. Some of the older machines with crinkly finishes, having been cleaned, will be somewhat discolored when dry. This can be easily corrected by using glycerin on a cloth or soft brush then wiping with a dry cloth, restoring the finish like new.

Electronic machines that have tubes, transistors, or other components get dusty inside the case. Dusting and cleaning these will make the machine perform better since dust is often a conductor of electricity, or sometimes a non-conductor, which will stop the flow of the current to some of the components. If you attempt to clean these, be sure the machine is turned off and be careful not to damage any of its components. This should probably be done before cleaning the outside of the equipment.

It is equally important to keep hand tools in good condition. Files, screwdrivers, staking tool, bench block, poising tool, truing calipers, hand pliers, tweezers, and all the other hand tools should be kept clean for optimum performance. Screwdrivers, gravers, benchknives, and tweezers should be kept sharp at all times. A steel-wire brush on the polishing motor is excellent for cleaning and burnishing the pliers, tweezers, and bench block. The steel-wire brush also does an excellent job on clean files to make them cut better. A small drop of oil on the hinge of the hand pliers will make them function better. Truing calipers, poising tool, and staking tool can be cleaned with watch cleaning and rinsing solutions while the staking punches can be wiped with an oil-dampened cloth. I always have kept an oil-dampened cloth in my staking tool box, with the lid kept tightly closed. In the sealed box this oily cloth produces a vapor which settles on the punches and stumps and prevents rust and corrosion. My staking tool is over thirty-five years old and still is in good condition with only a few punches having been replaced in all this time. Chain nose pliers sometimes get bent, nicked, or broken on the points. These can be filed or stoned back into shape, then polished with tripoli on the polishing motor using cotton or felt buffs. Likewise, tweezers can be sharpened and reshaped by using a fine-cut file, then an india oilstone, and finally a hard arkansas stone.

Since the inside of the tweezers should not be too smooth so as not to flip small parts, I have devised a method for roughing these surfaces. A piece of medium grit emery cloth, about one inch wide and twelve inches long, is doubled. The loose ends are stapled to the edge of the watch bench. By grasping the unattached end in one hand and grasping the emery cloth with the tweezers, I rub them up and down the emery a few strokes. The result is a satiny finish on the inside of the points, yet rough enough so small screws, jewels, and other small parts will not easily slip. This reduces the chance of flipping these small objects, thus eliminating time spent searching the floor area around the bench for missing items.

Sharpening screwdrivers and gravers is a must as they will not function properly when dull or with chipped points. Jewelers' engraving type gravers, or watchmakers' gravers, as well as screwdrivers will have to be sharpened periodically while using them. Whenever some free time is found, it is wise to go over them to be sure they're all in good condition, ready for immediate use. Many devices are available to aid in more accurate sharpening of these tools, but if through practice you learn to sharpen them free hand, it is much faster and extra tools are thereby eliminated.

For sharpening screwdrivers, I have found an even faster way than using a corborundum, india, or arkansas hand stone. I have a small motor-driven hand grinder that can hold a lathe mandrel. See Figure 1, View A. I use separating discs on this, and the tool is always on my bench ready to

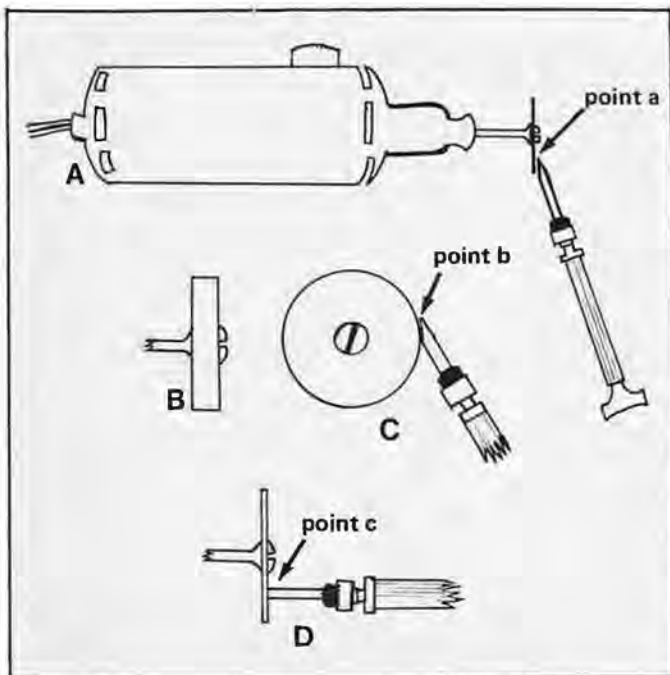


Figure 1

pick up and use. By holding the hand grinder in my left hand and the screwdriver in my right, I can use my loupe and use the flat side of the separating disc to get the correct angle on both sides of the blade. See Figure 1, View A, point a. Then hold the blade perpendicular to the flat surface to square the end and get the desired thickness. See Figure 1, View D,

point c. This works well for use in everyday work since during the course of disassembly or assembly, it only takes seconds to sharpen a broken or chipped blade. Today there are many different width slots found in watch screws. Having a difficult screw to remove sometimes requires special shaping of a screwdriver blade to remove the screw without damaging the head. This may require the blade to be hollow ground and may also require a thicker abrasive wheel, since the grinding surface used is the arc of the wheel instead of the side. Although this requires more time, this should be done by chucking the wheel and arbor in the watchmaker's lathe which will give freedom to both hands in order to hold and to steady the screwdriver, achieving the hollow ground edge desired. See Figure 1, View B, which shows a wider wheel and Figure 1, View C, point b, showing how to hold the blade while hollow grinding the point. This may be time consuming, but if we take pride in our work—especially on high-grade watches—screwdrivers should be shaped to fit the screws, eliminating the chance of damage to the screw heads.

Sharpening graters is a maintenance chore that requires much skill, especially if done by hand. The available graver sharpening tools will produce good results if properly set up and used, but are much more time consuming than sharpening by hand. For sharpening graters I use a wet crystal grinder instead of hand stones for the rougher work, but for fine work, I finish them with hand stones. The crystal grinder uses a fine cutting stone which leaves a fairly fine finish, and being wet eliminates the chance of the graver getting hot enough to draw any of the temper from it. Even though I use this time saving tool, I polish them on a hard arkansas stone and then polish by hand on a piece of 4/0 emery paper mounted on a piece of glass about 3 x 4½ inches. The emery paper can be purchased in 9 x 14 in. sheets from your material distributor, then cut to size and mounted on glass by common mucilage or any other adhesive that will cause the emery paper to adhere to the glass. Graters used for wetting stones can be sharpened on the wet wheel by hand only. It would not be practical to set up and to use a hand graver sharpening jig for this purpose. Achieving the correct angles on graters comes

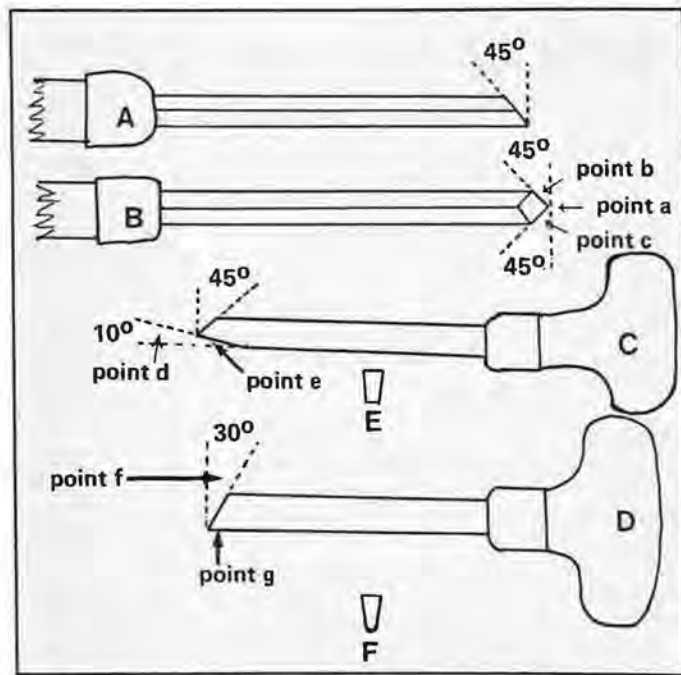


Figure 2

with practice and experience. I will illustrate the approximate angles to use when sharpening graters in order to make them cut properly. As you become more experienced, you may deviate from these recommended angles simply because every individual will hold the graters differently. Watchmakers' graters are square and are sharpened diagonally on one end at a 45° angle. See Figure 2, View A. The face and the two bottom sides are polished. See Figure 2, View B, points a, b, and c. The brightness of the cut obtained while turning metal depends on how well polished the graver faces are.

Graters used by jewelers for stone setting are a tapered bar, sharpened on one end, and have a handle on the other end that fits in the heel of the hand so enormous pressure can be applied in making cuts or pushing up metal to form beads. Flat bottom graters, which are used for making cuts or removing metal, should be sharpened by first stoning away the bottom to a 10° angle. See Figure 2, View C, point e. Next the point should be stoned or ground to a 45° angle from the bottom of the graver, which actually leaves the point to be 35°. Polishing on this graver is done on the bottom only. See Figure 2, View D, point e. The round bottom graver, used for pushing up metal to form beads, is stoned or ground to a 30° angle. See Figure 2, View D, point f. The bottom of this graver is polished on the 4/0 emery paper by using a rotating and turning motion while rubbing. See Figure 2, Views E and F, which show an end view of the two stone setting graters. The drawings are just to illustrate the angles at which the graters can be sharpened and represent no particular size. Graters come in a range of sizes and the angles shown can apply to any size. With experience you may find it to your advantage to change the angle slightly to serve the particular need of the metal you are cutting.

Good maintenance is just a matter of applying good common sense and logic. Most tools and equipment on the market today will continue to operate even if neglected, but with proper maintenance they will be in service much longer. At the first sign of trouble, such as a squeak or rattle, apply a drop of oil or tighten a screw, and a major repair may be prevented. With good maintenance you can enjoy the smooth efficiency of your tools and equipment. Without it you will have to tolerate the problems of poorly operating tools and equipment.

In the next article we will discuss methods of holding small pieces of jewelry for making solder joints and setting stones.

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**TECHNICALLY WATCHES**  
(Continued from page 10)

ness. It is important that the two sides be flat and parallel to each other. This is shown at "d" of View E, Figure 12. Now equal amounts should be removed from each edge of the two flat sides to obtain the proper width to the block. This is shown at "b," View B and "e," View E. Next, the hole "c" is drilled. First, spot the center with a center punch in the center of the block in line with the edge of the filed section. See View B, Figure 12.

To drill hole "c," the block should be fastened in a drill vise by the section just filed, making sure the block is level. The drill press should be used to drill this hole. First use the No. 30 drill to drill a pilot hole; then use the 1/4 in. drill to finish the hole to size. Now chuck up the block in the lathe by the round section with the round end outside the chuck. Then use a graver to spot a center in preparation for drilling the hole for the set screw at "e," View B. Use the No. 30 drill to drill the hole, and thread the hole with the 8-32 tap, round off the end of the block with the graver, spot centers, and drill and tap the two holes "d" of View B. Use the No. 30 drill and the 8-32 tap. This completes the base block.

Next, the extension arm shown

in View C is made. Since this is a long piece of material, it would be best to support its end with the tailstock. A center should be spotted in one end of the 1/2 in. piece of brass rod for the male center of the tailstock to work in to support the rod. After the rod is chucked and supported by the tailstock, portion "a" is turned straight to 1/4 in. diameter. It would be best to use the slide rest to turn this part. Next, a center is spotted and hole "b" is drilled—first with the No. 30 drill and then the 1/4 in. drill. NOTE: To drill a round rod such as this, it can be held in a drill vise or on a "v" block; or if drilled in the lathe, it can be held in a "v" center. Now the piece is chucked up so the large section is outside the chuck. A center is spotted and the hole "c" is drilled and tapped for the set screw. Use the No. 30 drill and the 8-32 tap. Next, the end of the piece is rounded off with the graver. This completes the extension arm.

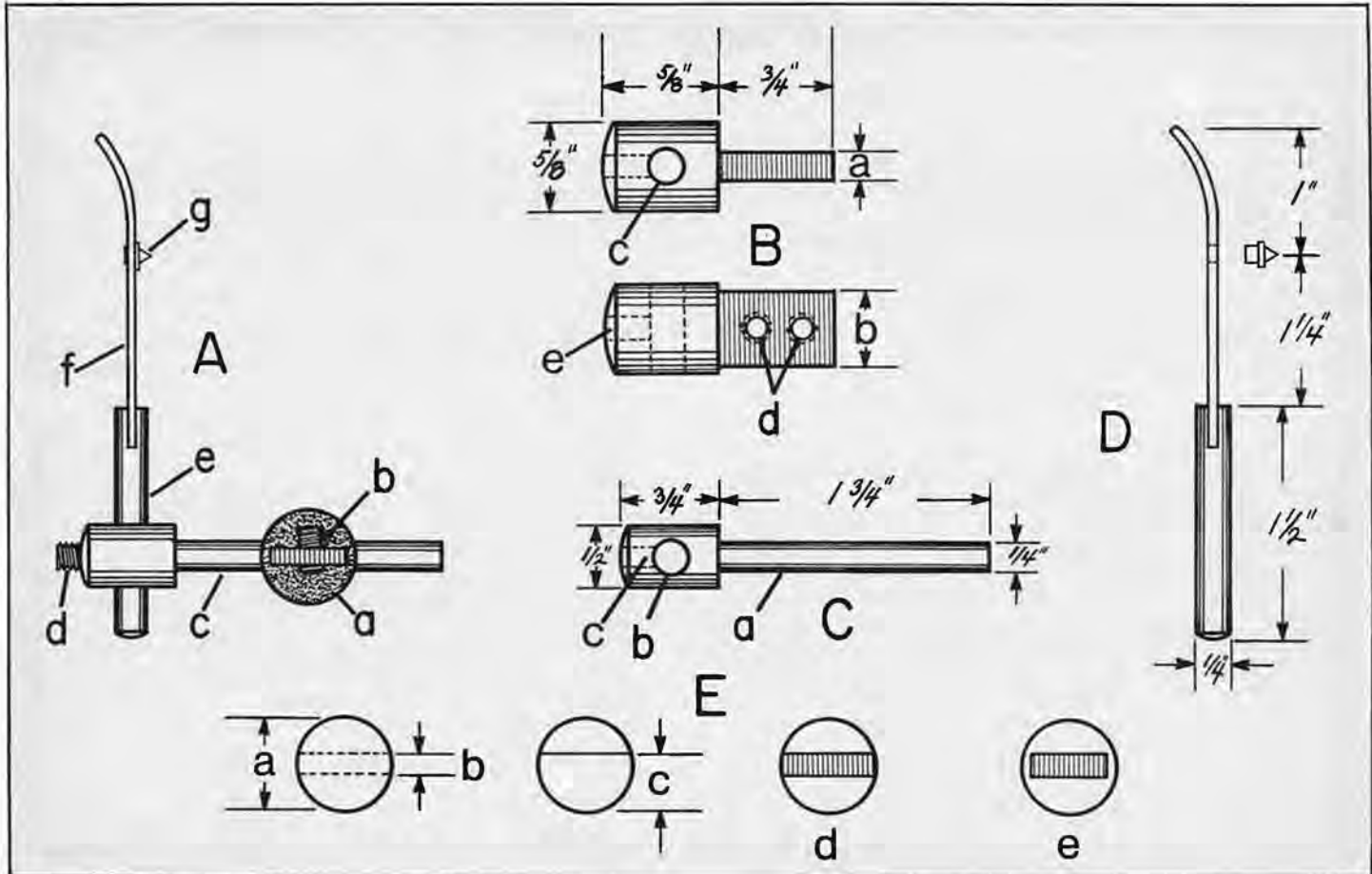
Now the index arm is made as shown at D, Figure 12. First, fasten the 1/4 in. piece of brass rod in the bench vise, and use a hacksaw to make a straight slot in the center of the end of the rod to a depth of 3/8 in. This slot is for the spring arm to fit into. The spring arm should fit the slot very closely. This spring arm can be fastened in the slot by drilling two holes through the rod and the spring

can be soft soldered in the slot. Next, a hole is drilled in the spring for the index pin. Spot a center, then use the No. 30 drill to make the hole. NOTE: It may be necessary to draw some temper in the spring in order to make it soft enough to drill. When drilling the hole, turn the drill slowly and use cutting oil. After the hole is drilled, make the index pin. If the pin is to go into the holes of an index plate, the pin should be turned with a conical shoulder. If the pin is to work in the notches on the edge of an index plate, then the pin should be filed or ground to a wedge shape to fit the notches in the plate. After the index pin is made, it is riveted into the index arm. This completes the index latch.

Some companies, such as Derbyshire and Bergeon, sell a large index plate with several rows of holes which will do a majority of the indexing needs. The plate that Derbyshire sells is 8 in. in diameter and has rows of holes which do all the numbers to 80, even numbers to 100, and also 144, 360, 365, and 366. This index plate requires an index lathe, which has a pin to go into the holes, rather than a wedge that goes into the notches around the edge of the individual index plates.

The discussion of indexing will continue next month.

Figure 12



**ZANTECH**



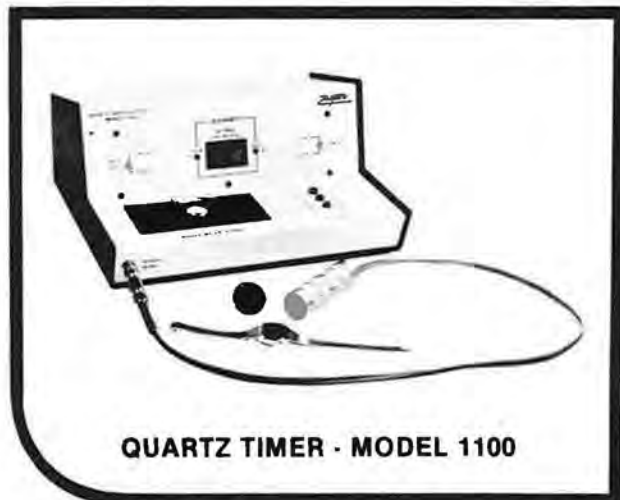
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## The Congreve Rolling Ball Clock

**W**e had not seen one of these fascinating clocks since a few years prior to World War II when we saw one merrily rolling away in the window of Dent's, close to Trafalgar Square in the heart of London. So when Robert Phillip, of the Robert Phillip Museum of Time in Cookstown, Ontario, Canada, informed us that he had recently purchased a version of the original Congreve Rolling Ball Clock, we decided to look further into the matter.

