

# GoldSmith Watch Works



GSW COMMUNITY WATCHES



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<< PATEK-TIFFANY-MAINSRING CHANGE - Dial Restoration Is Costly Yet Necessary >>

## WHAT IS WRONG WITH MY WATCH

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### HOW A WATCH WORKS OR WHAT IS WRONG WITH MY WATCH

Remembering that I am self-taught has its bonus' as well as its drawbacks. using a history of mechanics, jewelry repair and design, books, video, and the internet, I became successful. The following info is written with an open view. So those greater than I have room....to? My explanations may befuddle a master watch maker. For I am not a master nor watch maker. I am a master watch restoration expert. Completely different in every way. The master simply builds the parts AND works in a computer processor type environment ...I find the easiest way to restore/repair my time pieces in a manor I can warranty yet not spend 7 hours building a balance. I rather replace the parts. Spend more time cross referencing vintage parts than building them. I spend more time on everything. how to repair a conversion accomplished in 1919. How to rebuild cases. how to cut crystals. to fix and restore dials. and, though my shop is so far from this immaculate watch makers shops, my product in all case is the same, but in many cases s better. I will not pay 35.00 getting new green bench covers. I use mine for years. they look like.. well.. stains all over,but it is permanent.and last but not least, my hands always bring critique. they are usually images of my work. the stuff doe not come out for weeks....

rock

#### TO BEGIN, IF YOU KNOW IT, SKIP AND READ NEXTIT.

IT IS ACTUALLY A MINOR EXPLANATION OF THE OPERATION OF THE DRIVE TRAIN.AND NOT AN EXACT/COMPLETE EXPLANATION. IT IS WRITTEN TO GET AN IDEA SO AS YOU READ YOU CAN UNDERSTAND. I HAVE USED MY PICS AND OTHERS CALLED UPON A FEW SCHOOL OR FORUM IMAGES THESE ARE LINKED TO THEIR APPROPRIATE WEB SITES.

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**: 1 THE TRAIN.**



- › First or Great wheel – is attached and ratchets the main spring by way of screw through the wheel and into the arbor of the mainspring barrel. The ratchet is the large wheel you see when opening the case back. What keeps the spring wound, forcing it to move the barrel, is “the click”. The click is a spring loaded device that clicks against the ratchet teeth and locks it into whatever place it stops at when winding. thus each winding of spring. Each turn of crown is met by the sound and/or feeling of the “clicks” of the click. This is caused by the clicking noise of this device as it lifts and then settles in between the ratchet teeth as it is wound. The pinion of the center wheel is turned by the teeth on the barrel.
- › Center or second wheel – turns once per hour. Its pinion is turned by the teeth on the mainspring barrel. Its arbor projects through a hole in the bridge and drives the *canon pinion* by friction. which carries the minute hand. It also drives the pinion of the third wheel. in wrist watches with center/sweep seconds, that is with the seconds hand pivoted coaxial with the minute and hour hands, this wheel is positioned off center to allow the fourth wheel to be placed at the center of the movement. In this arrangement the wheel is called the second wheel, because it is still the second wheel in the train but no longer at the center of the movement.
- › Third wheel – which drives the pinion of the fourth wheel. (this is called the third wheel because the mainspring barrel is the first wheel and the center wheel is the second wheel in the gear train)
- › Fourth wheel – In watches with the second hand in a sub-dial on the face, this turns once per minute, and the shaft projects through the face and holds the second hand. The fourth wheel also turns the escape wheel pinion.
- › Escape wheel – This wheel is released one tooth at a time by the escapement, with each swing of the pendulum or balance wheel. The escape wheel keeps the pendulum or balance swinging by giving it a small push each time it moves forward.

