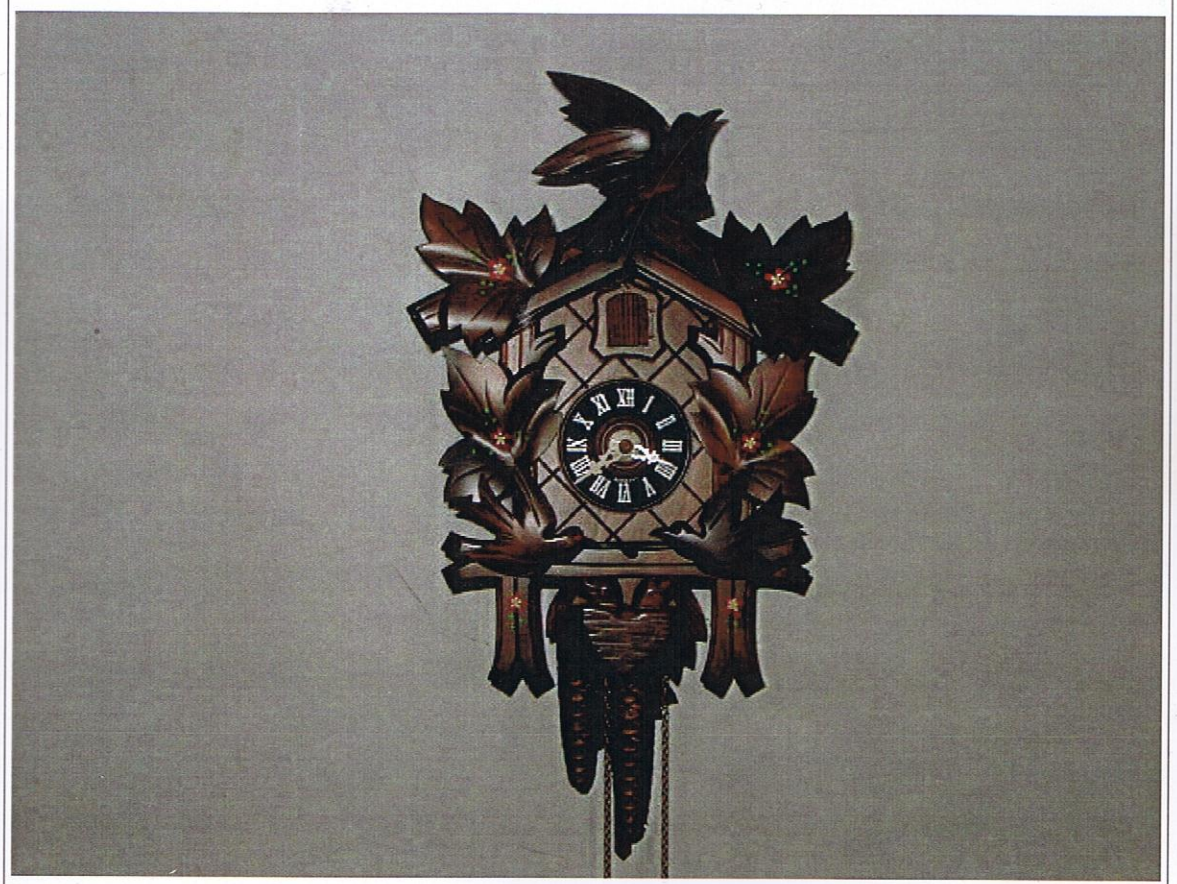
CUCKOO CLOCK REPAIR MADE SIMPLE

TOM SEAMAN



Welcome to the fascinating world of Cuckoo clock repair. The movement (the mechanical works) shown in most of these pictures is the "Regula" brand one-day movement. Regula is the most common, and the most reliable, movement in production today. There are two or three makers of Cuckoo clock movements, and they all are basically similar with just small differences, but the studies in this book will give you a basis for understanding all of them.

SAFETY PRECAUTIONS:
~Always wear eye protection.
~Always use rubber gloves when working with chemicals.
~Follow manufacturers recommendations for their products.
~Never follow my example.