During the course of some correspondence on this particular matter and on other items of horological interest, Mr. Phillip sent us some excellent photos shot by his son Robert John, which have been reproduced here as Figures 1, 2, 3, and 4. We will also discuss a Congreve clock designed and manufactured by Mr. John Wilding, author of *How to Make a Congreve Clock*.

William Congreve, the original designer of the clock, was born in 1772. He was the oldest son of William Congreve and later became Lieutenant General Sir William Congreve, Commandant of the Royal Artillery (Turner & Devereux). Congreve, being an artillery officer, contrived the original rolling ball in the clock as a musket ball. The original driving force was a cannon ball situated beneath the clock and hooked up through a hole in the table. Congreve patented his famous clock in 1808.

The Congreve clock purchased by Robert Phillip, was made by Thwaites & Reed of London in the 1960-1970 period. It is one of a hundred "limited edition" clocks, of which Robert Phillip's clock is No. 99. The clock is keywound,

with a fusee-controlled power source, and has, approximately, an eight-day running time. The table tilts during the operation for release of the train.

The most unusual feature of the clock is the adjustable throw crank (shown somewhat in Figures 4 and 5), which tilts the table. The adjustment of this throw crank is critical and must be very secure on its arbor.

In this particular version of the Congreve clock, the duration of the ball "run" from one tilt of the table to the next is fifteen seconds. (We shall see, however, that in the model designed and manufactured by John Wilding, the time for the tilt period was increased to thirty seconds.)

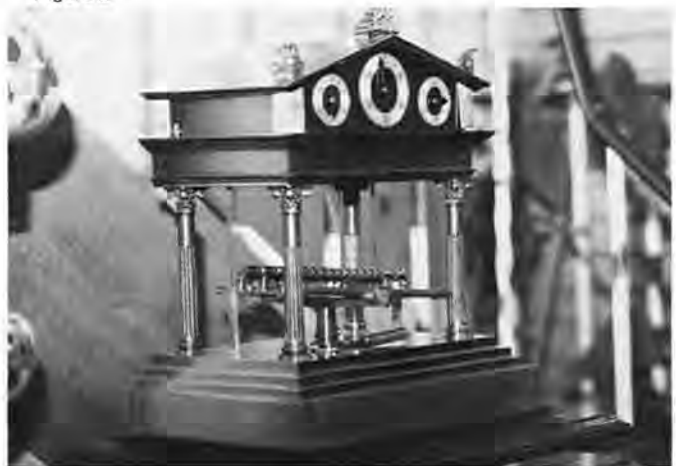
There is no means of real regulation, therefore, the clock is not a reliable timepiece. John Wilding himself makes it "quite clear that one does not construct a Congreve clock for the purpose of telling the time." Wilding points out that it is the "mesmeric effect of the ball endlessly traversing the inclined platform" which is the attraction for most people. He adds that one only has to visit the Time Gallery of the British Museum in London to prove this point. To use American parlance—although it is a poor timekeeper, it is a most interesting conversation piece.

The clock is wound by a crank key through a gear assembly at the top right rear (looking toward the front) of the clock. See Figures 4 and 5. This crank winds a fusee having a flat metallic ribbon-type connection between the mainspring barrel and the fusee. See Figures 3, 4, and 5, top center. This "ribbon" is a modern substitute for the old fusee chain, since

Figure 1



Figure 2



# Essence of Clock Repair

the latter is no longer manufactured.

Congreve called the table a "plane"—a matter of curiosity only. The throw crank speed is controlled by a fly (or fan), which can be clearly seen in Figures 3 and 4. It is situated on the arbor of the throw crank.

One important point made by Robert Phillip during our visit and inspection of this clock, is that the table cannot be vibrated in any way, or the clock will stop.

There is something which will, undoubtedly, amaze the average clock mechanic: there are three chapter rings. As John Wilding has pointed out, there is no motion work, the time being indicated on three separate dials as in regular design. This amazes Wilding. He states, "The Congreve is no regular as far as timekeeping is concerned." Wilding has also observed that it was rather muddled thinking on the part of the early makers of these clocks who put an intermediate wheel between the main and center wheels "with a reduction of approximately 3:1 for no other purpose, it seems, than to put the hour wheel in the correct position relative to the half minute and center wheels . . . And so we have three separate chapter rings (or dials): hours on the left, minutes in the center, and seconds on the right on the minute release wheel arbor." See Figure 6 of Wilding's layout.

Robert Phillip's No. 99 Thwaites & Reed version of the Congreve clock is sturdily constructed using steel pinions. However, in his instruction booklet on *How to Make a Congreve Clock*, Mr. Wilding has specified that they be made using lantern pinions because, in his words, "I am still convinced that the lantern pinion is the easiest for the amateur to make." An independent opinion here might be that at this point, having made the plates and cut the wheels, the perfectionist should go all the way and manufacture steel pinions as in the original Congreves. (A matter of desire and opinion.)

Robert Phillip's No. 99 Thwaites & Reed version also has all brass plates and pillar construction and is mounted on a polished hardwood baseboard, having four adjustable feet, the level being most critical as mentioned. The inclined "plane," or table, has seven grooves cut into it, down which the steel ball rolls under gravity on a prescribed track. The table is tilted every fifteen seconds by the throw crank mecha-

nism. When the ball reaches the end of its run in one direction, it activates the throw crank mechanism at which time the table tilts, and the ball repeats its movement in the opposite direction. At the release of the throw crank mechanism, the hands advance.

After we left the delights of Robert Phillip's clock Museum, we focused our attention on the study of the Wilding clock. First, Mr. Wilding warns against any further deviation from the original Congreve construction, stating that such a practice will only end up in disappointment. In other words, there seem to be no changes which can be made to improve it as a timepiece or in any aesthetic fashion.

The clock has three basic components. The main clock frame consists of the top and the bottom held by four corner pillars. On this unit there are four adjustable corner feet, which were originally made of brass. However, Wilding has used black plastic "feed lever balls," which substitute adequately for ebony. One may also prefer to use white plastic balls, which can pass for ivory.

The second component is the tilting table. In the Wilding clock, it is skeletonized with a series of brass triangles screwed to a baseplate. This doubles the weight of the table and makes it more stable.

The third component is the actual movement. It is located on the top plate, being secured by two holding screws. The movement, as in the original Congreve, is of the fusee type. Again, no escapewheel is included, the last train wheel being the release wheel. The release wheel in Wilding's clock (See Figure 6) is a one-half minute release. (Robert Phillip's Thwaites & Reed version has a fifteen second release.) Therefore, the Wilding release wheel has two radial release pins set on its periphery at 180° apart. Mounted on an extension of the arbor or this one-half minute release wheel is an adjustable crank, the latter being joined to the table by a connecting rod.

Regulation, such as it exists, is apparently obtained by altering the crank pin throw by turning the knurled screw provided on the crank assembly.

The train itself is released as soon as one of the rolling balls strikes one of the release levers. The levers are secured to a long arbor running under the plane. There exists

Figure 3



Figure 4

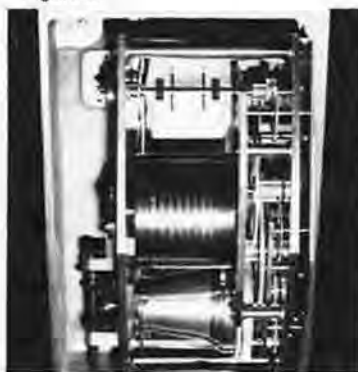


Figure 5



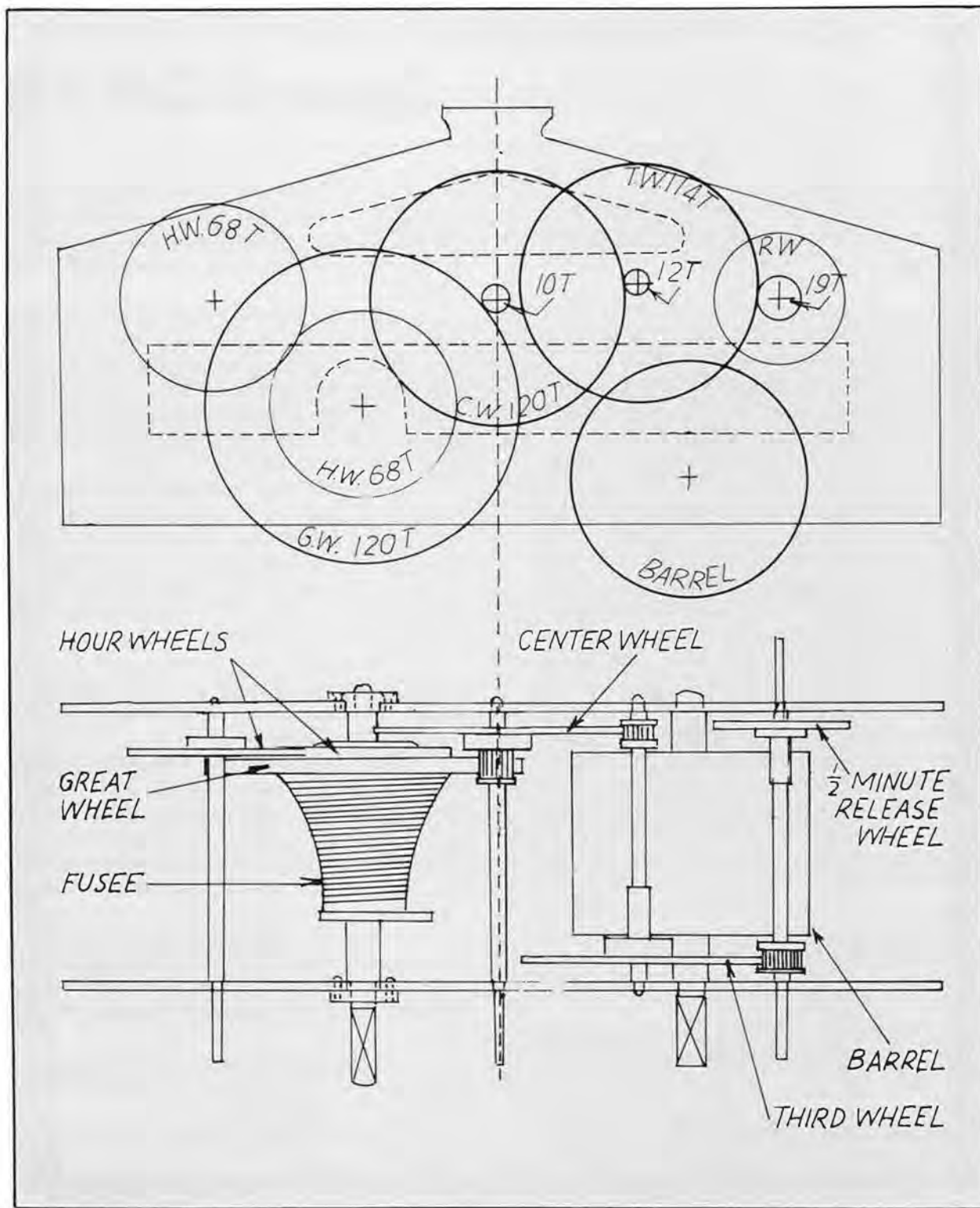


Figure 6. Wheel count and train layout of John Wilding's Congreve Clock.

a third lever, or locking detent, mounted on this arbor which arrests the release wheel when it arrives in the path of one of the two radial pins on the release wheel.

Wilding uses a seven-sixteenths inch steel ball. The size of the ball makes a difference in the running of the clock. He uses a somewhat larger ball from that used by the early clockmakers in this instance in view of the unlocking problems. He also states that the size of the ball affects the speed of travel. Indeed, a smaller ball will certainly have to

make more turns on its journey along its pathway than a larger ball on the same pathway, in order to cover the same distance.

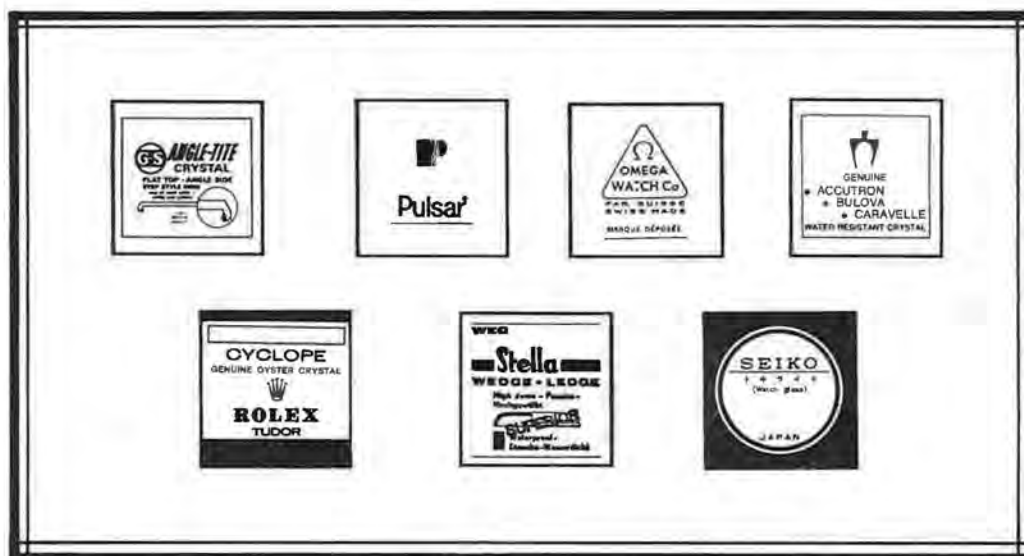
Finally, we are indebted to Mr. Wilding and to Brant Wright Associates for allowing the use of much of this material. Anyone who wishes to make a clock of this type may obtain the plans from: Brant Wright Associates, Ltd., P.O. Box 22, Ashford, Kent, England TN23-1DN. Ask for John Wilding's *How to Make a Congreve Clock*.

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By Gerald G. Jaeger, CMW  
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## Resistance and the Ohm Meter

Having completed our study of the volt and realizing that voltage does not move about in the wires of an electric circuit, we will undertake the study of resistance.

In the scheme of components in a simple electric circuit, the voltage is the pressure that moves the electrons in that circuit. The electrons, in their movement through the circuit, are the little gems that do the work. Were they allowed to traverse the circuit in an uncontrolled manner, these electrons would be useless and therefore, must be regulated.

The circuit could be compared to a garden hose. If the hose were connected to a source with great pressure and if the water were turned on full force allowing the water to flow at an uncontrolled rate, we would probably do more damage to the area we intended to water than had we not watered it at all. If we were to put a controllable nozzle at the end of the hose, adjust it to a rate of flow applicable to the job specified, the result would be as intended. This is the same concept employed in the control of electrons in an electric circuit. We have a cell (battery) which supplies electrons and provides the force (voltage) to move electrons in the circuit. The electrons leave the cell and move along the conductive paths (wires) provided for their travel (flow). In order to control this flow of electrons, blockages or resistances are placed in their path. These resistances can be predetermined or fixed in order to allow only the required amount of electrons to flow in the circuit. As horologists we must be able to measure these resistances.

### The VOM and Resistance

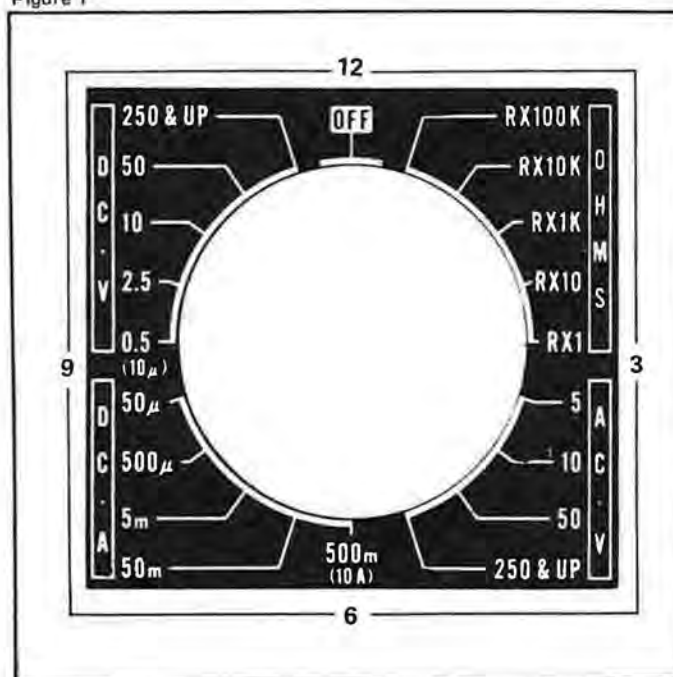
We have now established that resistance is the opposition offered to the flow of electrons in an electric circuit. It is measured in ohms and is measured by an ohmmeter. Having completed, for the time being, the measurement of voltage, we will place the voltmeter upon the shelf and bring down the ohmmeter, referring to the selection and readout areas for ohms.

The same concept applies to the selection area of resistance (ohms) as the readout area of resistance. The selection area of the VOM for resistance is the 12 to 3 position in a clockwise direction as shown in Figure 1. The readout area for resistance is the scale on the very top of Figure 2, parenthesis A.

A few things must be considered in order to understand ohm measurement. When measuring voltage the scale begins at 0, on the far left of the readout; the maximum voltage is read at the far right of the voltage readout. Noting the ohms readout we see that 0 ohms is found on the far right of the scale. This seeming contradiction of the meter readout will be clarified with further exploration of ohm measurement.