[ back in the olden day some bored watchguy figured that metal wheels lasted longer if they were fabricated of opposing materials, such as brass alloy against white metal alloy and vice versa. thus two brass wheels with meshed teeth/tines will wear faster than a steel wheel/gear against a brass alloy---fact rock]

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## 2 MAIN SPRING A



[click for mainspring repairs](#)

**DUE TO THE FACT THAT THERE ARE MANY WAYS OF DRIVING THE CANON PINION, AND MANY SUB DIALS, AS WELL AS UPPER/UNDER OFFSET CANON PINIONS, THE FOLLOWING, TO KEEP IT FRANK AND SIMPLE, WILL NOT GO INTO EVERY/EACH WAY. THE USE OF THE NAMES WITH TERMS OF USE SUCH AS CENTER, FIRST, PINION, THIRD, FOURTH WHEEL WILL BE KEPT SIMPLE BY EXPLAINING THE BROADER FACTS OF OPERATION. WHEEL/GEAR COVERS BASE. THE PINION ON THIRD WHEEL SIMPLY WILL BECOME A WHEEL/GEAR. FASTER WRITING VERSES EXACT TERMINOLOGY WHERE IT IS NOT NEEDED THANK YOU.**

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### 3 MAINSPRING B



#### MAINSRING BEGINS IT ALL

The mainspring when wound pulls the spring from the wall of the barrel onto the arbor / center tube with hook. the spring becomes wound around that tube with the hook holding steady. The spring, doing what it does BEST, tries to unwind back to it's normal position against the "wall of comfort". The only way to do this is for the barrel to turn rather than the spring because the spring is "locked to the arbor hook which is locked by the ratchet wheel "CLICK". So the entire barrel is turning trying to release the pressure. As it turns, the spring is slowly going back to it's natural position on the wall while the barrel turns THE

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### 4 "AS THE BARREL TURNS "

CENTER WHEEL POWERING THE CANON PINION.



BELOW PLATE ZODIAC OFFSET



Canon-Pinions-Explained

The mainspring just happens to have a " barrel of teethremember top info that center wheel and second wheel are used to explain the following

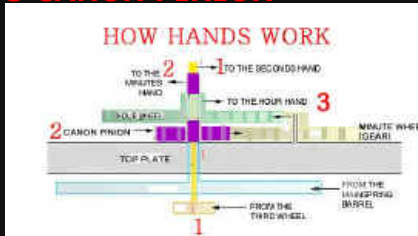
In addition to a container to hold the energy of a powerful spring, it is a "barrel of teeth" that mesh with the center wheel's PINION thus powering it up. So, as the barrel turns so does the center wheel and thus the CANON PINION because that center wheel naturally has a staff with pivots, the bottom pivot resting in a jewel or metal mount , and the upper staff fitting through a jeweled or non jeweled exit through the face plate where a canon pinion is fitted and were it then finds it's way through the canon pinion and a second hand is mounted.

note. There are a variety of ways movements are built.. there is the straight through center wheel with staff protruding through the canon pinion and powering the second hand, and then there is the center wheel with a hollow shaft that is fitted with a hollow canon pinion to mount the minute hand to. Then there is a third wheel that is separate it fits through the center wheel hollow shaft to mount second hand. Thus we have two units through the plate. The hollow operating the seconds hand direct the hour hand through the minute wheel [read canon pinions] with a second shaft on the third wheel that protrudes through the center wheel and canon pinion and where the second hand mounts.

below shows third wheel for second hand  
the canon pinion with connect with minute wheel and minute hand  
hour hand off the minute wheel

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## 5 CANON PINION



click above for info.

This is how the movement becomes a watch; where hands display time. A hollow tube with a gear at bottom titled the CANON PINION will fit over the center wheel staff and friction between the staff and that canon pinion will operate the hour and minute hands, but the second hand will fit over a machined end of the center wheel staff or the third wheel staff, which ever it is, that which protrudes to operate are hooked up. they are part of the actual train in every way. simply touching a seconds pinion will stop watch. as you read this study, way down, you will see that sometimes a hand fit too tight to dial can cause havoc!

remember, the only parts connected with movement, as in a trannie in gear with an engine, is the second hand pinion. period. if you have a movement with no second hand, you cannot stop movement if you grab the hands because all contact is through friction. why? when setting the hands the hands cannot be directly connected or it would destroy wheels in the movement. The only direct attached item outside of the movement are second hands; both sweeps seconds, clickers [my term for some click wrist watch seconds hands] or sub second hands. And it will be the only part that is directly and permanently [until removed] "hooked up" to the movement.

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## 6 ESCAPE WHEEL



I.

So we have main driving second wheel/center wheel. Depending on the movement, hands and canon pinion set up, we have the center wheel powering the next wheel in the train. That next wheel now performs the same task: a connecting wheel in a train of wheels with its engine remaining the mainspring.