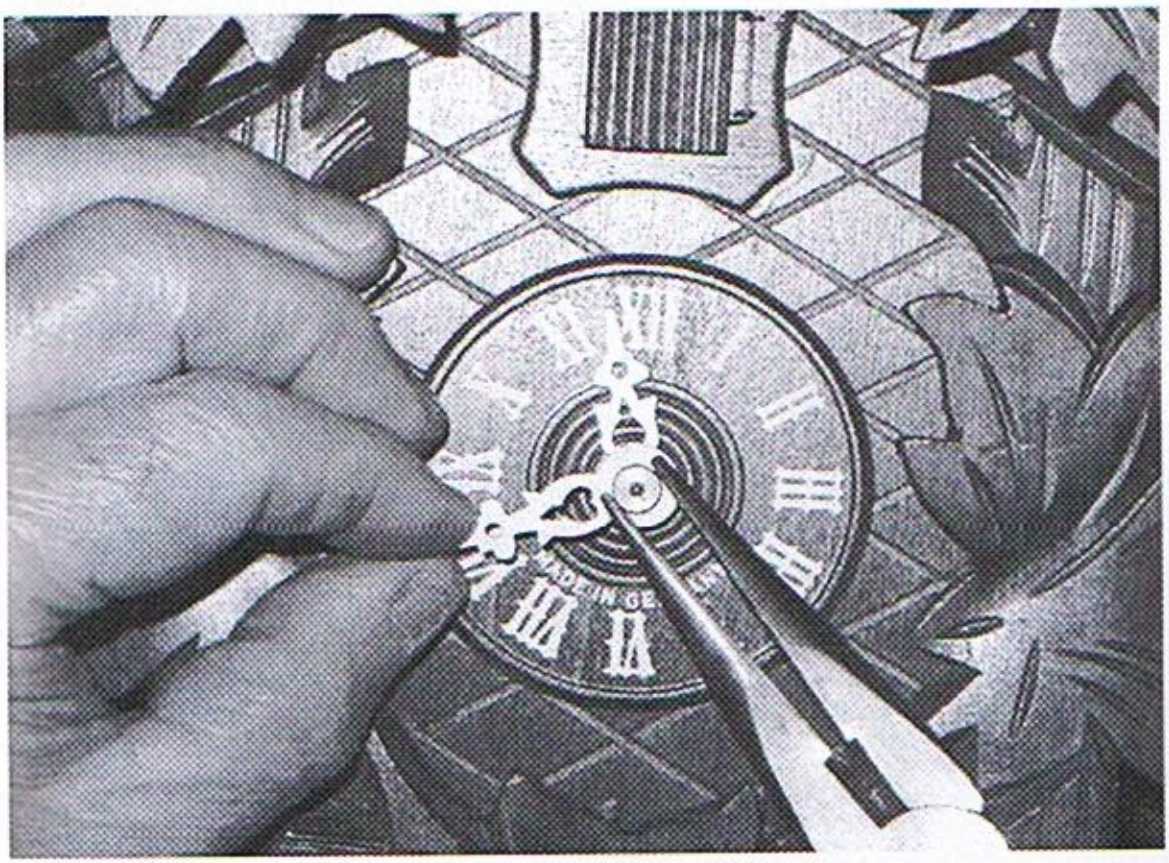
RECONDITIONING CUCKOO MOVEMENTS

This book takes you beyond the beginner's stage, and guides you into the advanced world of reconditioning Cuckoo clock movements.

Here is a list of tools you will need (see contact information for parts suppliers near the end of the book). The lathe is suggested here for polishing pivots, but a drill press can be substituted for this procedure. If you plan to expand your clock repair capabilities, think seriously about purchasing a Sherline lathe.

- 1/2 Inch tapered reamer -------(hardware store)
- Needle-nose pliers----------(hardware store)
- Small standard screwdriver------(hardware store)
- Small Phillips screwdriver---------(hardware store)
- Pivot burnisher ----------(*Ronnell #TL-71)
- Lathe for polishing pivots----(*Timesavers *16500)
- Drill press-------(*Harbor Freight #44506-1VGA)
- Set of drills----(*Harbor Freight ---#34627-5VGA)
- 3 Bushing reamers (*Ronnell #TR-02K, #TR03K & #TR04K)
- Set of bushing cutting broaches --(*Ronnell #TL-42)
- Set of bushing smoothing broaches-(*Ronnell #TL-43)
- Bushing assortment-(*Ronnell Asst. #BL-1 plus one pack size #13 bushings)
- Bushing tool; either a commercial machine -(*Ronnell #TM-2A or a hand tool Ronnell #TR-38,~~~ or drill press driver. Or a hand tool.
- Bushing size guide ----------(*Timesavers #13483)
- Bench grinder ------(Harbor Freight #90003-OVGA)
- Hand grinder such as a Dremel --- (department store)
- Nut driver ---------- (department store)
- Oxy/Acetylene Torch with fine tip----(welding supply)
- Set of needle files ----------(*Ronnell #TL-94)
- Flat-nose punch ---------- (hardware store)
- Set of assembly legs ----------(*Ronnell #TL-97)
- Hemostat clamp ----------(a surgical tool ~ optional)
- Large tapered reamer --------(*Timesavers #13528)
- Clock cleaning concentrate-----(*Ronnell #SOL-100A)
- Ultrasonic cleaning tank---------(Ronnell #TNK-212)
- Clock test stand ----------(contact Tom Seaman*)
- Brass nosed hammer ----------(*Ronnell TL-12)

The first step is to remove the hands. A pair of needle-nose pliers is best, but any pliers will do. Unscrew and remove the nut holding the minute (long) hand. Remove the long hand and the brass bushing that fits it to the hand shaft. Make a mental note of the order of these brass goodies.