When measuring the resistance of any given component within a circuit, we are measuring the opposition to the flow of electrons offered by that component. In order to measure this offered opposition, we must attempt to move electrons through that component. This is exactly what we do with our selector set at any of the ohms selections. The VOM has a battery or two batteries housed within it. These batteries come into play only when we use the VOM as an ohmmeter. When the ohmmeter selector is positioned at any of the ranges, electrons are trying to flow from the black

Figure 1



meter probe to the red meter probe. With the two meter probes lying next to the meter, free of contact with one another, you should have a meter reading of infinity. Note the position of pointer "a," Figure 2. Pointer "a" is at the far left of the ohms readout. Infinity is indicated by the symbol  $\infty$ . The number value of the resistance in ohms with the pointer at this position is so great that it is immeasurable. For our purposes we will consider this to be an open circuit. An open circuit is a circuit in which no electrons can flow because of a break in the conductive path which the electrons usually follow.

Our next task will be to have the two meter probes make contact with one another. This may be done by either holding them together with the thumb and forefinger of the left hand or connecting them with a jump wire. Set the selector at R x 1 in the ohms selection ranges. Find the ohms adjustment knob on your panel. The ohms adjustment knob is indicated by the arrow in Figure 3. The ohms adjustment knob may be on top of the panel, or it may be on the side of the meter. It is usually red and clearly marked. With the two meter probes making contact, adjust the ohms adjustment knob until the pointer on the meter points to 0 on the ohms readout (pointer "b," Figure 2). If by turning the adjustment knob to a maximum in both directions the pointer will not "zero out," the meter will have to be opened and the batteries checked. If the batteries are good, check the battery contacts. If the battery(ies) is/are more than two years old, it is best to replace it/them with a new cell(s). Repeat this zeroing procedure at each ohms selection on the meter. Notice that each time you make a selection change, it may be necessary to rezero the needle. When measuring resistance and the necessity arises to change selections, it is imperative that we readjust the meter to 0. When the probes are making contact with each other and the pointer is at 0, this indicates

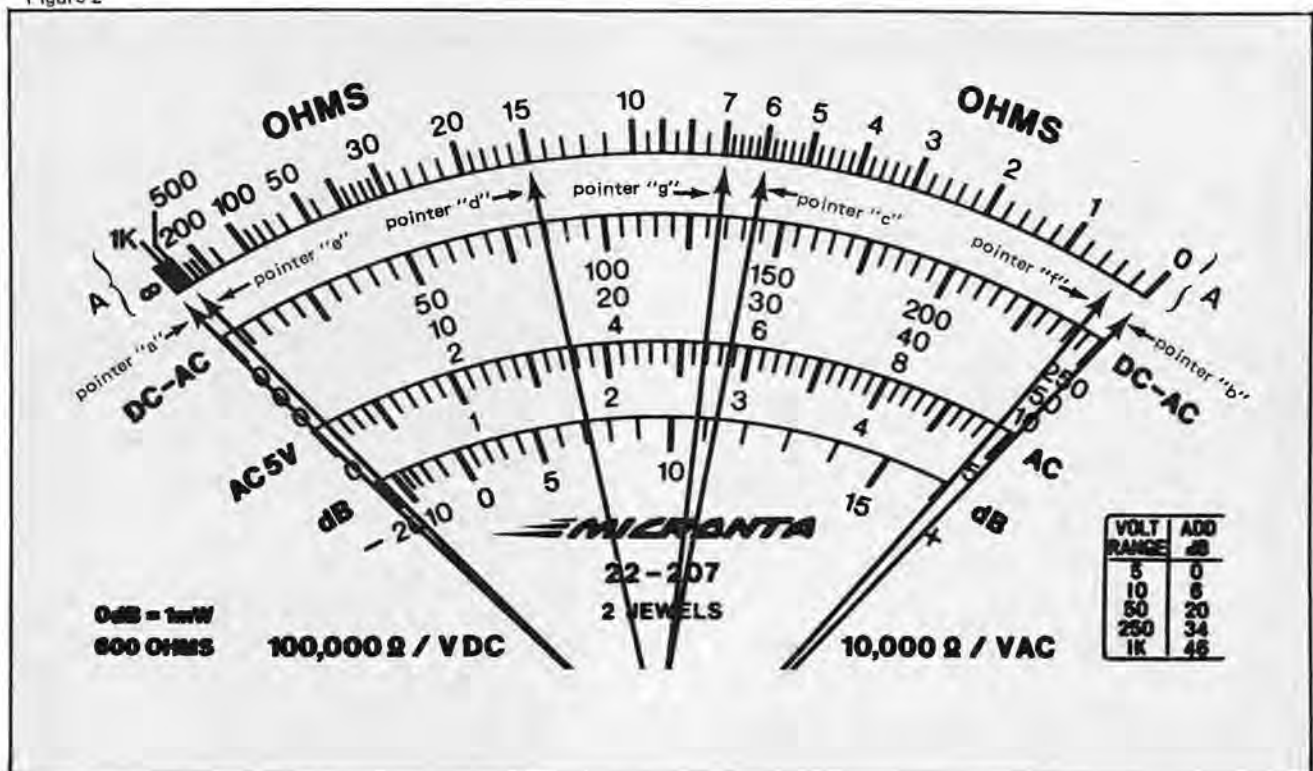
the path for the flow of electrons is resistance free. The electrons are flowing from the negative terminal of the cell within the meter, to the positive terminal of the cell and the meter is measuring the resistance they encounter.

### Continuity

We use the resistance measurements for two purposes; to determine the actual resistance offered by a component, such as a resistor or coil; and to measure continuity, which does not involve any actual numerical measurement of resistance. It is of prime importance to remember that any current other than that provided by the ohmmeter cannot be present in the circuit or component being checked or measured.

The measurement of continuity is employed as a check to see if a given path will allow electrons to flow freely. This check is used when we do not expect any resistance to the electron flow. We have seen that when the two meter probes are in direct contact with each other and the ohmmeter is set at any of the resistance scales or selections, the pointer registers 0 resistance (pointer "b," Figure 2). Were we to take a six inch piece of wire with the two ends exposed and the portion from end to end hidden by insulation or wrapping, we could not visually see if this wire were continuous or broken. The ohmmeter could see this. By making contact with one probe of the meter and one end of the wire and making contact with the other meter probe and the other end of the wire, the meter would indicate if there were a continuous path or not. With the meter zeroed, the selector set at one of the ohms selections, and observing the meter readout, we too can see the condition of the conductive path. If the needle settles on 0 in the ohms readout (pointer "b," Figure 2), we can be assured this is an unbroken path allowing free electron flow. If the pointer settled at  $\infty$  (infinity)—the position of pointer "a," Figure 2—this would indicate that a break or "open" was present in the wire. We cannot see if a

Figure 2



solder joint is good. We cannot see if a hidden wire is complete from end to end. The meter can, and when properly used it can be an eye that can see the hidden.

### Resistance (Ohms) Measurement

As in the measurement of voltage, the ohmmeter has a readout for every selection found in the selection area, even though there is only one set of numbers comprising the ohms readout (parenthesis A, Figure 2). Your meter may not have the identical selections of the meter being used for this primer, but the concept explained here is applicable with few exceptions. There are meters on the market that have 0 ohms on the far left of the readout scale and  $\infty$  at the far right. With an understanding of resistance measurement, you should be able to apply these measurement concepts to this type of meter.

In reference to Figure 1, the 12 to 3 position will reveal five possible ohms selections. The selection we use will dictate the value of the readout for that specific selection. (We should, by now, realize that any further reference to the ohms readout refers to the ohms readout scale pictured at the very top of Figure 2, parenthesis A.) To measure a coil we must seek out the wire or conductive path entering the coil and the wire or conductive path leaving the coil. With the selector on R x 1 (resistance multiplied by one), the meter probes on the entering and leaving points of the coil wire, and with the meter already zeroed, we will begin to explore what the meter tells us. The selector set on R x 1 indicates that the meter readout should be read as the raw or actual numbers as they appear. The pointer resting at 6 (shown by pointer "c," Figure 2) indicates that there are 6 ohms of resistance present in the coil being measured. Were the pointer to rest somewhere between 6 and 7, the value of each increment would have to be calculated. With the selector at R x 1 the value of each increment would have to be 0.2 ohms. Now measuring a different coil, with the selector set at R x 10, the pointer settles at 15 on the readout scale. This tells us the value of the coil is 15 times 10. The resistance within this coil is 15 ohms times 10 and has a resistance value of 150 ohms. Were the pointer to rest at one of the increments that lie between the 15 and 20, we would again have to make some mental calculation. Realizing that the selector being on R x 10 changes the value of the 15, the pointer rests from 15 ohms to 150 ohms. This concept applies to every number on the readout scale. With this in mind the 20 ohms now becomes 200 ohms. This then gives each increment between the 15 (actually now 150) and the 20 (actually now 200) a value of 10 ohms. This concept of readout value change with each selector change can cause confusion because of the mental multiplication required. I find it much easier to deal with the addition of 0's to the raw readout numbers as the selector indicates. When the selector is positioned at R x 1, the value of the readout scale is its actual raw value. In other words, a 6 is 6 ohms, 20 is 20 ohms, etc. When we move the selector to R x 10, the value of each readout number has one 0 added to it. A 6 becomes 60, a 20 becomes 200, etc. When the selector is set at R x 1K we add three 0's behind the raw number. A new factor to be considered is the value of K, which is 1,000; therefore, 7 would become 7,000 and 15 would become 15,000, etc.

We could go through all the selections of the ohms selector but that would require three more pages and another hour of reading. We can simply use the following mental transpositions rather than attempting to multiply. Following is a list of selector settings and the number of 0's to be added to the raw numbers of the readout.

- R x 1: Read out the raw values of the readout.
- R x 10: Add one zero to the raw numbers of the readout.
- R x 100: Add two zeros to the raw numbers of the readout.
- R x 1K: Add three zeros to the raw value of the readout.
- R x 10K: Add four zeros to the raw numbers of the readout.
- R x 100K: Add five zeros to the raw numbers of the readout.

Keeping in mind that as each readout value changes due to selection change, so too does the value of each increment between the numbers change. You will have to become adept at figuring this value change. Simply apply the concept as described in the earlier explanation of this increment change from a setting of R x 1 to R x 10.

When measuring resistance we want to get into the practice of measuring these values from the middle to upper (far right) regions of the scale. For example, we could measure a 500 ohm resistor or coil on the R x 1 selection. The pointer would rest on the 500 (pointer "e," Figure 2). We could also measure a 500 resistor or coil on the R x 1K selection. At this setting the pointer would rest at the position of pointer f, Figure 2. This would be the better of the two choices since the readout is at the upper portion of the readout scale. Most meters have a R x 100 selector, and this would be the ideal selection as it would put the pointer at the raw 5. With the selector at R x 100, the raw 5 on the readout would translate to 500. It will be noticed that many of the resistance measurements can be made in more than one selection area. Always use the area that will result in the pointer settling at the mid to upper portion of the readout scale. This practice must be followed because the meter is more accurate in this readout area, and the incremental value between numbers allows for a more concise determination.

Let's look at one more resistance readout. Assume we were measuring a resistor or coil with a resistance value of 7,000 ohms. We would set the selector on R x 1K. The selector set at R x 1K would, in effect, append three 0's to the raw 7 on the readout, making the 7 a 7,000. The pointer would rest at the position of pointer "g" in Figure 2. Should it rest a bit under or over this position, we would have to ascertain the value of the increments between the 6 and 7, or 7 and 8. Notice there are five increments between the 6 and 7 on the readout. Knowing that the actual value of the raw number 6 on the readout is 6,000 ohms and the actual value of the raw number 7 is 7,000 ohms, dictates that each increment between the 6 and 7 on the readout scale has a value of 200 ohms. Whenever the pointer falls between a raw number or an incremental marker, an educated guess will have to be made as the exact value being registered.

When reading resistances it is well to keep in mind

Figure 3



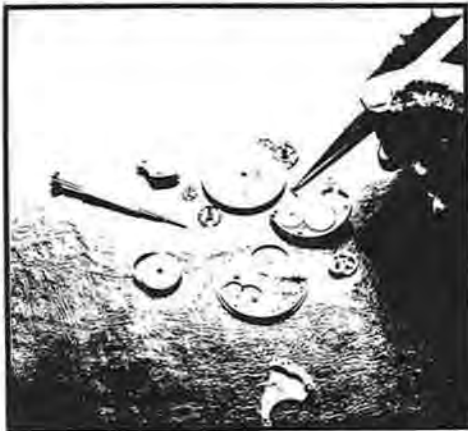
there is an acceptable error margin. Suppose the resistor had a 10% error or the coil had an allowable 10% error, and suppose the meter had a 5% error and we erred 5% in reading the meter. This adds up to a 20% error, should all errors be made in the same direction. Now suppose we were measuring a coil that a technical bulletin reported as having a value of 3,000 ohms. If we measure this coil and come up with a reading from 2,700 ohms on the low side, to 3,300 ohms on the high side, we would consider this to be a very acceptable reading as it is well within 20%. In fact, technical guides allow for this amount of error and state the coil may vary even more than the 20%, making the watch well within the acceptable operating coil resistance ranges. A technical bulletin reports that the coil value is acceptable when it measures from 3,400 ohms to 4,300 ohms. By pointing out that there are allowable variations in ohms measurements by no means implies that poor measuring practices are acceptable. A complete understanding of how a low or high reading coil affects the operation of a step motor watch will be a great aid in troubleshooting for difficult-to-find problems you may encounter when undertaking the repair of these watches.

You have probably noted that in this series I do not show a meter specifically for horological application. There are a few reasons for this. My meter study and its application to horology began before some of the presently available meters were on the market. I continue to use this meter since its wide range offers some teaching opportunities others do not. I am not in a position to recommend any specific meter, but I would suggest that meters which are available from watch material supply houses or watch manufacturers be examined. They are more applicable to the volts, ohms, and amps ranges encountered in watch diagnosis and repair. They also have or are readily adaptable to some add-on attachments, which are being introduced within the industry.

Next month we will look at amperage and the ammeter.

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# THE ROCK QUARRY

By Fred S. Burckhardt



## Customer Relations

**F**or those of you who may not know what is meant by "customer relations," it's just the opposite from your relatives—you're supposed to treat the customers nicely and with some respect. I asked one fellow what his thoughts were about customer relations and he said, "I've made it a point never to have affairs or associate with my customers." As you can tell from that statement, he has very little going for him.

How you treat your customers will determine how successful you are in this business. I know some business men that treat their customers like Attila the Hun treated his captives. Others, as soon as a customer enters, turn on the old "Suaveness," or as they say in Spanish, "El mucho suave!"

We must remember that our customers come to us because they have a problem. For some, the problem is much worse after coming to us. Nevertheless, it's up to us to solve the problem as quickly and efficiently as possible. While doing so, we must treat the customer as someone special. The customer may be feeling a little down as it is. Don't make things any worse. For example, if a customer comes in with a watch problem, don't do as one watchmaker I know. He opened the case, looked at the movement, and periodically glanced at the customer as he shook his head from side to side. Finally, he closed his eyes as if in prayer, then heaved a deep sigh. Acting like this would unnerve even the stout hearted. One woman went into a coma after watching him go through his act. When she came to, she said all she could see were her Social Security checks flying out the window. It's rather like the feeling you get when an auto mechanic looks at your car and only mutters "Hmmm" with an occasional "Whew!" It would be more humane to throw the customer into an arena with hungry lions.

Another thing you should never do is to embarrass or insult your customers. One time I was visiting in a store when a repair customer came in and laid his watch on the counter. The watchmaker looked at it and said, "That watch is filthy. I don't even want to touch it." He then added, "You don't even deserve to own a watch. Take it somewhere else!" It's possible that a reaction like this could cause hard feelings. Not only that, it could get you a rap in the mouth.

It's true, there are some customers who try to get to you. When this happens it's okay to lose your cool. Did you ever have a customer try to get you down in price? Try this: make believe you are refiguring the estimate and say, "I made a mistake. It should be ten dollars more." Then add, "I already quoted the other charge, so I'll stick with it." They'll jump at the chance to save the ten.

How about comebacks? Did you ever know a watchmaker to admit he did a lousy job? I know some who would rather have their hearts torn out than to admit the fault was

theirs. We must always look at the customer's point of view—not for too long—but we must look.

You know, electricity was one of the greatest things ever invented for the watchmaker. I wonder what excuse they used in the past? Can you imagine a watchmaker back in the 1700s telling a customer, "Too many protons got mixed up with the electrons, forming an overabundance of neutrons, and they got all over the hairspring." That son of a gun would have been burned at the stake. Now, all we have to say is, "Your watch has to be de-electrified." This also works with sundials but not with clepsydras or hourglasses. So, be careful.

Customers don't mind paying a good price to have their work done, so always charge a fair price for your labor and always give your customers their money's worth. They understand you have to make a living too. Nowadays, with so much talk about economic conditions, a review of your prices is in order. You must maintain a decent economic status. This can be done in one of several ways: raise your prices; raise a vegetable garden; raise the roof with your employer; or the last way, which is not recommended, become a thief.

Raising a vegetable garden is an excellent idea—if you have a green thumb. I'm afraid I don't excel when it comes to plants. I threw out a plastic rubber plant the other day because it died. Don't complain to your spouse (or spouses, whichever the case may be) about the grocery bills. There was a young couple in the store the other day looking at engagement rings. When she finally decided on the one she liked best, he asked her if she wanted the ring or a head of lettuce. I thought he was kidding until I walked over to the grocery store at lunch time and looked at the price of lettuce. It's no wonder it took the girl so long to decide on the lettuce and not the ring.

If things do become a little slow, learn to cut corners wherever possible. When you need to buy some clothing, go to Goodwill and buy back the things you donated last year. If you feel you can't stoop to this level, learn to shop wisely. I found a bargain a few weeks ago. It was a good-looking suit with three pairs of pants. The first time I wore it, I burned a hole in the jacket. It wasn't comfortable anyway. Wearing the three pairs of pants made me look a lot heavier than I am. I should have learned from a previous experience when I bought a pair of shoes real cheap. The reason the price was so good was because both were left-footed shoes. They didn't look too bad; it was the problem of walking in circles when I wore them.

What all this has to do with customer relations I don't know. To sum it all up, I would like to quote the words of a good friend who said, "When a customer comes in smiling and leaves frowning, you know you've done a good job." I wonder why He's not in business anymore?