[...also drives the pinion of the third wheel. in wrist watches with center/sweep seconds, that is with the seconds hand pivoted coaxial with the minute and hour hands, this wheel is positioned off center to allow the fourth wheel to be placed at the center of the movement. In this arrangement the wheel is called the second wheel, because it is still the second wheel in the train but no longer at the center of the movement]

Eventually, these wheels end connected to a wheel titled the ESCAPE WHEEL. The escape wheel has odd tines that were designed for two functions

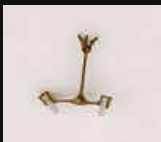
- 1- to allow the jewels of the pallet fork to stop the escape wheel over and over thousands of thousands of times WITH NO DAMAGE.
- 2- to supply a "nudge" power back through the pallet fork to give the balance some return power.

Thus the escape wheel is a part made to allow the timing of the watch. each tine a measured device that breaks the run of the main spring into sections each exactly the same at tremendous pressure without failing. THE POWER OF THE MAIN SPRING REQUIRES CONTROL THE MEANS OF THAT CONTROL ARE FROM THE OPPOSITE SIDE OF THE POWER. YET AT THE VERY CORE OF IT. Thus THE ESCAPE WHEEL IS THERE, WAS CREATED TO, AND PLACED AS, THE JUNCTION OF THE CONTROL ROOM IT IS THE CENTER OF THIS UNIVERSE. POWER UP THE LINE, A BALANCE ON THE OTHER, THE ESCAPE WHEEL TO CENTER.

THUS WE INTRODUCE THE **PALLET FORK**

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## 7 PALLET FORK



The wound main spring turns the barrel >> which turns the center or second wheel >> which turns the hands through a canon pinion and directly turns the second hand while connecting to the next wheel in the train that end at the last stop THE ESCAPE WHEEL. AND IT REQUIRES THE PALLET FORK TO OPERATE.

THE PALLET fork, with two jewels on the outstretched arms and a notched v end on the other, combines with the escape wheel to perhaps, before the introduction of the computer, one of man's most awesome inventions in time. the PALLET FORK CONNECTS THE BALANCE ASSEMBLY TO THE ESCAPE WHEEL which is the ultimate end of the mainspring power. up till this time it is simply raw power doing no more than spinning 3 or 5 wheels till it runs out. the combination of the pallet fork and escape wheel is to make the energy produce something: time

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## 8 ROLLER JEWEL



A ROLLER JEWEL FITTED INTO A ROLLER is then slipped over the lower portion of the under the balance.. the PALLET FORK when mounted has its v straight end position to the balance staff, the roller

jewel, when the balance is moved back and forth, contacts that v section caused the PALLET fork to move also back and forth. the jewels mounted on the pallet fork come in contact perfectly with the odd designed tines of the ESCAPE wheel thus controlling the MAIN SPRING power. the movement begins to dance a rhythm. each back and forth can be timed. it can not become the whole of the piece. the balance moves, the pallet for jewels are touching the escape wheel in such a minute was, that it is pure joy to watch/ as the balance moves, the roller jewel does not simply bang against the control arm of the pallet fork, it moves with it until at end it reverses and move again. the pallet fork with contact with escape wheel, actually nudges the roller jewel to assist movement the balance so it not only starts and stops the escape wheel, but assists in reversing the balance staff

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## 9 PALLET FORK ROLLER JEWEL ESCAPMENT



the pallet fork and escape wheel are without a doubt the most overall important parts of the movement with the PALLET FORK surely THE CENTER OF THE GLOBE! So, pallet fork is a Y with a rectangular jewel on each upper Y end, these connect into the escape wheel when ever you move the lower arm of the Y back and forth, those jewels start and stop the ESCAPE WHEEL Z tines. so, with watch powered urgently desiring to move, this pallet fork movement now controls that movement, how fast or slow the pallet fork moves back and forth controls the timing of the watch. HERE steps in the balance assembly. a staff with pivots machined and polished at ends, a balance wheel machined or stamped adds the weight to the staff, a hairspring, which supplies power to ASSIST IN RETURNING THE BALANCE ALLOWING IT TO swing back and forth, then a roller, the roller with half round [they come in different shapes sizes, some metal] jewel, or in those non jeweled, a metal pin.

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## 10 COMMON FAULTS TO POOR WATCH PERFORMANCE

A- Dirty and or dry movement.