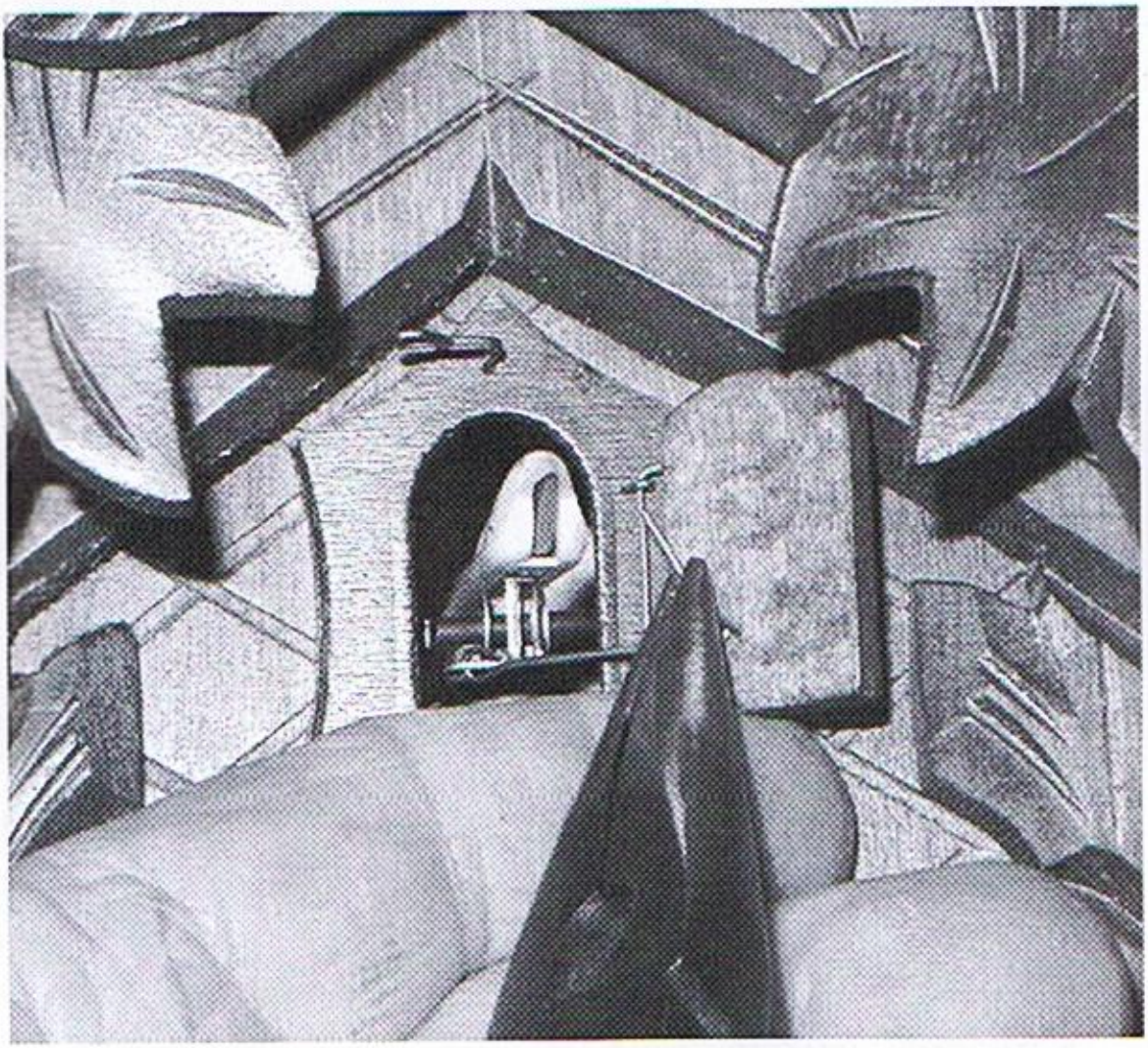
Then remove the hour (short) hand. Grasp it at the point nearest the center of the dial and pull it toward you. You may need to rotate it a little to the right and left to loosen it, but it will slip right off. The tube that bears this short hand is tapered, so later, when you put the clock back together, you will just press this hand in toward the dial, and it will get tight. These hands are often brittle with age, and will break. Not to worry. They are replaceable.* If you install a new

pair of hands, you may need to ream one or both for fit (use the 1/2 inch tapered reamer). Be careful not to ream the holes oversize. This is especially important on the short minute hand. The "canon tube" onto which it fits has only a slight taper. If you make the hole too large, the hand will not tighten up when you push it on.