WFB



Figure 3

### TREASURE FROM THE SEA

(Continued from page 14)

bell and the half hour on the higher pitched bell. There is also some form of quarter strike as can be observed from the four-lobed cam. There is evidence of a false pendulum, which is apparent from the curved opening above the center post of the dial. The four hinge blocks are visible. The alarm must have been a pull alarm, judging by the wheel with the square hole and small hole on the periphery for the tying of the pull cord. The comb is there for the return of the chime hammers and the impulse of the hammers on the bells. Visible are the calendar wheel and its index spring, the contrate wheel, the strike wheel, and the warning wheel with holes in the periphery, where steel pins once were to perform their various functions. The fusee and mainspring barrels, the twelve-lobed snail that controls the number of strikes, and an assortment of springs serving various functions are also visible. See Figure 3.

It is my opinion that it would be a major, yet worthwhile job to restore this clock to a functioning timepiece, as the maker had intended it to be.

I would like to thank the National Geographic Society for their cooperation in allowing me to use the infor-

mation from the December 1979 *National Geographic* magazine. The particular article referred to is entitled "Graveyard of the Quicksilver Galleons," and I would encourage anyone interested in more information to read this article. I would also like to thank the National Geographic Society for allowing the use of the photographs taken by staff photographer Robert S. Oakes.

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By Otto Benesh, CMC  
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## New Teeth For An Old Timer

I was recently asked by a client to repair his long case clock made in 1670 by Isaac Thuret of Paris. A little background on Thuret shows that he had been the clockmaker to King Louis XIV, the Horologist of the Observatory of Paris, and worked in the galleries of the Louvre. He is considered one of the most eminent of the early French clockmakers. Thuret duplicated the Huygens clock, created by Christian Huygens of Holland, who was credited with the development of the pendulum for clocks. Huygens was not successful in obtaining a patent in France where Thuret was working, but commented on Thuret's clockmaking abilities stating, "He makes them better than Samuel Coster did." (Samuel Coster of Haarlem, Holland had been making the clocks under a license from Huygens.)

The client owning the clock complained that it was no longer dependable in keeping accurate time. The second hand was skipping or jumping ahead and the clock was gaining time. Examination of the clock revealed a badly worn and poorly repaired crown-wheel. A previous attempt to correct wear by filing the teeth is shown in Figure 1.

Figure 2 shows a close-up of the teeth. The different lengths and poor filing in an attempt to improve the

Figure 1



depth, is quite obvious. The lack of depth resulting from the filing was adjusted by raising the lower crown-wheel arbor pivot as it rested on the lower potence. If only one or two teeth were too short, consideration might have been given to adding metal to the mauled teeth. In this case, however, so many of the teeth were in bad shape, that this would have been an unproductive type of repair. In addition, the teeth had been filed deeper. This creates a very bad situation, and one that falls more into the realm of restoration than that of repair.

There are two ways the crown wheel can be restored. One is to make a new crown wheel and collet. The other is to replace all the teeth with a new set. This is done by removing the old teeth, welding on a new ring, and then cutting new teeth. Figure 3 shows the parts that may be used.

Normally, if the object can be restored by replacing 50% or less of the original parts, then it is best to replace the bad portion. If more than 50% has to be remade, it is usually better to reconstruct the entire piece. This rule of thumb is not inviolable but it is a starting point in helping to make your decision. In the repair of this clock, cutting off all the teeth, adding a new ring, and cutting new teeth constitutes less than 50% replacement, so the second suggested course of action was decided upon.

In order to complete this res-

Figure 2



toration with the equipment available in most shops, all the work was performed by hand, or on a watchmaker's lathe. The wheel was mounted in the lathe with the upper pivot supported from the tailstock, and all the old teeth were cut off. Prior to cutting the teeth, a measurement was taken from the bottom of the crown wheel to the top of the least damaged tooth. An additional 2mm was added to this measurement as the height required for the new teeth.

Figure 3



Figure 4



The addition of 2mm was based on a visual examination and knowledge of this type of escapement.

After the teeth were removed, a ring was prepared to be added for the new teeth. This ring is made slightly oversize in order to allow for trimming so that the joint will be invisible. Figure 4 shows the crown wheel without teeth with the new ring ready for welding. Notice that the crown wheel has not been removed from its arbor.

Figure 5 shows the ring with bits of industrial silver solder that will be melted on the ring, and eventually sweated to the crown-wheel base.

Figure 6 shows the parts assembled and about to be prepared for the final welding. You can see that the new ring is slightly oversize in this view.

Figure 7 shows the sweating of the piece. The two objects that look like clamps are actually heat sinks, and are used to prevent the heat from traveling down to the pinion. This operation should not be performed without protection of this sort, or you will be left with

Figure 5



Figure 6



a soft pinion. If you cannot divert the heat, it would be better to remove the wheel from its arbor. However, if this is done, it may be necessary to make a new collet.

With the new piece welded to the crown wheel, the next step is to make the two pieces conform in thickness and depth. This operation is shown in Figure 8, where you can also see the arbor support that is used from the tail-stock.

Obviously, you cannot do all the sizing on the lathe because you cannot cut between the arms of the wheel; therefore, a file will be needed for the inside of the wheel. Figure 9 shows the inside being shaped with a crossing file. It is not necessary nor good practice to clamp the work in a vise while filing. If the corners near the arms need clearing, the use of a barrette file is suggested.

The next step is to cut the new teeth. If you have a cutter such as the one shown in Figure 10, the job can be finished in one operation. However, these cutters are extremely scarce, so we will use another method. The crown wheel we are dealing with has 15 teeth, and this is a bit of good luck. The index at the back of the headstock spindle is divided into 60 divisions. 60 divided by 15 gives 4, and by using every fourth hole, we will get 15 divisions. Since we are not using a shaped cutter, we will divide the wheel by using a slitting saw.

If you do not have a milling attachment for operating the slitting saw, the job can still be done. The rim of the wheel can be divided by using a protractor. 360° divided by 15 equals 24°,

Figure 7



Figure 8



so a mark at each 24° will give the spacing required. Another way to accomplish this is by using the index at the back of the lathe, setting the T-rest corner edge at the center of the spindle, and then moving the entire T-rest to the rim of the wheel. Without disturbing the height, mark the rim at each fourth hole of the index, and you will have your 15 divisions. These are then cut with a saw. You will need to allow a little extra metal for finishing, as hand saw cuts are not as smooth as the slitting saw.

When using any type of cutter or saw, it is vital that it be aligned exactly in the center of the headstock. An easy way of doing this is to put a male taper center in the headstock and then adjust the cutter to it as shown in Figure 11.

The male center is replaced with a collet that fits the crown-wheel arbor, and the 15 divisions are cut. The old

Figure 9



Figure 10



Figure 11



crown wheel had a decorative marking band or ring cut on the outer edge of the wheel. This mark was originally used to indicate the bottom of the teeth. The same ring was cut in the new piece and is the guide for the depth of the new teeth. Figure 12 shows this operation. The camera angle gives the illusion that the saw and the slit are at different levels but they are not.

When the 15 cuts have been made the next step is to cut the clearance at the back of the teeth. One half of a millimeter is a sufficient amount to leave at the top edge before beginning the clearance cut. These cuts are shown in Figure 13.

The clearance cuts are made with a jeweler's or piercing saw. A piece of wooden dowel is placed over the pivot, and the saw is used at an angle, in order to prevent damage to the pivot and other teeth as shown in Figure 14. Be careful! This is not the time to spoil the work done so far.

When all the teeth have been cut, it is time to finish the piece. The crossing file is put to use again as shown in Figure

15. It is used diagonally and in the end by drawfiling. This will result in a fine finish. This is followed by polishing with number 0 and number 4/0 french emery paper or an equivalent. The paper, cut to adequate size, is wrapped around the file, and used as you would in drawfiling.

In order to make sure that all the teeth are filed and finished to the same shape, a gauge as shown in Figure 16, is used. This is made from sheet aluminum. It is actually called "flashing aluminum" which is used in roofing houses. It is an excellent material for making this type of gauge, and can also be used to make test patterns for levers, detents, and other parts to be replaced. It is easily cut with a pair of ordinary scissors.

When all the teeth are the correct height and shape, nicely polished, and in harmony with the other pieces in the clock, the final step is to burnish the teeth. This is done to the front and back of the teeth. A narrow burnisher is being used as shown in Figure 17. The burnishing helps to harden the brass and also puts a smooth finish on the teeth.

Figure 18 shows the restored wheel, and can be compared with the original wheel in Figure 1.

The crown wheel is shown mounted back in its clock movement in Figure 19. There are a couple of inter-

esting points for your notice in this figure. The number of teeth in the crown-wheel pinion is 20. This is an extremely high number. The average clock with a verge movement usually contains 6 teeth or leaves. This large number was Huygen's solution to reduce the amplitude of the pendulum. Another interesting point is the length of the pallets. Many, many years later Dr. Rawling proposed that the pallets should be even longer for better operation of this type escapement.

There are many other fascinating things about this clock, but as we started out to correct the teeth of the crown wheel and this has been accomplished, it is time to let the patient resume its merry ticking once again after over 300 years of motion.

Figure 12



Figure 13



Figure 14



Figure 15



Figure 16

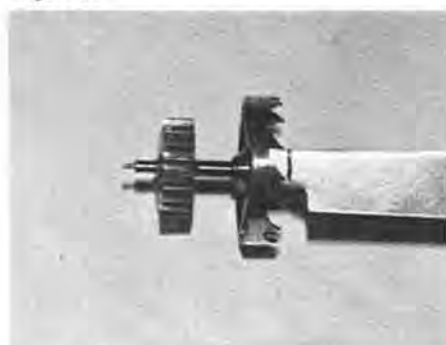


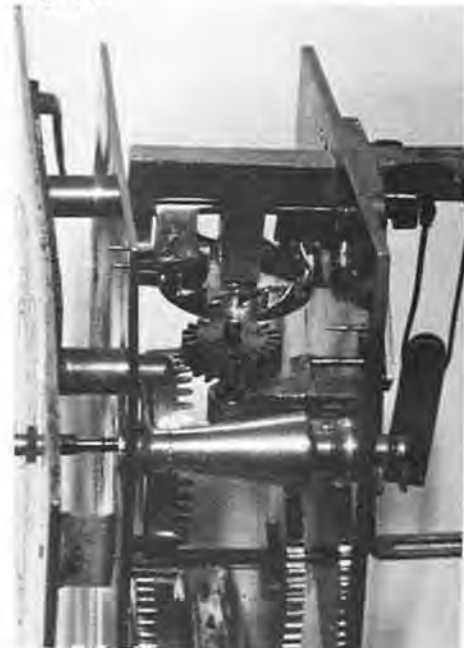
Figure 17



Figure 18



Figure 19



**SETH THOMAS CLOCK**  
(Continued from page 13)

but always retained its general form. It is considered to be one of America's most beautiful clock cases.

Our story on the Seth Thomas Pillar and Scroll-Top Clock will continue with Part II, "Case Restoration," in the next issue. This will include replacement of lost or improperly restored case pieces, veneer, escutcheon, repainting of the dial, and replacement of the tablet. A description of refinishing techniques will be included. It will be illustrated with photographs taken during the time.

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## Chinese Clock By Su Ling

It is a long day's journey and more from Canton, China to Colorado, even in these days of jet propulsion. How long and hard such a trip would have been 200 years ago is a matter of conjecture, limited only by imagination. But a clock made in 1760, traveled that distance. That clock, formerly in the Hagans Clock Manor Museum, is now at the Clock Tower Inn-Time Museum, Rockford, Illinois.

Actually, being a crude replica of an eighteenth century English clock in the James Cox tradition, but lavishly embellished in the oriental trend, the clock is a curious blend of European and Far Eastern design. For instance, the handcarved automaton figures show a hunter in a cocked hat, but the rabbit dangling from his arm has oriental eyes.

With a rectangular base about 18 in. x 12 in. and an overall height of 30 in., the massive bronze mechanism has a case adorned with handpierced scroll work, designed in a Chinese motif.

Each hour, on the hour, an acrobat within the upper frame turns on a trapeze. In the base of the clock sits a Chinese magician displaying an elaborate variation of the old shell game. While tinkling bells chime the hour, the magician lifts a tiny bell from the table before him to show that the bell conceals nothing. After lowering the bell and raising it again, a dish of fruit is seen. A third lifting discloses a bowl of fish, and when the final demonstration occurs, a bare plate is shown.

My interest in the clock began in 1954 in Chicago when I wandered into an antique shop while waiting to catch the train. The dealer, an old friend, mentioned that he had a clock from the Armour estate for sale. Within minutes the clock had a new owner—myself.

Each clock I have known with a history, has had an alive and vital personality. I can't explain why, but this anonymous clock appealed to me as if it were crying out for help. I spent every available moment of my time during the next four months in repairing and reconstruct-



This timepiece is believed to have been made by a Chinese scientist nearly 200 years ago.

ing the old clock. My first important discovery was Cantonese inscriptions on the backplates. They indicated that the clock was the laborious handwork of some patient, but crude workman, following as best he could the more refined English or Swiss original. The second item of significance was the clock's finish of fire-gilt, an art that had been lost for centuries.

Now began the long ordeal of walking back through uncharted areas of ancient history. The Chicago dealer and the estate liquidator, from whom he bought it, knew nothing more than the fact that the clock had belonged to the Chicago meat packing family. A letter to Mr. Philip D. Armour brought only the response that the clock had been in the family several years, a gift to himself from his stepfather, Mr. P. A. Valentine. Mr. Armour knew nothing of the clock's earlier history.

It is well known that not only the great James Cox, but many of his

English competitors, brought similar pieces with moving figures to China in the eighteenth century. Following the popular Baroque trend of the era, some of these imported clocks were excessively ornate. In spite of the beauty of their rich bronze work, this ornamentation is described as gimcrack or gingerbread.

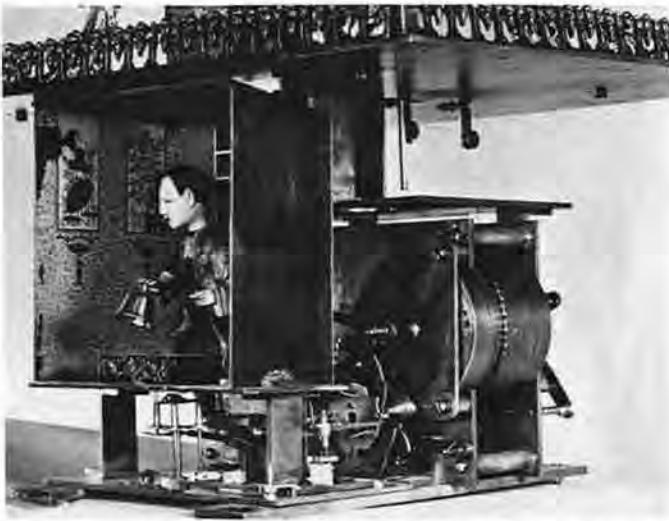
Chapuis & Droz, in their celebrated book, *Automata*, have noted that the watchmakers in Canton, and in Peking (or Peiping as it once was called), often copied these more ornate and richly decorative models, using fire-gilt finish. On the other hand, it is pointed out that many of the English clocks were overlaid with gold and precious stones by the Chinese purchasers, who desired to use them as gifts or bribes.

Since no definite information on the nameless clock had been acquired, I had been in correspondence with eminent horologists all over the world. Among those to whom I had written was the noted horological historian, the late professor Alfred Chapuis. I shall quote from his reply:

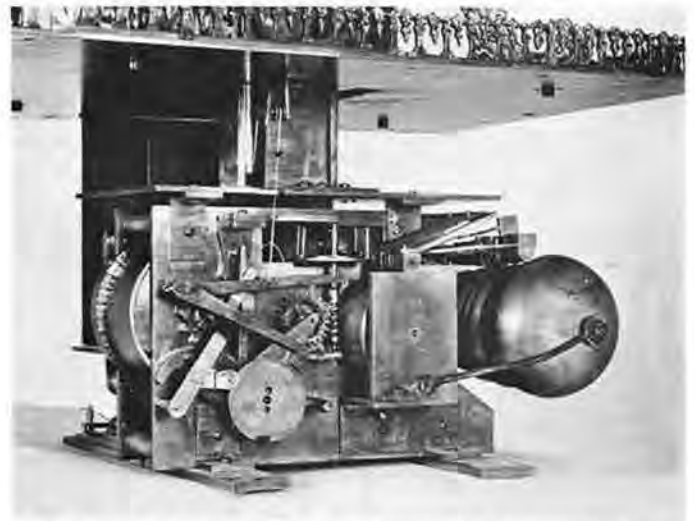
*This is one of the many pieces sent from England to China between the years 1760 and 1830, to which I am referring in Les Automates by Chapuis-Droz, page 112 to 120, and in Le Monde des Automates by Chapuis-Gelis, vol. 1, page 250 to 261. James Cox seems to be the best author concerning this type of clock, which is particularly popular in China and India.*

*I also have an article written by Simon Harcourt-Smith, "A Catalog of Various Clocks, Watches, Automats . . . in the Palace Museum and the Wu Ying Tien, Peiping (1933)." I know the author personally, who has lived in the Far East. However, this valuable work is no longer available, because the stock has been exhausted.*

*During all that time, James Cox and his competitors have manufactured and exported a great many timepieces bearing the names of J. Cox, G. Duck, Fleetwood, Higginson, George Pyke,*



Close-up of animated magician in the Chinese clock. The large drum at the right in the movement is a European-type chain-drive fusee, which equalizes the power transmission from the main-spring.



Rear view of animation and music section of the Chinese clock. The series of cams and levers is distinctly similar to the movements turned out by James Cox of London in the late eighteenth century. The workmanship is crudely finished but effective.

Carpenter, Barbot, etc. Some of these items marked W. Y. T. had an unusual, original style.

The clock you are referring to is one of the most harmonious types. If you study sketches 114, 115, and 116 in *Les Automates*, you will notice that the decorations in bronze are the same as the ones in sketches 197, and 198, as described in *Le Monde des Automates*.

The construction of the musical part of the movement is of English origin. During that particular period, the British were experts in making these musical boxes. Like the "automats," the "acrobats" were very popular in 1790. You may find in the *History of the Musical Box and Mechanical Music*, an English clock made in 1790 by William Staples (London), which has a dial with an "acrobat" of the same style. The "jugglers"

were also very popular and concerning this matter, I wish to refer you to *Les Automates* (Chapuis-Droz). I would date this clock as of 1790. (I have a little Japanese booklet showing one of these "jugglers" of Hosokowa, dated 1796.)