First you should clean and oil the time piece **unless there is a problem you recognize**, such as broken balance staff or mainspring. But, either way, cleaning must be performed. So, diagnosing a watch means understanding the sections of a watch as well as individual parts. The Mechanisms, Assemblies, Sections

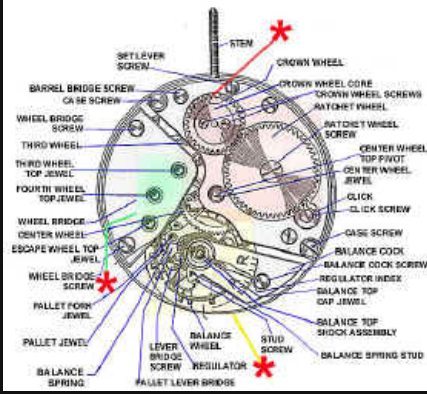


image from © timezonewatchschool.com winding mechanism:

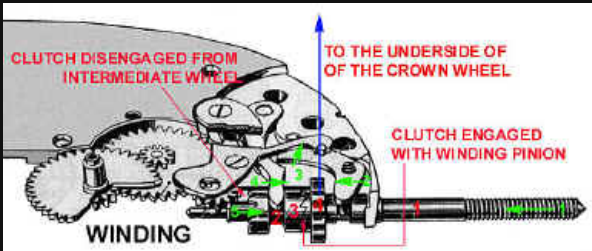


image from © timezonewatchschool.com winding mechanism

turn crown > turns stem > engages clutch > turns winding pinion > turns crown wheel > turns ratchet wheel > turns mainspring barrel arbor > winds main spring > power turns mainspring barrel

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## 11 Mechanisms, Assemblies, Sections

.Thus a watch is comprised of a group of assemblies working together yet acting alone. The winding mechanism is used to input power into the movement and powers the escapement.. Thus the mainspring assembly powers the escapement.mechanism. The escapement is a group of individual parts performing a function as a whole. thus, this group of parts joined as one are a mechanism. A mainspring ASSEMBLY on the other hand is a single item with multiple parts that perform a function a function.



barrel – spring wrapped – center is arbor – barrel cap

<http://goldsmithwatchworks.com/our-pdf/MAIN-SPRING-REPAIR-1.htm>

When you add a calendar, or automatic winding, pointers or chronograph, while these are actually sub-assemblies or module mechanisms, the fact that they are interlinked with the movement means any problem within these sub' means a problem with the movement. thus a mechanism could be a feature, or simply two parts within a movement feature, such as the spring and click mechanism that allows the date wheel to turn only one "date" or "day at a time when activated. [later].. thus, an integral "group of parts" in the movement could be a mechanism rather than part of a mechanism,

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## 12 EXAMPLE OF ALL OF THE ABOVE



**on a recent Seiko dive 6105 series restore, all parts assemblies mechanisms seemed to be perfect. yet the watch stopped at night?**

we discovered everything worked fine until the date kicked in at 24 hrs [SECOND ROLL OF AT 12PM]. a plastic wheel/gear that transferred power from hour wheel to the actual date turning mechanism was missing 5 teeth; THIS caused the hour wheel to jam into the intermediate turning wheel stopping the movement dead in it's tracks..

In the morning, our patron would awake, find the watch dead. reset the time physically moving hour wheel past the break in the in med wheel...

thus physically resetting the time moved the damaged part forward allowing perfect time/running till 24 hours midnight.



This single wheel/gear is a part of the date mechanism not a mechanism in its own right.

Yet, the spring with clicker that controls the turning of the date wheel, only allowing one date/day every revolution, is a sub-mechanism of the date turning mechanism . thus, a sub-mechanism can be two or more parts that create an action.

an assembly, like a mainspring, mainspring barrel and arbor is an assembly. naturally the ratchet wheel that is joined by screw and turns the arbor which turns the spring could be said to be a part of the assembly.



/ and s is a group of parts that make up a piece of the mechanism

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### 13 QUICK CHECK PROBLEMS:

A dirty movement can be a problem. Old oil/grease turned to "stone", absence of lubricant causing spring to unwind erratically. Thus, outside a clear balance staff problem, which is the very first mechanism you must check by gently attempting to move it up/down/aside to view if it is broken -the staff pivots- and examining hair spring to view if it is bunched or broken.