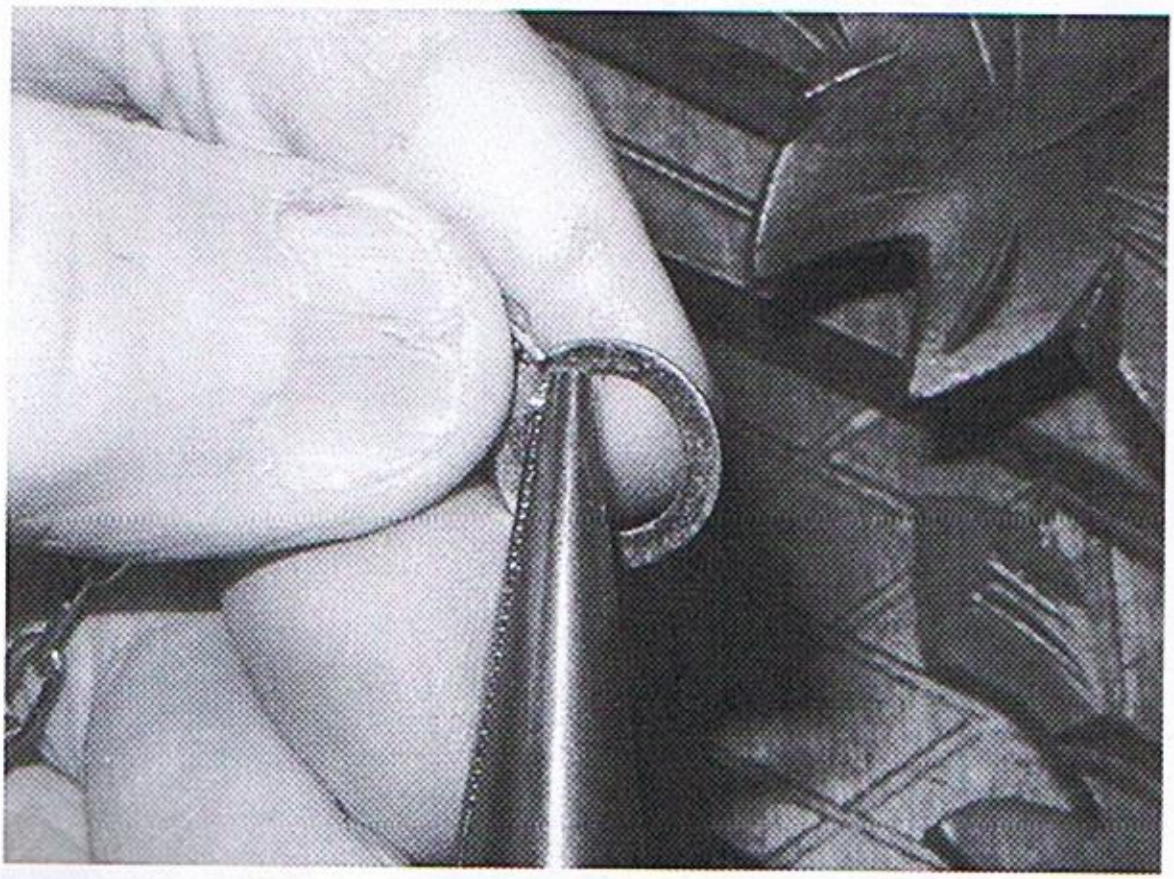
TIP: Use an old cottage cheese container (or similar) to contain all the small parts. If any of these small parts need cleaning, you must transfer them to a container with small holes in order to commit them to the cleaning/rinsing stages.

TIP: There is a Nomenclature section near the end of the book with pictures to identify the Cuckoo clock parts.

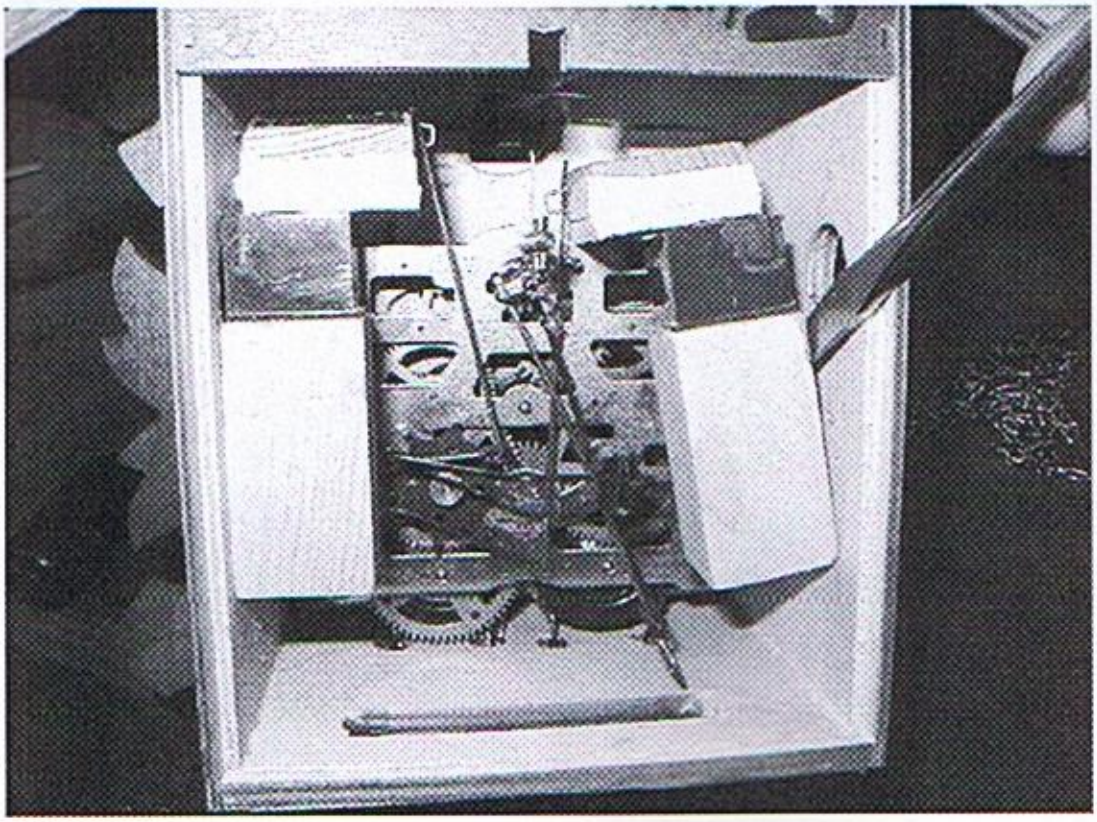
Next, open the little door just above the dial and release the wire that connects the bird to the door. With your needle nose pliers, unbend the looped end of the wire just enough to slip the wire out of the staple in the door.