Therefore, it is not very likely that this timepiece was offered in Europe by the Chinese or offered by Europeans to a Chinese emperor. However, it is a timepiece bought by a Chinaman from one of the European firms established in Canton, which at that time, was the key city for world business.

Mr. Jeanne-Pierre Savary, a consultant of the Watchmakers of Switzerland, sent a letter of which I quote:

According to Professor Chapuis, there are no records in Switzerland showing that the Chinese ever went there to study watchmaking. However, Francois-Louis Stadlin was one of the first Swiss watchmakers to go to Peking, China, where he died in 1740. A great many watches were sent to China during the second half of the eighteenth century through London. Around 1775, the Swiss were dealing with the Chinese through Canton. At this time, China was closed and it does not seem possible that anyone could leave the country to study in Europe. On that subject, I would like to refer you to the book by Chapuis called *La Montre Chinoise*.

The first Chinese watchmaker known to come to Switzerland was a certain Mr. Accan who accompanied Mr. Bovet when the latter returned to Switzerland in 1831. The trade exchange in watches was free after the Treaty of Nanking in 1842.

Our Swiss correspondents also tell us that from 1680, there were some watchmaking shops and small factories in Peking. These shops were in the hands

of Catholic missionaries, but they did not last long.

Research by Dr. J. R. Needham of the British Antiquarian Society substantiates Mr. Savary's remarks, and indicates that watchmaking began in China as early as the first century, A.D., advanced to a high degree during the next few hundred years, and had degenerated to practically a lost art by the time Marco Polo visited the Chinese Court in the thirteenth century.

So, the rabbit with the oriental eyes and his captor with the tricorne hat, the spinning young man on the flying trapeze, the clever prestidigitator and the gentle chimes, still clothed in the awesome dignity of the unknown, lend an air of Eastern mystery to the clear Western atmosphere of their present quarters—tick-tocking, instead of talking.

Rabbit, held aloft by hunter, has oriental eyes.



Close-up view of gilt bronze hunter.





## Clock Repair Seminar

**W**hile attending the Executive Committee meeting the 1st of February, I had an opportunity to review the curriculum which Otto Benesh and Marvin Whitney have prepared for the new "Introduction To Clock Repair" course which they will instruct in Cincinnati, Ohio on June 7 to June 11, 1982.

I believe this course, presented by these two outstanding instructors, will be the opportunity many have awaited to "get started" in clock repairing. The course will cover: use and selection of tools, nomenclature, escapements, trains, pendulums and suspensions, disassembly, cleaning, lubrication and assembly.

Participants will learn the following repair procedures: bushing, repair and replacement of pivots, repair of wheels (gears) and pinions, repair and checking pallets, broken hands, motion, weights, and mainsprings.

The striking train will be disassembled, repaired, adjusted, and reassembled. Nomenclature and function of parts will also be covered. Each student will be required to bring the following tools: (AWI can recommend sources for the student who does not have the tools required.)

Bench anvil	Movement assembly clamps or legs (Lab. hose clamps)
Broach, cutting (30 to 70)	Oiler, syringe or fountain
Broach, round (30 to 70)	Oilstone, combination, coarse & fine
Brushes, watchmaker's, 4 row, medium stiff & 1/2 in. & 1 in. paint brush	Pliers, end or side cutting 4 in. or 5 in.
Burnisher, steel	Pliers, flat nose 4 in. or 5 in.
C-clamps, 1 1/2 in. - 2 in. opening w/swivel buttons	Pliers, round 4 in. or 5 in.
C-mainspring clamps or rings	Pliers, long nose or chain 4 in. or 5 in.
Clock regulating stand	Pliers, flat nose parallel jaws
Drill, hand with 1/16, 1/8, 1/4 inch drills	Punches, flat set
File, 6 in. or 8 in. flat or pillar, 3 or 4 cut with safety edge	Saw, jewelers w/assorted blades
Files, needle, set of 8 or 12	Scribe
File block, bench, wood 1 1/2 in. x 3/4 in. x 4 in.	Screwdrivers, 6 in., 8 in., 10 in.
Hammer, brass 2 in. or 2 1/3 in. mallet head	Steel rule, 6 in.
Hammer, peening 2 oz.	Tweezers, clock 6 in. or 8 in. w/straight-curved points
Keys, bench or let-down, sizes (5 & 6), (7 & 8), (10 & 12)	Vise, bench 1 1/2 in. or 2 in. opening
Knife, bench	Vise, pin set of or double end chuck, w/reversible chucks
Loupe	Miscellaneous items:
Micrometer	Crocus cloth
	Emery sticks, assorted grits
	Oil, clock
	Pegwood
	Selvyt cloth

Optional tools which the student may bring:

Clock bushing tool or hand reamer set (7 piece set for setting bushing w/o KWM frame or tool)	Clock punches set w/large holes
Centering punch	Dividers, 4 in. or 6 in.
Glass or brass scratch brush (pencil type)	Pliers, bent or curved long nose
	Vise, hand w/handle (similar to Lowell Pattern or wing-nut type)

Jobs or repairs to be covered in the course include:

Filing or reshaping a tapered pin	Repairing click spring on American clock
Polishing pivots and pinions	Repairing the hole end of a mainspring
Replacing a bushing	Repairing friction tension collet on center arbor of American clocks
Replacing latern pinion trundles or rods	Repairing and/or making a click
Replacing lever arms in American shelf clock	Squaring and dressing up barrel arbor squares
Replacing pin/pins in pin wheel	Straightening an arbor
Replacing suspension spring	Straightening an escape wheel tooth/teeth
Replacing tension spring on fly	Straightening pivots
Replacing tooth/teeth in wheel and barrel	Topping escape wheel teeth
Replacing wire tension springs on American clocks	
Repairing a broken hand	

Other projects will include making the following:

Brass lined pliers and/or tweezers	Gong rod bending tools
Brass bench block	Screw bluing tool or holder
Brass and steel hollow and/or solid punches	Taper pins removing pliers
	Hand lifters

AWI will furnish the raw materials, cleaning solutions and equipment, movements, lathes and collets, instruction, and facility. The course will be held at the Imperial House West located at Rybolt Road and I-74, Cincinnati, Ohio—just minutes away from AWI Central. Enrollment is limited. The cost is \$350.00 for AWI members, and \$450.00 for non members. For complete details concerning the course, housing, etc., write: "Introduction to Clock Repair," AWI Central, 3700 Harrison Avenue, Cincinnati, Ohio 45211.

This is the perfect opportunity for those who are serious about clock repair.

## A Clarification

**V**eteran industry leader and AWI member, George Gruen, asks for further information on an item in our January issue. The item, direct from our sources in Switzerland, announced that the European Watch/Clock and Jewellery Fair will celebrate its 10th anniversary when it is held in Basel April 17-26. Mr. Gruen recalls attending the event as early as 1931.

We checked further and came up with what may be the explanation. The Swiss Industries Fair has been held in Basel for the past 65 years. In 1973, the watch/clock and jewelry exhibitors organized as an entity called The European Watch/Clock and Jewellery Fair. They have some independent functions but hold their annual exhibit as part of the overall Swiss Industries event.

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# AWI TOUR



Stalheim Hotel in Norway is situated on the edge of the famous precipice overlooking the narrow mountain valley between Voss and the Sogne fjord. (Photo from Norwegian National Tourist office.)

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The spectacular view of the Naero Valley will be admired by members of AWI's ninth annual Horological Tour. AWI tourists, once again led by Henry B. Fried, will stay at the world famous Stalheim Hotel while in Norway. The tour will take place from the first full week in June until the 22nd of June 1982. The tour will include Prague, Leningrad, Finland, Sweden, and Norway. As in the past, the group will visit places of horological interest and have an opportunity to meet with their European counterparts.

The tour will include visits to museums containing sizable collections of watches and clocks. In Prague, there are numerous ancient public clocks of world fame with astronomical and automated figures and music, not to mention Old World, Bohemian charm. Aside from the usual sightseeing in Leningrad, the Paris of Russia, the group will visit the world-famous Hermitage with its vast storehouse of treasures and excellent collection of watches and clocks.

Efforts are now underway to arrange meetings with watch and clock trade groups in Finland, Sweden, and Norway. Each of these countries has collections of horological interest, as well as other well-known tourist attractions of the north.

The summer solstice will be approaching in late June, so tour members will have the opportunity to enjoy the long summer days of the north and the midnight sun of the lingering evenings.

Kuoni Travel will again make travel arrangements. All breakfasts, many lunches, and all dinners will be included. Those interested should contact the American Watchmakers Institute.

This comprehensive course is designed to equip today's watchmaker with the basic skills and understanding required to successfully service modern electronic watches. The course consists of the following seventeen lessons:

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- Lesson 2 Bench Work with Magnets
- Lesson 3 Dry Cells: Voltage and Amperage
- Lesson 4 Using a Meter to Measure Voltage
- Lesson 5 The Theory of Electron Flow and Ohm's Law
- Lesson 6 Using Meters to Measure Current and Resistance
- Lesson 7 How Magnetism Can Generate Electricity
- Lesson 8 Generating Electric Pulses at Your Bench
- Lesson 9 Introduction to Diodes and Transistors
- Lesson 10 Experimenting with Diodes, Transistors, and Capacitors
- Lesson 11 The ESA Electronic Watch, Calibre 9158
- Lesson 12 Electronic Principles of the Accutron
- Lesson 13 Quartz Crystals and Electronic Reduction
- Lesson 14 Bench Practice on the ESA 9180
- Lesson 15 LED and LCD Solid State Watches
- Lesson 16 Bench Practice on the LCD Solid State Alarm Watch
- Lesson 17 Summary

In addition to the written lessons, students will be involved in servicing two electronic watches, as well as working with concept teaching kits. AWI will provide the watches and kits. This course will prepare individuals for the AWI Certification Examination of CERTIFIED ELECTRONIC WATCH SPECIALIST.

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They follow the same format as was used in AWI's popular "Questions and Answers of and for the Watchmaking Profession," which was published in 1970. The original Q & A book has been widely used by students and schools of horology. It is about to go into its third printing. The new "Clock Q & A" book will be a companion to the earlier text.

The book contains 224 large, 8 1/2 x 11 in. pages and includes many original drawings and photographs. The economical but durable soft cover helps keep the volume in a price range easily affordable by students and beginners as well as professionals.

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## Be Organized

**T**o be, or not to be: that is the question." To be organized is the answer. Contrary to popular belief, I am not the most organized person in the world. However, I hate to admit it, because I want to convince you that we should all be completely organized. To do so, we must form new habits. This is difficult mainly because we must break our old habits, and we all know that a habit is hard to break.

### HABIT ABIT BIT IT

If we take away the H in HABIT, we still have ABIT left. If we take away the HA, we still have a BIT left, and if we take away the HAB, we still have IT left. So we see how hard it is to break our age-old habits, but we must if we are suddenly going to organize ourselves, our office, shop, merchandise, etc.

Naturally our phone is placed in a convenient spot, but what about important catalogs and price lists? Are they handy so we can answer our customers' telephone questions? How about our bench tools? Those tools which we use twenty times a day should be close to us, while items used only once in three months could be kept in the back of the shop.

Once, I worked in a store where most of the cabinets of staffs, stems, etc. were in the front of the shop under one of the wall cases. When the repair benches, which used to be close to these cases, were moved to the back room, this material just wasn't transferred at the same time. This was in the days when we replaced lots of staffs. Remember those good old days?

Meanwhile, back to my perfectly organized article. Since time is money, we should listen to new ideas and new methods. Maybe we can change some old habits into new ones by changing to faster more modern methods, without sacrificing good quality of workmanship in the process.

In view of this, our lathe is a very important old habit to hang on to. We realize that lathes and other equipment are expensive, but are necessary to do quality work. The only thing more important is to be sure we use it. We should have our lathe ready to use at all times, with the motor plugged in, the belt

connected, and a small, clear bench space available. So if we want to polish that pivot, we can reach in to a handy drawer, pull out the balance "balloon" chuck, place the balance in it, set it in the lathe, and polish the pivots. If our lathe is not in the standby position, then we are tempted to skip some part of the process. Maybe we do not polish that pivot by convincing ourselves that it just is not necessary; or maybe we skip cutting down the roller shoulder on that new staff, and as a result, the roller table splits as we stake it.

It is strange how long we can work in a bad habit situation without making simple time-saving changes. I had a nice bow pliers tool and used it for years on my watchmaking bench for closing bows. I also used this same tool on my solder bench to shape rings during repair. After thousands of trips back and forth, I finally purchased an extra pair of those pliers. Now I have one for each bench, and this saves time.

Now, how about our office desk? Naturally we have within reach our supply of rubber bands, paper clips, stationery, etc. These little items seem too small to mention, but small items, such as stamps can be important. If we run out of postage stamps, we may fail to mail that important order, and even lose a sale. Like our tools, we must keep adequate supplies, and put them in the proper places — "A place for everything and everything in its place." By being organized we save our valuable time, and this is important, being both watchmakers and salesmen.

It has been said that as good salespeople we should have a "blotter personality," thereby picking up ideas from others and sharing them. In selling to our customers, we must know all about our merchandise, so it is helpful to have our various catalogs handy to show those items that are out of stock. If our customers are interested in items we do not carry, then we might suggest somewhere that they could make their purchase. Sometimes it is proper to tell a customer where to go. Those who disagree with sending customers to competitors probably have not seen the movie "Miracle On 42nd Street." You will recall that a large New York department store hired a Santa Claus who would recommend a competitive store for certain items. About the time the department manager wanted to fire him, their store business started growing rapidly. Other competitors wanted to get into the act, and the movie ends with everyone believing in Santa Claus and his unusual, honest approach.

If we want our business to grow like the "Miracle on 42nd Street," let's improve our habits and be organized. Then our customers will buy now.

Buy now,  
Wes

## Law Enforcement Inquiries

Anyone recognizing any marks on the watch in the photographs are asked to contact Sgt. William Cantrell, Police Department, Kankakee, Illinois 60901. The photographs are of a Lebolt watch, serial number 666266.



The police department of the city of San Carlos, California recently made a seizure of some stolen property. In the course of the investigation, four old watches were seized. Following is a list of repair numbers found within the watches.

T4906	23607
3885	37592
NRS475 or NR8475	1521
10685	7062H73323
13160	6074GM (script)
20433	19D86

Any help in identifying these watches will be greatly appreciated. Please contact the San Carlos Police Department at 666 Elm Street, San Carlos, California 94070. Phone (415) 593-8011.

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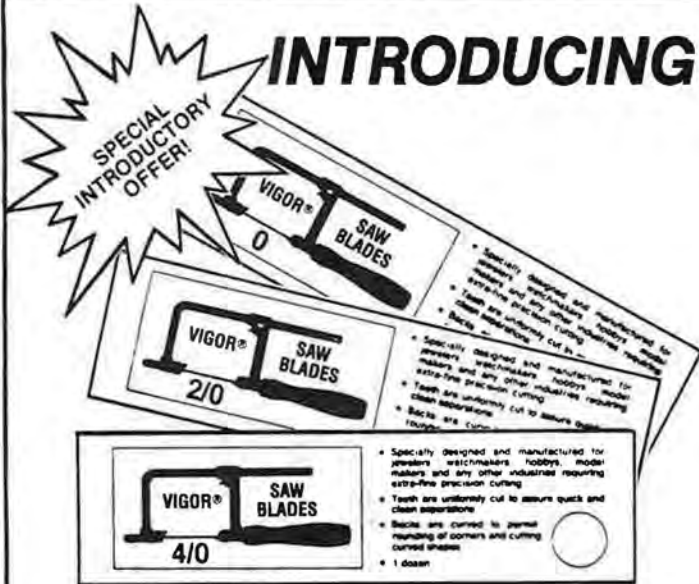


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## Credit Unions and Communication

I have received yet another letter from an aspiring young watchmaker, but unlike the others, he has a very positive attitude toward his chosen profession. He seems to feel that he is going to do well regardless of the adversities. I like hearing this from people. It is so easy to put the blame every place but where it should be - with ourselves. He does have one valid point (as do all persons just trying to get started). The cost of tools, materials, and borrowed money today is constantly rising. It is a problem that is not going to be resolved in the foreseeable future.

All this leads up to the question of what we as associations, guilds, etc. can do to help. The answer is a credit union. We here in Ohio, have such a credit union from which participating members can borrow money at a rate of 12% Annual Percentage Rate. Actually it is figured at 1% a month on the unpaid balance. This figures out to be somewhat less than 10% a year. Try getting your lending institutions to duplicate this program. It is a service that nearly all chapters could inaugurate to help its members. Should you be interested in getting a credit union started, I would suggest that you get in touch with Albert Brehl CMW, 1327 Linwood Avenue, Columbus, Ohio

43206. Al is one of the persons who helped to get the credit union started in Ohio and is presently its president. I know that he would be delighted to give you all the information he can.

I just received a note from our vice chairman, Fred Burckhardt, and he suggests that it might be a great idea if we were to institute a quarterly report from each chapter. This is a good idea, but we haven't worked out the mechanics yet. If any of you have any ideas about how we might implement this, let me know. We need to be in closer contact with each other, and we must find the best way to keep this communication open.

The lack of communication seems to be the biggest problem with the affiliate chapters. Each year new officers and delegates are elected. By the time a delegate gets back home and communicates what has transpired at our meeting, a new group of people hold office posts, and last year's report seems to somehow get lost in the shuffle. Perhaps a quarterly report is one way to remedy this situation. It would at least be a start in keeping in closer contact and better informed throughout the year.

We have tried having each

chapter send in a few copies of their bulletins to be distributed to the others, but it did not work because of the constant change in personnel. Regardless of the reason, the fact remains that we have an urgent need for a closer relationship between the chairman and the affiliate chapters. Once we find a way to break through this communication barrier, I am certain that we can be of genuine help to one another.

Again, I urge that you appoint your delegate for the annual meeting to be held June 25, 1982, if you have not already done so. You might also consider reappointing last year's delegate. It takes time for a person to become acquainted with the workings of the annual meeting, and it is possible that a person with a little experience can do more to further your requests. In any event, please appoint your delegates as soon as possible. It is just three months until the meeting, and I would appreciate having the delegates' names soon.