The mainspring is the power source for a watch. It must deliver the correct amount of power to the wheel train or the mechanism will not function correctly.



A quick test to view the escapement mechanism and power of spring is to remove the balance and pallet fork. then wind the piece while holding escape wheel I was informed to totally wind by releasing main spring by turning crown while using tweezers to lift click on ratchet wheel, then lightly hold escape wheel while when winding. after wound let loose of escape wheel. the movement will spin observer as it does



.now, I never release the winding. I want to know if a problem exists as is. experience is key. I hold the escape wheel with some green putty [rodico] used to clean dials/movement while removing pallet. It may be important to remove the hands from the watch before allowing the train to spin. Also, regulating the velocity of the spinning train by applying a small amount of pressure to the second or third wheel with your finger tip. may be accomplished if you are new to the job. .Freely back-lashing of the wheel teeth could occur which can sometimes cause damage to fragile train teeth, pivots and or jewels. Though in thousands of free spinning the movement I have had 0 happenings. in fact, all spun fast then slowed as the spring wore down. so back lash simply could not occurred.



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[THIS STUFF WILL REMOVE DUST, FINGER PRINTS](#)

[AND SO MUCH MORE FROM DIALS MOVEMENTS ET AL](#)

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## 14 NOT WINDING

If the watch main spring does not wind at all we inspect: The barrel and arbor both have hooks or slots The mainsprings have holes, tees, braces, tongue or outer spring bends Constant decades of winding, damage from moisture, dirt and dried out oils will cause springs to lose their ability to deliver full power for the duration that it was originally intended to or any power at all. Be sure to lubricate main springs, barrels and arbors. Some, like automatics, require specific grease. lubricating mains means the correct way and amount of lube; it is important not to be too much or too little

[.http://goldsmithwatchworks.com/MAIN-SPRING-REPAIR-1.htm](http://goldsmithwatchworks.com/MAIN-SPRING-REPAIR-1.htm) The mainspring inner-front end spring hole fits over the arbor hook. The outer or back end will have a slot, tee, tongue and will fit the appropriate hook, slot in wall, or with automatics, by friction. If these holes, slots or hooks wear, either on spring or wall, or lubrication seizes, or does not exist, or is too much, or too little, could mean problems. These factors control the main.

Then there is the single break. a main can break anywhere, depending on break and factors above, some will wind and run only for specified amounts of time. they can fool you. others wind and run only with a set amount of winds and over that slip so gently you have to listen, the easy ones simply turn and turn w/o winding. thus pressure felt on crown means little unless you examine.

Remember automatics are designed to allow the main to slip forward when fully wound so they do not break. now, the auto is a clear example of making sure during cleaning that it is removed and inspected. the can run for hours even broken.

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## 15 OVER WOUND WATCH:

Sometimes, on super antique models, a main full of old grease that dried can wind and then stick. but, that fact is extremely rare. only to be stated in only that situation and not enough to be a word used in watch talk. all those wound too tight statements, especially on EBAY, mean absolutely nothing.

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## 16 POSITIONAL ERROR:

**Amplitude of the balance= .how strong the "beat" the balance moving back and forth, , the speed of this alternating rhythm,**

Some watches can be adjusted in many positions. meaning dial up, dial down, right, left, et al. But most only one. Adjusting to position actually means tuning to maintain a certain amount of accuracy when placed in said physical positions.

Positional error means the "position" causes/delivers a timing error.

A Positional timing error means that though the mainspring and escapement are properly working, the balance delivers a difference in the rate the watch displays between these different positions. Another way to explain is that once the watch is cleaned and oiled it runs perfect with excellent balance wheel motion in the standard horizontal positions, but when the watch is moved to, say, to side position, the amplitude of the balance considerably slows down or speeds up –or changes in any way. A Positional error cannot be corrected until the amplitude of the balance is acceptable in all positions. This is a result of Friction on the balance pivots. period. Outside of damages or worn parts, the entire operation of a time piece rests on the lower and upper pivots of the balance staff. The balance is the controlling factor of operation. Thus changing positions changes how the pivots come into contact with the jewels or, in inexpensive movement the metal.