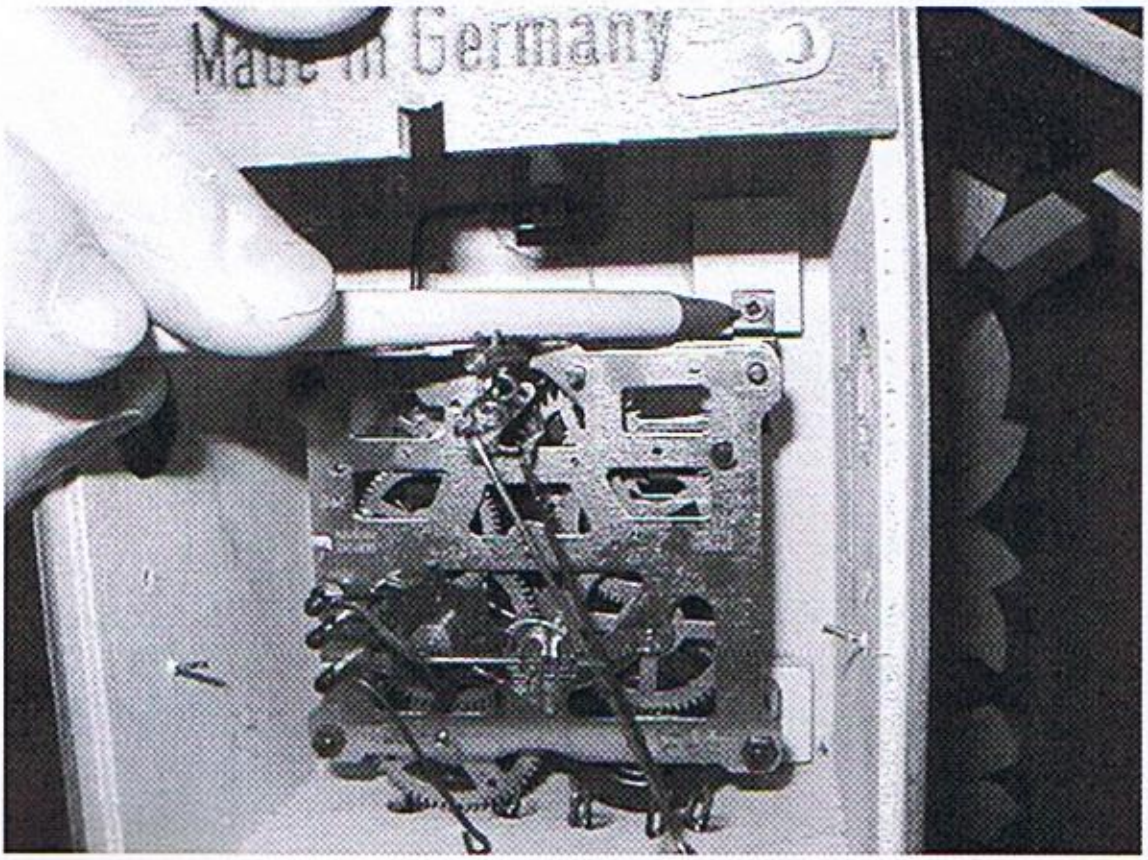
Then remove the hooks and rings from the ends of the chains. Use your needle nose pliers to bend the bottom chain link just enough to release the hook (or ring). Pull the chains all the way through the movement and lay them aside.



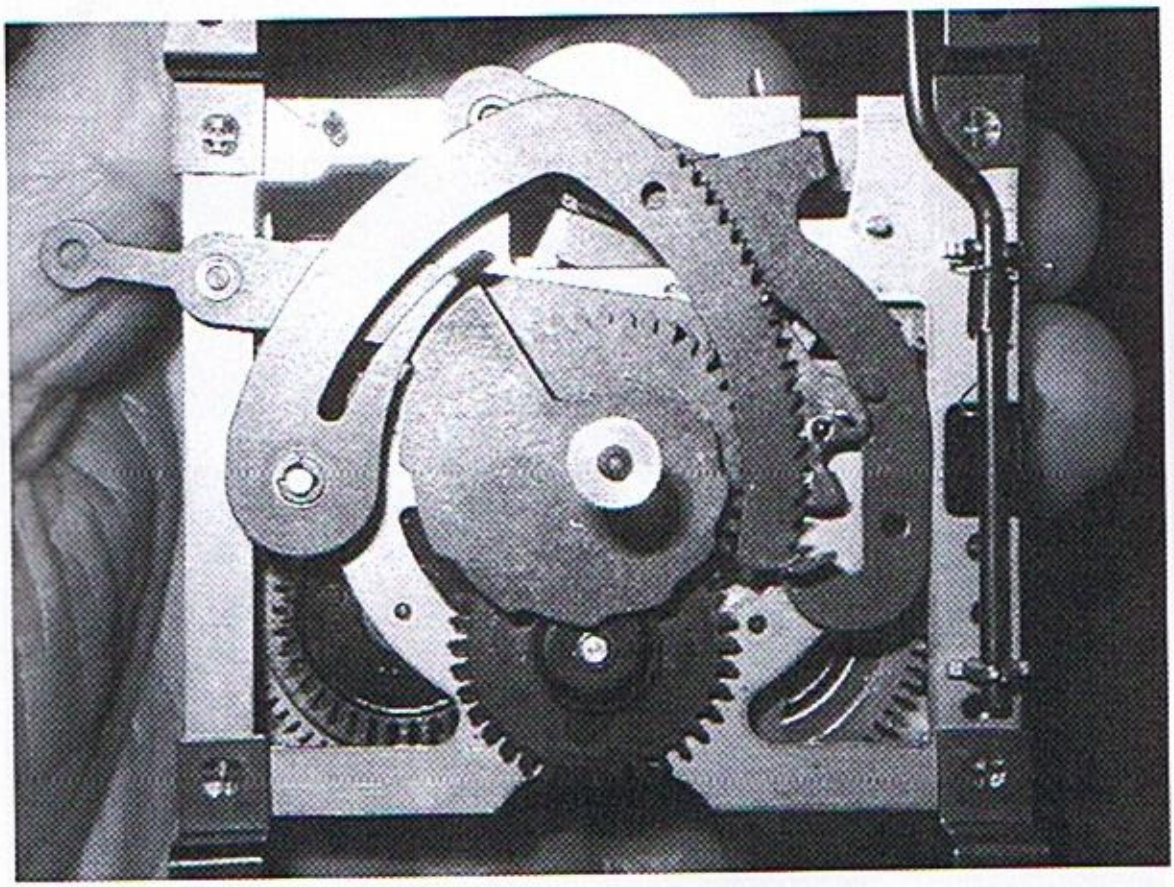
Remove the back door by releasing the metal latch at the top. Both Cuckoo bellows, which make the "Cuckoo" sounds, must be removed to make way for the movement to be extracted. The bellow's body is usually held in place by one wood screw and one small nail, or brad. Sometimes the bellows bodies are glued in place, and must be pried away from the inside of the clock. Manipulate the bellows as you remove them so as to free the lifting wires that lift the bellows tops. Notice that the lifting wire on your right is longer than the one on the left. This will be helpful when re-assembling. The bellows tops (the part with the fabric) often need replacement because the fabric becomes aged and cracked. These bellows tops are replaceable*.