Keep your eyes open for robins. They may not be the true harbinger of spring, but they will do until something better comes along. After this winter, I am really looking forward to spring.

TMB

...from all around the ASSOCIATION...



## New Guild Starts in Sacramento

Watchmakers in the Sacramento, California area will be pleased to know that a new watchmakers association has been formed. It is called the Sacramento Watchmakers Association. At a recent organizational meeting the following were selected as officers: Louis E. Lutche, President; Alan Mercier, Vice-President; and Antone Giovanini, Ph.D., Secretary-Treasurer.

The group's meeting nights are scheduled for the last Thursday night of each month from 7:30 o'clock to 9:30 o'clock PM. Members will receive a mem-

bership certificate, a monthly newsletter published by Dr. Giovanini, plus the opportunity to participate in technical programs and workshops sponsored by SWA and AWI. Dues are \$12.00 per year.

This enthusiastic group invites all watchmakers and other interested horologists to join them. As membership increases, it will be possible to hold workshops on step motor watches, solid state watches, clock repair and restoration, and much more. For details, contact Louis Lutche, 8982 Leedy Lane, Fair Oaks, California 95628

## OHIO

On Thursday, January 21, 1982, the Central Ohio Guild met in Columbus, Ohio for the election of officers for 1982. Paul Moorehead was elected Chairman and Don Foltz was elected Treasurer. They will take office immediately, replacing Howard Opp and Jack St.Cyr. Plans were discussed for some interesting programs in the upcoming year.

There will be a seminar on March 20 and 21 entitled "Introduction to Solid State Watch Repair." The instructor will be Bob Nelson. Those interested in attending the seminar should contact Larry Hilvers, 721 N. Perry St., Napoleon, Ohio 43545. The seminar will be held at the Delpian Inn, New Philadelphia, Ohio, Junction I-77 and State Route 39, exit 81 off I-77.

The next seminar will be held in Chillicothe, Ohio on May 15 and 16 at the Holiday Inn, 1250 N. Bridge Street. The topic will be "Fundamentals of Solid State Watch Repair" with AWI instructor Howard Opp.

## NEW YORK

The first meeting of the Horological Society of New York was held on January 5, 1982. Featured, was "The Story of Dial Refinishing." This extremely interesting program, from the files of AWI, tells how dials are made and refinished. The photos are from a dial refinishing shop.

The elected officers of HSNY for 1982 are Aaron Rennert, President; Dennis Tricarico, Vice-President; Alvin Rudnick, Executive Secretary; Peter Davis, Financial Secretary and Treasurer; Victor Hull, Recording Secretary; Seaford Williams, Sergeant at Arms; Irving Albert and Howard Levy, Trustees. The Executive Committee consists of Ben Matz, Irving Feld, Henry Loeser, Paul Homburger, and Morton Silver.

## NEW JERSEY

Watchmakers Association of New Jersey began its new year of programming with another of its members as the featured speaker. Steven G. Conover, who is also a technical editor of the *Horological Times*, entitled his presentation, "Is Clock Repair Worthwhile Today?"

Based on his own experience in building a successful repair business from what had started out as a hobby, Mr. Conover answered his own question with a qualified "yes." Being a good technician and having a thorough knowledge of clock mechanisms is not the only skill needed to succeed in this business. One must also have a keen

sense of customer relations. There are many pitfalls in the delicate relationship which develops between a repairman and those who bring their clocks to him.

Mr. Conover dealt extensively with many aspects of running a repair business, such as written estimates, investing in good tools, guarantees, and instruction (for the customer) on proper care of their timepieces.

The February meeting of the WANJ featured a Rolex program. The guest speaker was Mr. Erich Lorenz from Rolex. Mr. Lorenz comes from an impressive technical background: a four-year apprenticeship in Germany; a full-fledged member of West German

Watchmakers Association; and five years trade experience in Germany and Switzerland. In the United States he worked for Longines-Wittnauer before joining Rolex twenty years ago. Mr. Lorenz was foreman of the Rolex shop for ten years and has been manager of consumer service and personnel for the past five years.

In his presentation Mr. Lorenz went over fine, technical points, using slides to show movements in detail, special features, and lubrication procedures. He also gave a rundown on Rolex quartz models. In addition, members saw a sound film, "Of Time and Men." Mr. Lorenz also distributed tech-  
(Continued on page 50)

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## DAYDREAMING

Now that March has come, we suddenly realize that the cold, white winter, which battered the country from coast to coast, is finally passing. Looking at the calendar, we see that the 21st of March is the beginning of Spring. Now is the time to start daydreaming of the melting snow pouring into creeks brimming with trout. It is time to take out the fishing reel which has started to rust, take off the old line, and remove the rust from the wheel pivots.

March is the time to collect receipts of the past year and pay taxes. It is also the time to pause and look forward to see what is in store for you in the watch-repair field. With each new development in timekeeping technology, watchmakers have predicted the end of careers for watchmakers and repairers. When automatic watches came on the market, most watch repairmen threw up their hands and would not touch them. When electronic and quartz watches came out, the song was the same. Today some repairmen will not touch anything with a 1.35 or 1.50 V cell in it.

In this day and age, the realm of volts and electricity to an ordinary layman, including a watchmaker, is something to be coped with. Presently, liquid crystal, light emitting diode, and analog watches are on top of the trade. This is due to the accuracy of the quartz timepiece—forty to sixty seconds, plus or minus per year as compared to the mechanical winding watches of plus or minus five minutes per week. With such sophisticated timepieces, we still have a high demand for watch repairers. The repairman must be able to service these timepieces.

Keeping up with this watch technology is a challenge in itself. Quartz technology must be studied—namely, electronics. This can be done by attending seminars presented by watch manufacturers, watchmaking guilds, watchmaking schools, and AWI.

Let's take a peek at the slice of quartz that has been put in a vacuum tube. For accuracy, the piece of quartz is cut with a laser beam, while in the tube.

The 1.5 energy cell emits 0.000001 to 1 microamp quartz per oscillator, which will vibrate 32,768 times per minute. The integrated circuit decoder takes these 32,768 vibrations and divides it by two, fifteen times, which comes out as one vibration per second. The one beat from the stepmotor makes the one second on the sweep second hand on your watch. The mechanical watch ticks and tocks five times per second. That is 300 times per minute, 18,000 times per hour.

The watchmaking field attracts

men and women who are fascinated with miniaturized objects, who don't give up easily, possess good vision and dexterity, and are able to sit for long periods of time. Women watchmakers are making their mark in the industry. They are well accepted in the trade, and we in the industry are happy to see more women becoming interested in the repair trade.

Don't forget the AWI Affiliate Chapter meeting June 25 and AWI Directors meeting June 26 and 27, 1982. All instructors are invited to attend.

SCHEDULE FOR R.E.C. MEETING *		
Drawbridge Motel and Convention Center		
Ft. Mitchell, Kentucky - (Near) Cincinnati, Ohio Airport		
June 21, 1982		
8:00 A.M. - 12:00 P.M.	Les Smith, CEWS	Certified Electronic Watch Service Course for Certification
12:00 P.M. - 1:00 P.M.	Lunch	
1:00 P.M. - 5:00 P.M.	Certified Electronic Watch Service Course for Certification	
June 22, 1982		
8:00 A.M. - 12:00 P.M.	Certified Electronic Watch Service Course for Certification of CEWS	
12:00 P.M. - 1:00 P.M.	Lunch	
1:00 P.M. - 5:00 P.M.	Zantech—Louis Zanoni, instructor	
June 23, 1982		
8:00 A.M. - 12:00 P.M.	Citizen Watch Company	
12:00 P.M. - 1:00 P.M.	Lunch	
1:00 P.M. - 5:00 P.M.	Watchmakers of Switzerland Seminar	
June 24, 1982		
8:00 A.M. - 12:00 P.M.	Bulova Watch Company	
12:00 P.M. - 1:00 P.M.	Lunch	
1:00 P.M. - 5:00 P.M.	Seiko Watch Seminar	

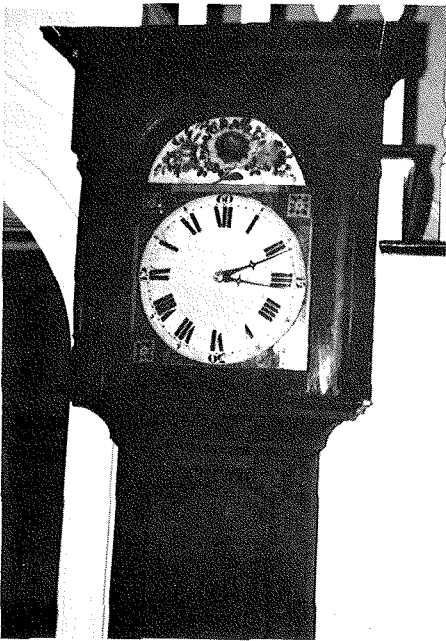
All instructors of the R.E.C. member schools are eligible to attend R.E.C. Seminars.

\*Please note date changes from February issue.

**QUESTIONS AND ANSWERS**

*(Continued from page 16)*

88" high. The movement sits on an H-shaped member with no fasteners of any type. The hood is removed by sliding to the front and has two free standing round columns at the front corners. The hood has a glass door and the trunk has a door with a rounded top. The clock sits on wooden feet about 3 1/2" to 4" high. Moldings used at the top of the plinth and top of the trunk are of the concave (hollow) type. There is also a wood plate affixed to the rear of the movement by two wood dowels and steel pins and has a round hole at the top. This appears to be a means of hanging the clock if it were removed from the case.



Any information you could give me regarding the probable date and place of manufacture would be greatly appreciated.

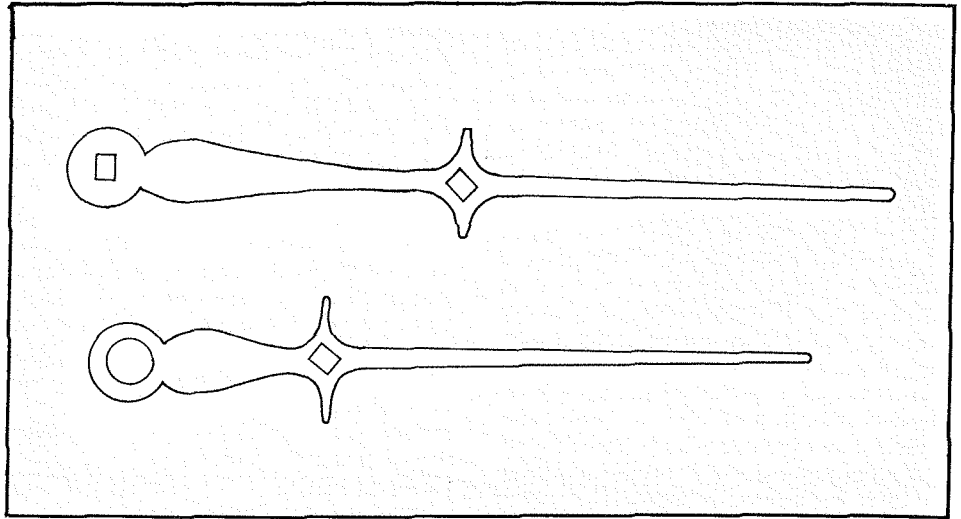
Tom Perkins  
Port Orchard, Washington

**A** The photos of the movement show a typical German clock of the middle to late-middle 19th century. This type was known as "wag-on-the-wall" and most often was hung without any tall case. Yours is most likely a later addition.

Such clocks were also made by the German Black Forest makers for table or shelf and used a fusee mechanism as well. The chain pull up is also typical. Some early types were also used for cuckoo clocks of a better make.

These are nice items. Sometimes I've seen these with new brass bushings in the wooden plates.

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## PRESIDENT'S MESSAGE

(Continued from page 4)

copies of current French calibers, as well as copies of calibers from other countries. A shock device shown on one movement was an exact copy of the Incabloc® shock device.

Mr. Fried reported that in the factory every part and every movement is carefully inventoried. With special permission, he was given a movement to bring out of China with him. Henry also reported seeing copies of his books and other well known horological books condensed and translated into Chinese. He had the opportunity to visit some individually operated watch repair shops. The government does permit the operation of these businesses; however, the owner is paid a salary from the government, and all income from the shop is turned over to the People's Republic of China.

The people pictured in the streets seem to be well fed and well clothed. The mode of transportation

for most was by foot or bicycle. Their standard of living is about forty years behind ours, but the people are reportedly happy with the progress they are making. There is little crime. Families are penalized for having three children or more, and the changing of jobs or towns requires government approval.

Because of the special interest in Mr. Fried's report on the development of the horological industry in Red China, Robert Nelson, Chairman of the Visual Aids Committee, arranged to have the entire program recorded on video tape. This extremely interesting program will be available to watchmaker and jeweler groups for viewing at their scheduled meetings and conventions.

## ASSOCIATION NEWS

(Continued from page 47)

nical literature. To top off the evening, Rolex treated members to cake and coffee.

## FLORIDA

At the first quarterly meeting of the FSWA, Charles (Chuck) Bates was installed as President. Chuck graduated from the Spencer School of Watchmaking in North Carolina in 1946. He owned and operated a jewelry store for several years. At present Dr. Bates is Director of Teacher Education at Warner Southern College in Lake Wales, Florida. He also owns and operates a small trade shop and has served in all the offices of the state association.

Mr. Melvin Liebman was installed as Vice-President and will be in charge of publishing the convention booklet. Dorothy Aderman will continue as Executive Secretary and Wilburn Felty of LaBelle, Florida is the Treasurer.

Buddy Carpenter came out of the snow and cold January 23 and instructed the first bench course of the year on the Citizen Quartz Calibers 73 and 924.

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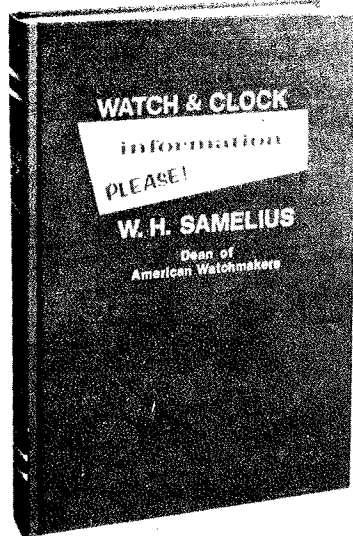
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More than 22 main categories of information appear, including: escapements; hairsprings; mainsprings; watch and clock and chronometer dismantling and assembly; striking and chiming clocks; pendulums; wheels; technical data; dials; tools; restoration and repair of clocks and watches; watch and clock adjusting; timing, as well as histories of many American clock and watch companies.

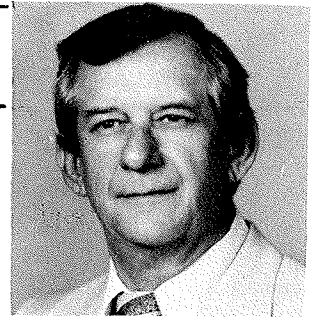
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# Bench Tips / Joe Crooks



## TWO TIPS FROM NORTH CAROLINA

*These two handy bench tips are from William R. Tobert, P.O. Box 710, Millers Creek, North Carolina 28651. Thanks Bill for taking the time to write.*

As you know, there are several tips concerning the location of a small stone or object lost in an ultrasonic cleaning tank. I have found that using a beaker to locate the item works quite well, although you still have to retrieve the item. I find that if you use a piece of packing foam rubber about 1/2 inch thick and slightly wider than your tank, you will be able to push it through your tank, holding it tight to the bottom and edges with your hand. You will find and retrieve the item with only one pass through your tank.

Another tip for a different way of removing a broken screw from a watch plate without tearing the movement down and soaking it, is to use the carbide tipped graver that so many

of us use to accomplish our scratch mark. Score the broken end that is left in the plate several times, and it will cut deep enough to allow most screws to be backed out with a screwdriver.

*About that first tip—the packing foam will also clean a lot of gunk from the bottom of the tank and give you a few more days between changing the solution. An accumulation of gunk inhibits the ultrasonic action in the tank.*

*I will try your second tip the next time I have a broken screw flush with the plate. I sure have messed up some good gravers trying to cut a screw slot!*

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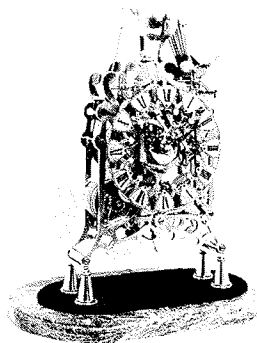
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## MARCH

7	F	Nashville, TN	Opp
14	D	Chicago, IL	Smith
20-21	H	Lancaster, PA	Benesh
20-21	I	San Francisco, CA	Baier
21	E	New Philadelphia, OH	Nelson
23	I*	Sacramento, CA	Baier
27-28	I	Los Angeles, CA	Baier
28	J	Lancaster, PA	Bishop
28	G	Orlando, FL	Biederman
28	C (a & b)	Ellisville, MS	Broughton

## APRIL

2	D	Lafayette, LA	Smith
16	C (b)	Wisconsin Conv.	Broughton
17-18	I	Phoenix, AZ	Baier
18	B	Boston, MA	Carpenter
18	E	Washington, DC	Nelson
18	F	Charleston, WV	Opp
24	G	North Dakota	Biederman
25	J	North Dakota	Bishop
24-25	H	Kansas City, MO	Benesh
28	I*	Albuquerque, NM	Baier

## MAY

1-2	I	Oklahoma City, OK	Baier
15-16	H	Knoxville, TN	Benesh
16	A	Dallas, TX	Jaeger
16	B	Philadelphia, PA	Carpenter
16	C (a & b)	New York, NY	Broughton
23	J	Wichita, KS	Bishop

## JUNE

6	F	Indianapolis, IN	Opp
9	I*	San Antonio, TX	Baier
12-13	I	Houston, TX	Baier
13	B	Kansas City, MO	Carpenter
19-20	I	Baton Rouge, LA	Baier

## JULY

10-11	I	Rockford, IL	Baier
17-18	H	Boston, MA	Benesh

## AUGUST

21-22	H	Minneapolis, MN	Benesh
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# Book Review

## ERROR

In the January 1982 issue of the *Horological Times*, on page 54, (Dr. Joseph G. Baier's book review, *19th Century American Clocks*, H.G. Harris) the last line reads, "Trichloroethane, a harmless substitute, has long been available . . ." The phrase "a harmless substitute" should have been deleted. As every watchmaker who uses "One Dip" knows, a warning appears on the label of that degreasing agent—an agent which very early replaced carbon tetrachloride.