**Note: A small drop in balance amplitude when a watch is moved from a horizontal position [ dial up/ dial down] to a vertical position.**

In the horizontal position the balance pivot is exerting its pressure down onto one cap jewel. The shape of the pivot must be correct and condition of cap jewel perfect. In this manner the balance experiences little resistance from friction. Now, when the movement is altered to a vertical position, we now have both the top and bottom balance staff pivots experiencing direct friction, and it is notably greater friction due to the increase in surface area contact. Unlike horizontal, with face-up or facedown, with only one pivot, either top or bottom, with said pivots bottom or top centers touching jewels [or metal] , both the pivots, along the sides are contacting the walls of the hole jewels, or metal pivot slots.

Further, the condition of your movement can be discerned from the amplitude of the balance. By winding and watching as you move the movement into various positions, any slowing down will indicate a problem. first wind and check the balance at horizontal face-up. Now check the balance at horizontal face down. Both positions should mean the balance operated with the same amplitude or movement. If, say face up is strong. while face down is slow, or stops, or exhibits stutter .. a change in rhythm would indicate a problem. While this could mean train issues, such as wheel mesh, a problem with a jewel or pivot associated with a wheel in the train, the balance assembly itself must be examined due to the fact this is the one item that controls the operation outside of power source, the mainspring. It is quite simple to id. Try removing the pallet fork from the movement. We can now grab the watch blower and gently provide a few shots of air to inspect the balance wheel to observe the balance motion and try while placing the movement in various positions. If the motion is now acceptable when changing between dial up and dial down then we have eliminated the balance assembly as the problem and the problem is somewhere in the drive train or pallet assembly.

Remember, balance staff pivots can have super minor to the eye imperfections that are magnified during operation. Not only could it be broken, it could be scarred, it could be worn, or the jewel could have a crack, or breakage. maybe the pivot needs polishing or jewel replaced. If on the other hand, the motion still changes excessively, then inspect the clearance between the balance wheel and center wheel in both positions. The balance or hairspring sometimes hits the underside of the center wheel during part of its oscillation. The cause of a wobbly balance wheel? Is it loose or crooked on the balance staff. Hair springs... yes, the majority of issues are based on hair springs. An out of flat hairspring or the hairspring hitting the center wheel?

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### 17 LOOK FOR

out of flat wobbly center wheel?  
 cracked cap jewel?  
 broken balance staff pivot?  
 especially the upper. they can be damaged and not effect the piece until side position et al  
 Make sure nothing is interfering with the balance assembly.  
 a screw protruding through the pillar plate  
 balance cock issue etc  
 the balance assembly itself.

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## 18 EXAMINING THE BALANCE PLUS

ONLY USE HIGH BRIGHT MAGNIFICATION when examining balance, staff, pivots, springs. Pivots must have perfect shape and well polished surfaces.

To be perfect, balance holes and cap jewels must be right. While Synthetic sapphire jewels provide extremely hard, polished surfaces that hold lubrication extremely well, enabling there use as bearings, cracks and chips do occur and they will score pivots. thus if a jewel is cracked, but does not effect the operation at the time of inspection, they must be changed for sooner than later these chirps cracks can suck the oil and eventually score pivots which, even if minor will alter the amplitude of the motion.

While we are here. that hair spring I made a comment about earlier, they are my worst nightmares.Hairsprings. 7 of 10 problems come as a direct result of hair spring Check, visually see, that the hairspring is true and flat. Out of flat could mean it is hitting the balance arm at certain times or events. Over coiling may mean the contact of the underside of the balance cock in one or more positions. Difficult as it may be, take time to focus. use jewelers head piece 4 times with light. and for bench an old double eyepiece microscope for jewelers works great. You see, if contact is being made it may occur for only an instant during each oscillation of the balance.

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## 19 Mainspring Not Correct For Your Movement

Mainsprings are getting more and more difficult to find. also, many EBAY watch guys will simply fit whatever they can for a replacement. some cut a spring to fit. then bend the end to the wall piece. you receive the time piece and it ruins as described but it is hell trying to get it to run properly. be sure in many cases to check the main spring by measuring it. length by width by thickness. we have fixed 2000 watches that had shortened main springs made to power the watch though not correctly. running slow or running fast.