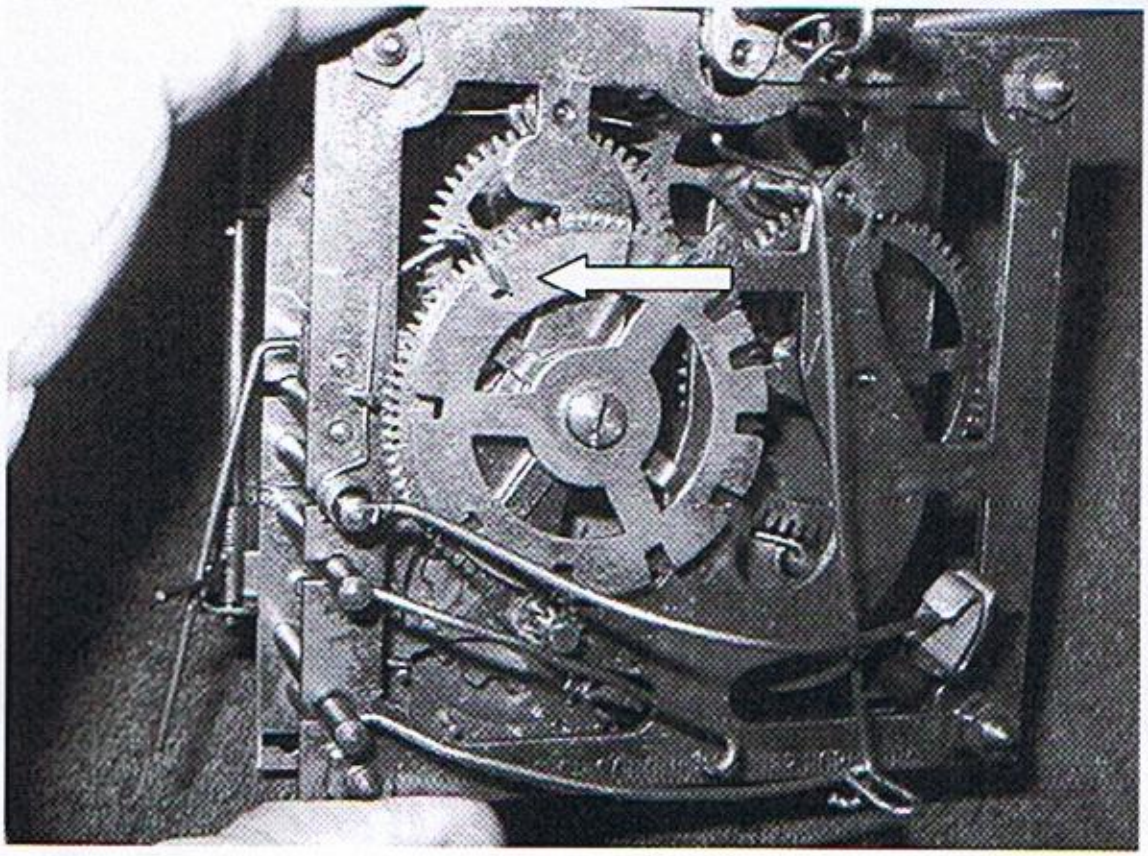
Now unscrew the 4 wood screws that fasten the movement to the inside of the clock and carefully extract the movement.