*The Longcase Clock*, by Eric Bruton, second edition has 246 pages, 146 black and white illustrations, hard covers with dust jacket, 8 3/4 in. x 7 1/4 in. Published by Scribners. \$28.95.

Eric Bruton is one of horology's most skillful writers and researchers. His numerous past books have been well received. This second edition is an expanded volume illustrating a

larger selection of newer clocks. For those unfamiliar with the first edition, the book deals exclusively with the long case clock, (the proper term for what is otherwise known as grandfather clocks.)

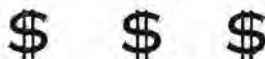
Bruton's fifteen chapters describe the birth of the pendulum clock, the very first clock with a pendulum with references to Galileo's and Huygens' work, and repeating Leonardo daVinci's sketches of such devices in the early sixteenth century. The development of a longcase clock concerns the public notices of Ahasuerus Fromanteel of such timepieces, and the ensuing development of case styles, dials, and hands.

Also, separate chapters are devoted to detailed discussions of moon and other calendric functions, and the development of the precision regulator in longcase, one-hand, and one-day clocks. Famous makers and their work are discussed in another chapter. The chapter entitled "An Ancient Workshop And Restoration Today," covers the descriptions of a master's shop with illustrations from old woodcuts. Wages, apprenticeships, officers of the guilds and their duties, and production methods are also covered in this chapter. Details of how they constructed and repaired clocks, provide an informative insight into their history and production.

(Continued on page 55)

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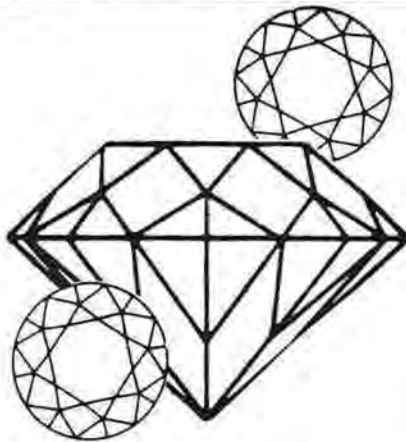
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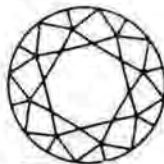
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**BOOK REVIEW**  
(Continued from page 53)

This fifteen page section is amply illustrated showing procedures covering a span of over two hundred years.

While the book deals with the longcase clocks of England in only four pages, the closing chapter on European and American clocks is more informative. A final chapter of ten pages concerns "Valuing And Setting Up A Clock." There are a number of detailed drawings to illustrate the instructional areas in the book; however, the center drawing on page 16 has the pallets twisted in the wrong direction—a fault found frequently in other texts as well.

An appendix for calculating pendulums is a worthwhile inclusion. Another appendix consists of a chart which assists the reader in establishing the era and age of a longcase clock. As in all of Bruton's books, this one has a very thorough index.

The book is well illustrated, the text is good, and photographs and drawings are clear. This book should make a fine addition to the horologist's library, especially to anyone contemplating or interested in purchasing or specializing in these stately timepieces.

Henry B. Fried

*Seth Thomas Watches, 1885-1915.* 94 pages, soft covers. Pub. 1981 at \$7.00. Distributed by American Reprints, 111 W. Dent, Irontown, Missouri 63650.

This booklet, containing actual reprints of old parts lists and Seth Thomas watch catalogs as well as information compiled from numerous trade and material journals, was assembled by Chris Bailey, Managing Director of the American Clock and Watch Museum in Bristol, Connecticut. Dan Gaenger of Long Island, an authority on Seth Thomas watches and clocks, contributed his research and cataloged a compilation of models and their grades.

This 94-page compilation is the best collection of Seth Thomas Watch Company history, tables, materials, and illustrations available to date, in one volume. This was originally published for the 1981 NAWCC convention and has now been reprinted for the general public. It contains pertinent material which has been extracted from over sixteen sources. This includes S.T. Movements, watch materials, and price lists. Virtually every S.T. movement is pictured in

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reproductions of engravings and line drawings. Seven photographs show the factory in different stages of development. Chris Bailey has also supplied a history of the watch company's operation from its inception in 1885 to the end of its production of over four million watch movements in 1915.

Among the models seen in this book are the 18 size 3/4 gilded plate and others, such as Centennial, Old Eagle, Maiden Lane, Old Century, New Eagle, 20th Century, Henry Molineux, Edgemere, and Eagle. In the material parts section, each part is pictured in actual size. In another section, complete watches are pictured. The Maiden Lane ornately engraved movement alone sold for \$50.00, while the now rare 25-jewel Maiden Lane is listed in 1909 for \$54.00. (Its original misprint lists this for \$30.00.) The various listings indicate the models, their grades, jewels, sizes, adjustments, type of regulator, hairspring, setting device, plate finish, and names on their plates. This is a fine work for the collector.

Henry B. Fried

*Clocks—Daniel Pratt's Sons.* Company catalog facsimile reprint of August 1911. 11 in. x 6 1/2 in., 83 pages, soft covers. Published in limited edition by Adams Brown Co., Exeter, NH 03833 at \$7.50.

Although Daniel Pratt's Sons is listed in B. Palmer's *Book of American Clocks* as operating between 1871-1880, the business continued until 1916 when the last Pratt died. This

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1911 catalog is the second of the catalogs of imported clocks, mainly with the Junghans trademark although French clocks are also shown.

Two hundred and twenty four clocks are assorted into these categories: "Westminster Chime Mantel," "Quarter Hour Strike Mantel," "Chime Wall," "Westminster Chime Hall," "French Gilt Crystal Regulators," "French Marble Clock Sets," "French Clocks In Wood Cases," "French Traveling Clocks," "400-Day Clocks," "Cuckoo (And Quail)," "Leather Folding," "Automobile," "Luminous 'Radium' Clocks And Watches," "Nickel Alarms," "Musical Alarm Clocks," "Desk And Novelty 'Show Window' Attractions," "Marble and Glass," and "Porcelain And Half-Hour Strike Mantel Clocks."

The mantel clocks which have the Junghans logo, show variety in well-finished cases with beveled, polished glass, matter dial plates, and satin chapter rings with strike-silent, fast/slow dialettes. These have three-train movements. Their style names include the names of numerous U.S. states and presidents, as well as other assorted names.

The wall clocks come with both exposed pendulum bobs, as well as others enclosed with beveled glass in multi-panelled designs with two- and three-train movements.

The hall clocks come in both spring driven and weight driven models, all with tubular chimes, and their height varies from 93 in. to 103 in.

The French crystal 14-day regulators illustrated contain mercury vial pendulums and fine French movements with spiral gongs. Some 8-day French movements contain cylinder escapements and are housed in wooden cases. The carriage clocks are supplied with both cylinder or lever escapement platforms.

Urania 400-day clocks are shown with a protective tube for the suspension wire, but have disc pendulums (one has a disc pendulum with two silver, governor type pivoted balls for regulation). These are housed in crystal regulator or domed glass cases.

There are twenty-seven cuckoo clocks with simple designs to very detailed and large carved figures. One clock has in place of the cuckoo bird, a trumpeter and bugle call in its housing. The auto dashboard clocks are Swiss, while most of the alarms are Junghans, including novelty alarms with apes, owls, and other animated figures.

Three models of Junghans "elephant" clocks are shown in the pivoting swinging types. The well-known light-house international time indicator clock with its windmill motif has eight dials slowly rotating to indicate world time. Two crystal ball clocks of the paper weight type, porcelain clocks, and table clocks complete this listing of various timepieces. Unfortunately, this well reproduced facsimile doesn't contain a price list but its good photos and fine engravings are an aid in identifying the 224 timepieces shown.

Henry B. Fried

*Collecting And Identifying Old Watches*, by H. G. Harris. 265 pages, 5 1/2 in. x 8 in., 83 figures, 4 full pages of color, hard covers with dust jacket. Published by Emerson Books, Inc., Buchanan, NY 10511 at \$11.95.

This book is a history of the watch ranging from its probable beginning in the late fifteenth century to the mid-nineteenth

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century. By following the text, one may reasonably date old keywound watches. Covered are the first known watches of the early sixteenth century and the more ornate ones that followed a century later. Technological developments such as the fusee, the balance spring, marine chronometers, the precision watch of the eighteenth and nineteenth centuries, and Franve's horological contributions are noted and illustrated.

Ornamentation and novelty watches are discussed and illustrated. Famous makers and their claims to status with examples of their work are pictured. A glossary of terms, dates of interest, and dates of French and English rulers are included to enable the reader to better understand the periods by which watches are known.

A good inclusion of English hallmarks improves the book's usefulness since so many English watches can be closely dated by the hallmarks in their cases. A bibliography and an excellent index completes the book. A four page color section pictures those watches having colorful enamels, gem ornamented cases and attractive, unusual forms; however, the color plates are not of the best quality.

The line drawings of the various escapements used in watches, the fusee, stackfreed, repeating and striking devices, technical features, and novelty clocks are well executed; however, the one illustrating "draw" is incorrectly drawn. The escape wheel teeth flanks, instead of having the required rake (most such escapements provide a 24° rake), are shown as radially planted teeth. This will result in the sharp entrance corners of the pallet jewels scraping the front straight flanks of these teeth. It should be pointed out also that the rake provides clearance but does nothing else to insure "draw."

This "draw" is a result of the offset angles of the locking faces of the pallet jewels from a line drawn from the escape wheel center.

There are numerous good photographs of typical period watches to help in determining their dates. A short history of famous horologists provides an interesting inclusion.

In all, this is a well-rounded book at a reasonable price. It will provide a good general reference for the beginner, as well as the experienced collector.

Henry B. Fried

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## BULOVA AND ETA ANNOUNCE FUTURE COOPERATION

In order to strengthen its position in timekeeping technology, Bulova announced today that it will join forces with ETA S.A. Fabrique d'Ebauches, the Swiss leader in high technology quartz movements. As part of this new arrangement, Bulova's Research and Development resources will be integrated into ETA. The strengthened Research and Development capabilities, increased production volume, and marketing skills will place Bulova in a stronger, more positive position in the marketplace.

According to company executives, not only will Bulova watches retain their advantage of strong consumer awareness and acceptance, but Bulova will also have products and styles which are at the forefront of Swiss technology, quality, and design.

James S. Waterwash, Bulova Vice President of Manufacturing said, "Such a positive outcome must result when you work from a larger production base incorporating the latest in Swiss technology. This agreement will create the highest quality and most technologically advanced watches at the lowest possible cost."

Andrew H. Tisch, President of the Bulova Watch Company, also stated, "Bulova and ETA have also entered into an agreement to join forces in the areas of advertising and marketing."

Dr. Ernst Thomke, Chief Executive Officer of Ebauches S.A., parent company of ETA, added that this agreement was the successful culmination of two years of negotiations between

the two watch companies. He added his enthusiastic support of this agreement stating, "Both companies will benefit greatly from our new arrangement."

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### EUROPEAN FAIR FEATURES NUMEROUS EXHIBITORS

The 10th annual European Watch, Clock, and Jewellery Fair is scheduled in Basel, Switzerland on April 17 to April 26, 1982.

Europe's leading watch and jewelry houses schedule the introduction of their latest developments and designs for the European Fair. The industry knows that the collections presented in Basel set styling trends for the entire year to come.

For the first time since the European Fair's inception, the organizers have decided to limit the number of exhibitors in favor of providing facilities to trade buyers and other business visitors. The Fair's roaring success since 1973 has made this necessary. There will be 472 exhibitors from the watchmaking industry, 729 from the jewelry industry, and 210 from related industries.

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### ZANTECH QUARTZ ANALOG SERVICE SEMINAR

Analog quartz and digital watch experts are joining forces to train

jewelers, watchmakers, and digital watch repairmen to service analog quartz watches. Louis A. Zaroni, President of Zantech, Inc., has announced that he and Ann-Louise Brackbill, President of Analog Watch Specialists Corp., are preparing for their first two-day Analog Quartz Repair Seminar. The seminar will take place in the new Zantech Training Center at 77 Shady Lane, Trenton, NJ 08619, on Friday, March 26, and Saturday, March 27, 1982.

Mr. Zaroni will conduct the electronic portion of the

seminar while Ms. Brackbill will instruct the students in the latest mechanical service techniques. The seminar will thoroughly teach all systems of the analog quartz watch. The students will learn and apply full analysis and troubleshooting techniques to both the electronic and mechanical systems, including a rarely explained generic study of calendar mechanisms and a new predisassembly circuit and coil test procedure. The tuition is \$300.00 per person. Anyone interested in attending or who

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Standing left to right are Louis A. Zaroni, President of Zantech and Ann-Louise Brackbill, President of Analog Watch Specialists Corporation. Seated is Mary Zaroni, Vice President of Zantech.



would like more information contact Mary Zanon, Vice President of Zantech, Inc. at 77 Shady Lane, Trenton, New Jersey 08619, (609) 586-5088.

### JA RALLIES FORCES FOR EXCISE TAX BATTLE

With the first "leaks" out of Washington indicating that a federal excise tax on jewelry (and other "luxury" items) might be imminent, Jewelers of America has already started to develop an intensive program to combat the problem. JA Chairman, Michael D. Roman stated, "We're not waiting for the tax to be a 'fait accompli' before we take action. We are putting the wheels in motion before the fact so that we are prepared to protect the interests of our jewelers from the very first moment."

JA's efforts are multifaceted. "Our Washington office has already been in touch with Congressional leaders who are involved in this issue," Roman explains. "We have also contacted other industry associations, as well as other retail associations to form a coalition that, with the strength of our combined numbers, can state our case to Washington."

### SEAFARING WATCH

A Pulsar men's LC Digital Alarm Chronograph watch was tied to the life raft ring of veteran sailor Reese Palley's 46 ft. yacht. It was used almost hourly for four months as a navigational instrument on a recent 9,000 mile Pacific Ocean sailing venture from Panama to Japan.

### BULOVA SCHOOL NAMES DIRECTOR OF DEVELOPMENT

Judy Myerson has joined the Joseph Bulova School (40-24 62nd Street, Woodside, NY 11377), as the first Director of Development for this vocational/rehabilitation facility.

A 1975 graduate of Farleigh Dickinson University, Myerson worked as an account executive before joining Bulova, September 21. She will direct a foundation/corporation campaign for the school.

The Bulova School is a nonprofit, vocationally oriented, rehabilitation facility founded by Arde Bulova in 1945. The school enrolls able-bodied, as well as handicapped students with disabilities either physical or emotional.

### CORRESPONDENCE COURSE AVAILABLE FOR QUARTZ REPAIRS

Media Digital Corporation has announced a quartz analog repair course which can be taken on a

correspondence basis. Consisting of fifteen lessons, the course covers the electronic portion of the quartz analog watch.

Some features of the course include: trouble shooting on the most common field repair problems on sample movements; training on the popular combined digital/analog quartz movement; and back up tools, equipment, and supplies available from stock, for sale.

The course price is \$225.00 and is offered on a pay-as-you-go basis. For a free brochure and application, call or write to Media Digital Corporation, 1 State Road, Media, PA 19063, (215) 565-7610.

### NEW JIC CHAIRMAN OF THE BOARD

James C. Clark, Executive Vice President of B. C. Clark, Inc. of Oklahoma City, Oklahoma has been elected Chairman of the Board of the Jewelry Industry



James C. Clark, newly elected JIC Chairman of the Board.

Council. Clark will be the seventeenth successive chairman to serve the council, a nationwide nonprofit publicity, promotion, and consumer education organization of the jewelry industry. It was founded thirty-six years ago and members of the council include retailers, manufacturers, and distributors.

Clark's election was announced at the organization's recent Board of Directors meeting held at the Rainbow Room of New York's RCA building. He will serve for a two year period.

Pulsar men's LC Digital Alarm Chronograph watch that was tied to a 46 ft. yacht.



## PULSAR INTRODUCES DUAL MOVEMENT MODEL

A handsome men's analog dress quartz model (UF298S) featuring dual movements and independent dual time zone settings was introduced for the first time by Pulsar at the Spring, 1982 JA Trade Show in New York recently. This men's dress watch has a gold tone rectangular case, genuine leather strap, a grey/gilt zone dial, with gilt hands and hour markers. Independent crowns control simple-to-operate time settings. The watch has approximately a two-year battery life. The Pulsar line is entirely quartz. Suggested retail price is \$140.00. For more information contact, Pulsar Time, Inc., Allendale Park, Allendale, New Jersey 07401.



New Pulsar Men's Analog Dress Quartz Dual Time Model UF 298S.

### NEW DIAMOND TWEEZER DUMONT

Dumont of Switzerland now offers a new line of diamond tweezers. Albert Froidevaux—USA is the exclusive distributor for the U.S.

Available in seven different styles, Froidevaux states that the jeweler will be truly impressed by the fine workmanship, smooth finish, deeply grooved stainless steel points, and the fine touch which could only be Dumont. These diamond tweezers are priced below what one might expect, the manufacturer reports. Froidevaux and Dumont feel that the market will welcome a high quality Swiss made tweezers at a reasonable price.

This product is imported exclusively by Albert Froidevaux and Sons—USA, and sold by Jeweler's Supply houses throughout the U.S. and Canada.

### TIMEX UNVEILS 1982 WATCH COLLECTION

With the introduction of 87 new styles, Timex Corporation launched an exciting 1982 watch collection at the Jewelers' of America International Trade Show. Paul Kulavis, Director of Advertising and Public Relations, Worldwide, noted that "The 1982 line is a breakthrough in styling refinement. We've created a new look—one that we feel meets the consumers' needs. Our styles are innovative and fresh, the line is complete, and we've been able to maintain or even lower price points."

Most of the mechanicals have been totally redesigned, and all are styled with flat crystals and dials for a trimmed down, fashionable look. Crafted with a quality finish and close attention

to detail, they range in suggested retails from \$16.95 to \$36.95—the same price as last year and the year before. For more information, contact Timex Corp., Park Road Extension, Waterbury, CT 06720.