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## 20 HAIR SPRINGS

Hairsprings must be in excellent concentric shape with no kinks. Spring must be between the regulator pins or no regulation can be had and that extra looseness will alter the end result. If it has jumped or fallen out from between the pins then it is free to move contacting various parts in various ways resulting in rate changes. The space between the regulator pins must be correct. If they are too far apart the hairspring may only hit one of the pins in one position and may make no contact with either pin when the position is changed.The spring should move back and forth between the slot making contact with both pins during a balance oscillation. this is one of the areas that most new apprentices miss. From rate increase during pin contact to rate decreases when no contact, your movement cannot reasonably be tuned as far as the balance and this, as explained, effects the entire movement. If the spacing looks good but contact is made with only one pin then just spring may need a small adjustment. Be sure the regulator pins are straight up and down, pins not parallel with a hairspring may cause the hairspring to tilt up and down during the oscillation. Now, always use non magnetized fine point tweezers and bend the spring -[not the pins!- in or out slightly just in front of the hairspring stud then examine..

Dirty, Oily, Rusty, Magnetized or a combination of these words, will cause positional error and sticking springs. Hair spring cleaner should always be utilized to clean the balance complete. the careful lifting of balance with balancecock on bebnch, oil the jewel. be sure not to use too much or contact the springs with oilier.

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## 21 Mainspring Barrel Problems:

.Mainspring barrel cap must not be distorted or warped. Unseated edges, even one, could cause drag hitting plate or bridges This is not a common problem. The key is that you surely snap the barrel cap firmly. I use a metal block with holes for the arbor ends fit in hole then apply pressure to entire barrel bottom. If it will not close, examine spring, is it higher than the cap seat/ledge in the barrel? Is the arbor seated? If the spring does stand above the cap seat and can not be pressed down replace it.

The mainspring must be in good condition with no burrs, rust or kinks and must be clean and lubricated, the coils must be able to slide freely with no obstruction as it slowly unwinds. If its surface has any burrs or scratches it may catch or bind. Winding a mainspring for the first time after it has been cleaned and greased should not be all the way at first as most watch guys preach. just my view, start at around 25 to 35%. then after it winds down, go 50 percent. then 100 percent. what this does is get your vintage barrel to accept the new spring.

"The power of a mainspring is determined by its thickness, width and length. If the thickness and width remain the same for a given spring but the length is cut in half the spring will be twice as strong delivering twice the power to the wheel train. If a springs length is reduced by 10% its strength will increase by 10%.

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## 23 Lubricants, Oils & Mainspring Grease:

The oil chosen will always make a difference. I have 20 vials of watch oil. synthetic natural and in-between. I have a gallon of 1789 Whale oil! not good anymore but a fact of the trade. Whale oil was the finest oil available in its time. While most oils are designed to flow or spread to protect what is being oiled, oils formulated for watches and clocks are created to say where they are applied. I

The replacement oils that first emerged on the market were far inferior to these oils and to the oils available today. I would sometimes receive timepieces back within just a few weeks that had stopped running as a result of dry pivot holes and surfaces. Better synthetic oils soon hit the market making the repair life a lot easier and they have continued to improve over the years, although they still can not match the whale and porpoise oils used in the past. The oil unused to treat say the train should not be used on the winding mechanism. So, be sure to check with Otto FREI or Jules boreal and read about the variations. In fact, I use a silicone to treat stems and winding mechanisms while I use two different oils for the train, I use only synthetic on spot oil for balance staff pivots. I will see when I can upload this ynfo for you

I

**DO NOT LOSE YOUR TICKET NUMBER. THIS TICKET REMAINS ONLINE FOR FUTURE WORKS OR WARRANTY WORK AND IF YOU EVER DESIRE ADDITIONAL RESTORATIONS..**

ONE MOST WATCHES: 175.00

INCLUDES AUTOMATIC AND MANUAL WIND WITH OR WITHOUT STANDARD DATE/DAY WINDOWS AND COVERS DIVE, MILITARY, DRESS, SPORT, COLLECTIBLE WATCHES IN EARLY ANTIQUE TO VINTAGE TO CLASSIC AND COLLECTIBLE DATE VARIATIONS. BOTH IN SWEEP SECONDS AND SUB-SECONDS [SUB-SECONDS REGISTER] PLUS WARRANTY AND PORTAL MEMBERSHIP

**175.00 WATCH RESTORATION W/WARRANTY W/RETURN SHIP & LIFETIME LSYF MEMBERSHIP [194.00]**

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TWO COMPLICATED WATCHES: 285.00  
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