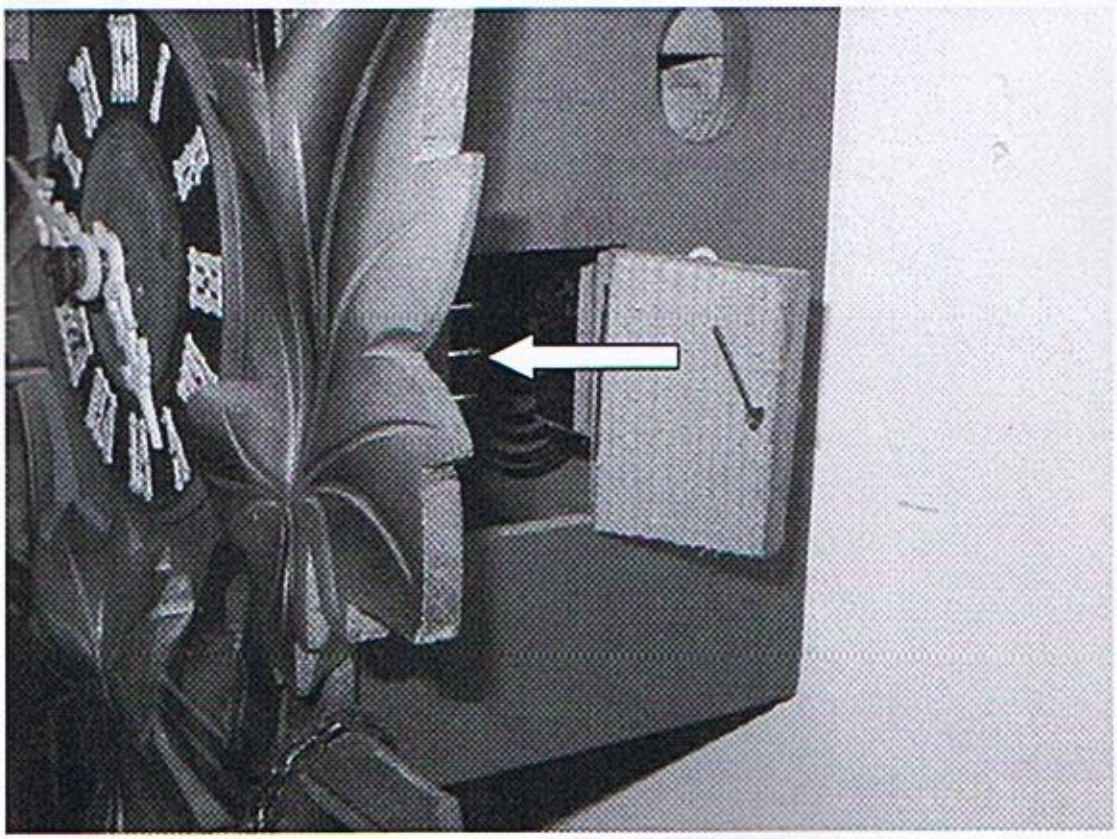
The Regula #25 one-day movement is our model in almost all the pictures in this volume. Most of what you will encounter in repairing Cuckoo clocks will be the Regula brand. The variations encountered in other Cuckoo movements will be relatively easy for you to figure out, once you have mastered this movement.



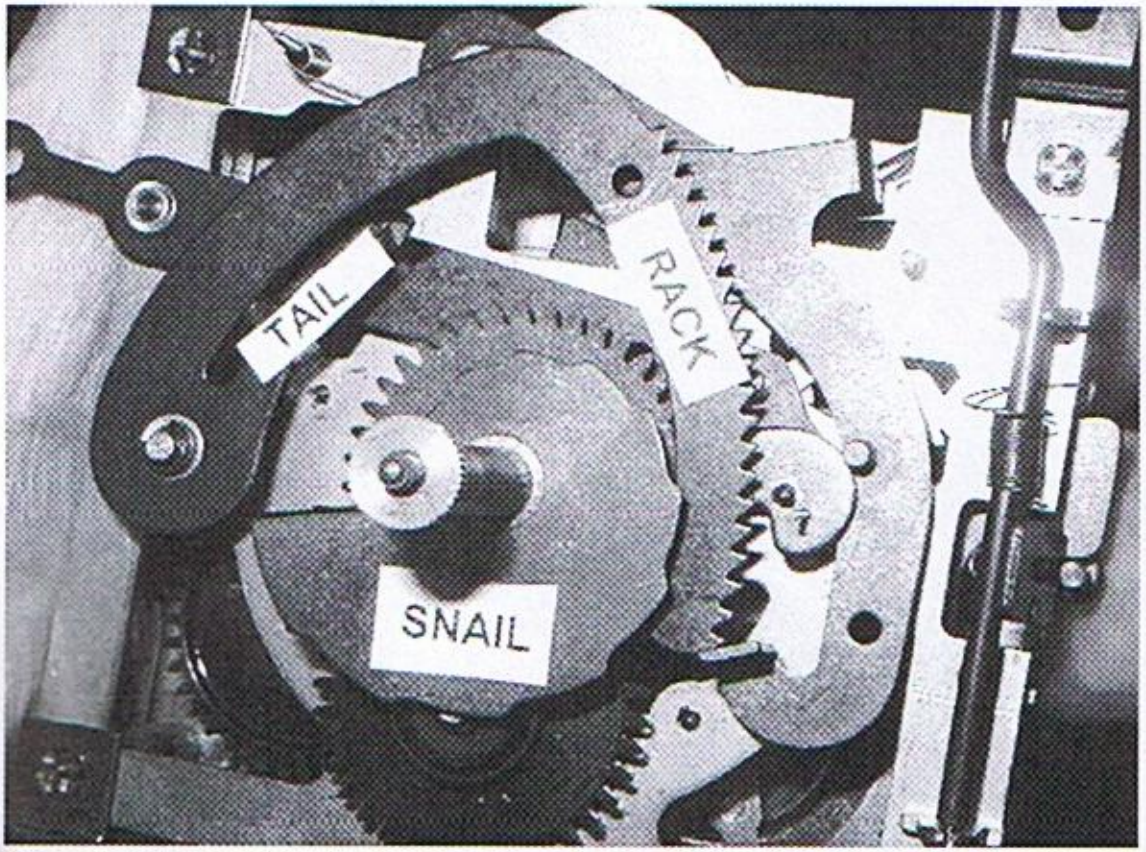
The earlier Regula movements (as well as other brands) had a different mechanism for controlling the number of times the cuckoo sounds. It was called a "count wheel" mechanism. In these movements, each time the cuckoo is triggered, the count wheel advances to the next hour or half hour without regard to what time the hands indicate. This type mechanism can get out of synchronization if the hands are moved ahead without allowing the cuckoo to sound out its full signal at each hour and half hour.