### BULOVA SPORTS MODEL

Bulova features an exciting water resistant sports model designed for every occasion. With a rivet set bezel framing a champagne dial, protected by a Dura-Crystal, this watch features Bulova quartz accuracy, and sells for \$165.00.

For more information contact the Bulova Watch Company, Inc., Bulova Park, Flushing, NY 11370 (212) 335-6000.



New Bulova water resistant sports model.

### COMMEMORATIVE WATCH FOR WORLD'S FAIR

A new commemorative pocket watch is being introduced for

New for 1982 is this man's high-styled, slimline quartz watch by Timex. The champagne dial, topped with a flat mineral glass crystal, is complemented by a textured leather strap and simulated jeweled crown.





**THE 1982 WORLD'S FAIR  
OFFICIAL COMMEMORATIVE  
POCKET  
WATCH**

World's Fair Commemorative Pocket Watch. Has distinctive red, white, and blue dial. "Energy Turns the World" spells out the theme of the Fair. Nickel plated. Size 16 .

the 1982 World's Fair in Knoxville, Tennessee, May through October, 1982. Westclox, a division of General Time Corporation, will manufacture the pocket watch designed and distributed by Wagner Time, Inc.

"Energy Turns The World" theme of the 1982 World's Fair highlights the red, white, and blue dial. The watch used by Westclox is very similar to the watches they produced for the 1933 Century of Progress Fair and the 1939 New York World's Fair.

The watch will be a companion product to the World's Fair Commemorative Clock. Additional information may be obtained by writing to World's Fair Clock & Watch, Box 1982, Barrington, Ill. 60010.

**MIDO BARONCELLI  
COLLECTION**

Mido introduces a new star in

their Baroncelli Collection for 1982. Among the basic features of all Mido Baroncelli models are the attractive styling of the watch and perfect blend of the case and bracelet. Using the most advanced Swiss quartz movement to date, it is protected by a super water resistant case.

Both men's (3513) and

New—from Mido Baroncelli collection.



ladies' (3013) can be obtained in stainless steel or gold electroplate with a suggested retail of \$450.00 and up.

For a new catalog write to Borel Watch Company, Mido Distribution Center, P.O. Box 13111, Kansas City, MO 64199

**SHIELDS CORPORATION  
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DISTRIBUTOR**

The Shields Corporation has recently been appointed by Bahco AB, Sweden as the U.S. importer/distributor of its high quality hand tools.

Bahco electronics pliers have long been recognized for their precision construction. Selection of Bahco pliers include three types of side cutters and end cutters, two types of snipe nose, flat nose, round nose, and lead nippers. Bahco tools offer uncompromising quality at a moderate price and come with a lifetime guarantee.

For a free brochure write or call The Shields Corporation, 3000 Dundee Rd., Suite 420, Northbrook, IL, (312) 291-1460.



Bahco electronics pliers.

**ULTRA-MYTE  
JEWELRY CLEANER**

New Ultra-Myte Ultrasonic Jewelry Cleaner is specially formulated for use in ultrasonic

machines. It cleans and brightens precious metals and stones, and helps restore their original beauty and brilliance. This cleaner is very effective in removing rouge, solder fluxes, tripoli, and buffing compounds. Ultra-Myte is a 7:1 concentrate (seven parts water to one part Ultra-Myte). It is available in pints, gallons, and larger containers, as well as in premixed gallons.

For a free sample write to Parkway Products, P.O. Box 16251, St. Paul, Mn. 55116.



New Ultra-Myte Ultrasonic cleaner.

**REVISED CATALOG FOR  
WILLIAM DIXON CO.**

The Dixon product catalog featuring precision tools, supplies, and equipment for professional industrial customers has been revised and is now being distributed.

The more than 5000 items contained in catalog no. 77R are primarily used in the jewelry manufacturing, metalworking, silversmithing industries, and are sold exclusively through industrial distributors. Copies of the catalog are available from distributors handling the Dixon product line, or may be ordered direct from William Dixon Company, Carlstadt, New Jersey 07072. Include \$3.00 to cover shipping and handling costs.

# Classified Ads

## Regulations and Rates

Ads are payable in advance \$.40 per word, \$.50 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

## Tradesman

**QUALITY WATCH REPAIR** for the trade: Accutron, Quartz, Mechanical, all types of chronograph repair. European craftsman. Full 12 month warranty. Call collect, 1(612) 933-1120. Vaysberg's Watches, 166 No. Blake Road, Minneapolis, MN 55343.

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

**QUALITY WATCH REPAIR** by experienced European watchmaker, specialized in Antiques, RR-watches, Repeaters, chronographs, Hi-grade watches and unusual timepieces. All work guaranteed, prompt service, free estimates. Werner Landau, P.O. Box 7366, Carmel, CA 93921. (408) 625-1367.

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

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

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

**CUSTOM BALANCE STAFFS** for platforms, ship's clocks, pocket watches. Since 1922. SASE for information. James Bourne Co., P.O. Box 215, Ladysmith, WI 54848.

**CLOCK WHEEL AND PINION CUTTING,** repivoting, retoothing, escapement work. J.C. Van Dyke, CMW, CMC, CMBHI, 1039 Rt. 163, Oakdale, CT 06370.

**I AM NOW ACCEPTING QUALITY CLOCKS** for repair or restoration. Clock wheel and pinion cutting, repivoting, retoothing. Parts made to order. Send sample for free estimate. No watch parts please. David Arnold CMBHI, 556 Ann St., Elgin, IL 60120. (312) 695-1689.

**CLOCK SERVICES** wheels, gears, barrels, retoothing, repivoting, mainspring winding, bushing, jewelry. Send sample for estimate. SASE. Roy H. Niegel CMC, 21837 Woodbury, Cupertino, CA 95014. Phone (408) 253-4927.

**10% OFF** with this ad!! All dial refinishing, crystal fitting, and watch repair work. 48-hour service - Finest quality. Kirk Dial & Crystal Co., 625 4th & Pike Bldg., Seattle, WA 98101.

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

**TRADE WORK.** All tuning fork, step motor, LED, LCD, balance wheel electronic watches, except Timex. Prices on request. Darrell Archer. A-K Electronic Service. P.O. Box 719, 315 Muskegon Mall, Muskegon, MI 49443.

Restoration of antique watches and clocks. Gear and pinion cutting; cylinder staffing; repeaters and chronometer repair. Jean Fischer, 3920 Greenpoint Ave., Sunnyside, Long Island, NY 11104. Phone (212) 729-1785.

You! Have tried the rest. Now! Try the best for your custom made Horological and Instrument parts and Tool repair. Precision Instrument, P.O. Box 70004, Charleston, SC 29405. Phone (803) 553-1198.

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**CLOCK REPAIRMAN** for Richmond, Virginia clock shop. Will be an addition to our clockmaking staff. Familiarity with modern and antique, as well as a desire for quality work essential. Benefits: insurance, sick pay, holiday pay, vacation salary, and production commission. Call or write to Manager of Repair Department, Joe Pacino, 5609 Patterson Avenue, Richmond, Virginia 23226. (804) 282-0331.

Wanted: Watchmaker—Experienced in all phases of watchmaking. Some jewelry repair preferred. Live and work in resort town in sunny Florida. Send resume to: Horn's Jewelry, P.O. Box 1616, Crystal River, Florida 32629.

Two certified or experienced clock repairmen and one watchmaker to operate a factory authorized service center for clocks and watches in St. Charles, MO area. Must give estimates, completely overhaul and rebush antique or new clocks, cuckoos, anniversary, chime clocks, and grandfather clocks, etc., and do minor case repair, in a 10-year established business. We have the shop, tools, and equipment. Work under AWI Certified Master Clockmaker, Daniel J. Schultz, a skilled professional. Send Resume and picture to Tic-Toc Shop, Inc., 122 W. Terra Lane, O'Fallon, MO 63366. Phone (314) 625-1033.

## Wanted To Buy

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

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

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

## For Sale

**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. \$200.00. Write EOG, P.O. Box 11011, Cincinnati, Ohio 45211.

**For Sale—Timing Machines, Watchmaster Timers, Vibrograph 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, Tennessee, and West Virginia.

American Pocket watches, movements, cases, material and tools for sale. Write for list. Want to buy watchmakers tools, American pocket watches, related items. Dashto Horological Services, 5349 Basilica Circles, Virginia Beach, VA 23464. Phone: (804) 420-2631.

**U.S. HEADQUARTERS FOR ALL SCHATZ PARTS. PARTS FOR THE NEW 400-DAY ELECTRONICS. ALSO FOR KUNDO ELECTRONIC. GREENHILL CLOCK SERVICE, P.O. BOX 172, SANTEE, CA 92071.**

Metal Cutting Lathes, Bench Mills, Drillpresses, Unimats (accessories also), Maximats, Sherline, Machinex, the new Maximat Super Eleven. Lathe Catalog, \$1.00. Precision tools, inch or metric, aluminum, brass, steel, all shapes, miniature screws, taps, drills, saws, collets. Tool Catalog, \$1.00. Campbell Tools, 2100 Selma Road, Springfield, Ohio 45505. Phone (513) 322-8562.

**QUARTZ BATTERY CLOCK MOVEMENTS:** Regular or Mini; \$7.95 each, 3 for \$22.65, 6 for \$42.90. Hands included \$2.50 handling. CALDAK TIME, Box 3181, Camarillo, CA 93010.

Kienzle Quartz Clock Movements. Battery operated. From \$4.80 (in quantity). Free price list. North American Supply Company, Box 77-92BK, Fox River Grove, Illinois 60021.

Portescap VC-10, mint condition. \$1200.00. (208) 467-2863.

**AUCTION SALE: Sunday, March 14, 10:00 AM. Jewelers' Equipment and Supplies.** Darke County Fairgrounds, Greenville, Ohio (35 miles north of Dayton). Indoor, heated, seating, lunch. Settle estate of Ted Martin, Jeweler for 52 years. Jewelers' equipment and supplies. For sale bill contact John Neiswander, Auctioneer, 232 W. Fourth, Greenville, Ohio 45331. (513) 548-2640.

Steamaster steam cleaner, Model HPJ-2. Brand new, used only twice. \$450.00. Barfoot Jewelry, Custer, SD 57730. Phone (605) 673-4121.

**SUNNY FLORIDA:** Well established antique clock repair shop. Good paying trade. Interested parties contact Leonard Blum, P.O. Box 50262, Pompano Beach, FL 33064.

**JEWELRY AND GIFT STORE FOR SALE.** Northern Ohio. Town of 10,000. Only jeweler. Retiring. *Horological Times*, Dept. FS 382, P.O. Box 11011, Cincinnati, OH 45211.

**RETIRING — Clock Shoppe —** Southern California, Hi Desert — Elite Store — Heavy Repairs — Good Inventory — Excellent Lease. (714) 365-9676 days; (714) 365-9363 evenings and Sundays.

## 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. Zanonii, Zantech, Inc., 77 Shady Lane, Trenton, NJ 08619. (609) 586-5088.

**Clock and Watch Repairing Books.** Free catalog. North American Supply Company, Box 77-92B, Fox River Grove, Illinois 60021.

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**THE BEST OF**

## J.E. COLEMAN: CLOCKMAKER

For more than 28 years, Jess Coleman helped working horologists solve their day-by-day technical problems in clock repair by answering and analyzing their questions in his column "Clockwise & Otherwise," which appeared in *American Horologist & Jeweler* magazine. Since Coleman's death, many clockmakers have felt the void created by his absence. Now, in this single reference volume, the writings of Jess Coleman have been skillfully compiled by his contemporary, Orville R. Hagans, and a unique, 9-page index and cross-reference guide prepared by Hagans is a valuable, extra feature. Designed to aid those who are interested in solving the everyday problems confronted in practical clock repairing, this attractive, hard-bound, 544-page encyclopedia of horological information is published by the American Watchmakers Institute Press. The price is just \$30.00 postpaid.

Send \$30.00 payable to  
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Cincinnati, OH 45211.

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# Dates To Remember

## MARCH

- 2-7—Watch Material & Jewelry Distributors Association Annual Meeting; The Greenbrier; White Sulphur Springs, WV
- 6—MJ&SA Annual Boston Banquet, Park Plaza Hotel; Boston, MA
- 6-7—Jewelers Association Convention and Trade Show; Holiday Inn East; Springfield, IL
- 6-7—Jewelers Association Trade Show; Olympia Resort; Oconomowoc, WI
- 6-9—Gift & Jewelry Show; Denver Merchandise Mart and Exposition Center; Denver, CO
- 7—The Middle Atlantic Travelers Association Jewelry Trade Show; The Rouse Bldg.; Columbia, MD
- 7-9—Gift Show; Ramada Inn Blue Grass Convention Center; Louisville, KY
- 13-16—Gift & Jewelry Show; Cook Convention Center; Memphis, TN
- 14-17—Gift Show; Veterans Memorial Building; Columbus, OH
- 16—Jewelers & Silversmiths Management Association meeting; Top of the Court; Seekonk, MA
- 19-21—Jewelers Association Convention; South Padre Hilton Resort; Padre, TX
- 20—Jewelers Association Banquet; Ilikai Hotel; Honolulu, HI
- 20-21—Jewelers Association Convention and Trade Show; Hyatt Regency; Dearborn, MI
- 20-21—Watchmakers Association of Ohio; Seminar, "Introduction to Solid State Watch Repair," Robert Nelson, Instructor; New Philadelphia, OH
- 20-22—Georgia Jewelers Association Inc., Annual Convention; Northwest Hilton Inn, Atlanta, GA
- 28-April 1—Annual Exhibition of Fine Jewelry & Sterling Silver; Goldsmith's Hall; London, England

## APRIL

- 3—MJ&SA Western Gala; The Friars Club; Los Angeles, CA
- 4-6—MJ&SA Expo West; Los Angeles Bonaventura; Los Angeles, CA
- 17-26—European Watch, Clock & Jewellery Fair; Basel, Switzerland
- 23-May 1—MJ&SA Export Seminar and Basel Fair Tour; Basel and Lusanne, Switzerland
- 24-27—American Gem Society Conclave; New Orleans, LA

## MAY

- 11-13—1982 "Write Show;" The Writing Instrument Manufacturers Association; Peachtree Plaza; Atlanta, GA
- 14-18—California Jewelers Association Convention; Canyon Hotel; Palm Springs, CA
- 15—Jewelers & Silversmiths Management Association meeting; Bay Queen cruise departs Warren, RI
- 30-June 4—American Jewelry Distributors Association's Annual Convention; Tan-Tar-A Marriott; Osage, MO

## JUNE

- 6-9—Consumer Electronics Show; McCormick Place; McCormick Inn; American Congress Hotel; Chicago, IL
- 22-23—17th Annual Northeast Crafts Fair; Dutchess County Fairgrounds; Rhinebeck, NY
- 26-28—World Jewelry Trade Show; Las Vegas Convention Center; Las Vegas, NV
- 27-30—International Investment Gemstone Conference; Century Plaza Hotel; Los Angeles, CA

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# The best way to keep up with what's happening is through the company that's making it happen.



**Everything you need—technical information, special equipment, parts and materials—is available to you.**

**1. The Seiko Technical Library:** Six volumes containing everything about repairing watches. For mechanical watches, it's all-inclusive, and designed to put all the facts at your fingertips. Includes a Technical Guide to all basic Seiko movements, a Watch Parts Catalog, a Parts Interchangeability List and a Casing Parts List. For quartz information, there is a sampling of Analog and Digital Quartz guides as well as the current quartz casing catalog.

**2. The Seiko Microfiche System.** Saves you time, space and money, too. By storing the equivalent of 425 8½" x 11" catalog pages on one 3" x 5" grid. Every grid titled and alpha-numerically indexed for easy reference accessibility. Making important technical data and previously unavailable information readily accessible and easily stored in a minimal space area.

**3. The New Seiko Quartz Tester.** QT-99. A revolutionary timing rate measuring instrument, utilizing a sophisticated microcomputer system. Measures the timing rate for quartz crystal, tuning fork and jewel-lever clocks and watches. The rate is digitally displayed when the timepiece is placed on the microphone. It's also the only quartz tester that accurately measures the timing of Seiko Caliber 99 watches (Twin Quartz). Simple and ideal for after-sales servicing of just about every kind of clock or watch, and a powerful tool for promoting the sales of superbly accurate Seiko Quartz clocks and watches.

**4. The Seiko Handy Parts Pak Binder Assortment.** Three convenient replacement parts kits that can be purchased separately or as one combined unit. Includes the "Seiko Battery Hatch Gasket Assortment" totaling 72 gaskets in 16 different sizes, fitting 175 case numbers. The "Seiko Spring Bar Assortment" includes 100 spring bars covering 20 of the most popular spring bar sizes, that fit literally hundreds of Seiko

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Please send me more information on the subjects indicated. I want to keep up with what's happening. Check desired information:

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- Microfiche System
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This comprehensive course is designed to equip today's watchmaker with the basic skills and understanding required to successfully service modern electronic watches. The course consists of the following seventeen lessons:

- Lesson 1 Theory of Magnetism
- Lesson 2 Bench Work with Magnets
- Lesson 3 Dry Cells: Voltage and Amperage
- Lesson 4 Using a Meter to Measure Voltage
- Lesson 5 The Theory of Electron Flow and Ohm's Law
- Lesson 6 Using Meters to Measure Current and Resistance
- Lesson 7 How Magnetism Can Generate Electricity
- Lesson 8 Generating Electric Pulses at Your Bench
- Lesson 9 Introduction to Diodes and Transistors
- Lesson 10 Experimenting with Diodes, Transistors, and Capacitors
- Lesson 11 The ESA Electronic Watch, Calibre 9158
- Lesson 12 Electronic Principles of the Accutron
- Lesson 13 Quartz Crystals and Electronic Reduction
- Lesson 14 Bench Practice on the ESA 9180
- Lesson 15 LED and LCD Solid State Watches
- Lesson 16 Bench Practice on the LCD Solid State Alarm Watch
- Lesson 17 Summary

In addition to the written lessons, students will be involved in servicing two electronic watches, as well as working with concept teaching kits. AWI will provide the watches and kits. This course will prepare individuals for the AWI Certification Examination of CERTIFIED ELECTRONIC WATCH SPECIALIST.

Course Price: \$250.00

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