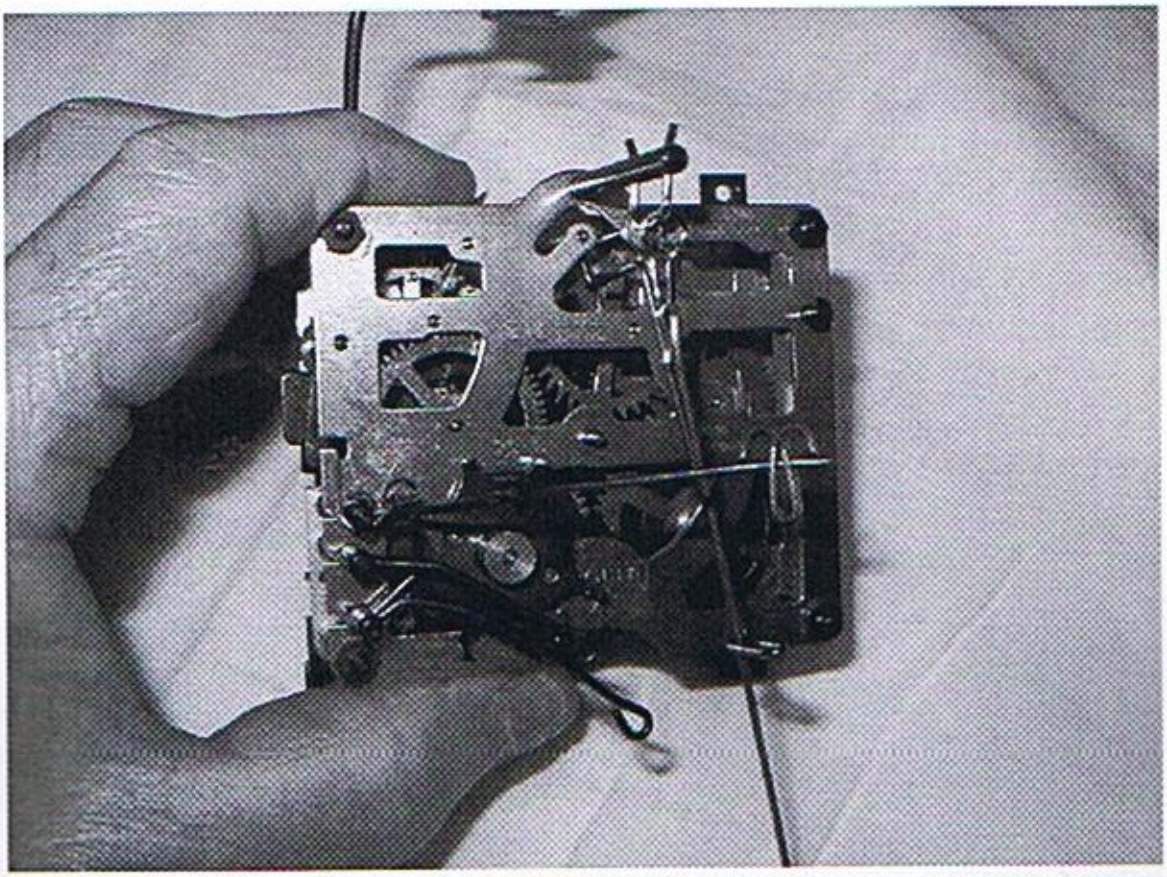
Re-synchronization is accomplished by repeatedly triggering the cuckoo till the count catches up with the hour as shown on the dial. Clocks with these movements usually have a little side door into which you can place your finger to manually trigger the cuckoo. Sometimes there is a pull string hanging below the clock.



The newer Regula movements (as in our model) have what is called a "rack and snail" mechanism. It is a fail-safe design that never can get out of synchronization (provided the hour hand is not disturbed). This delightful design works this way: The tail of the rack falls on one of the plateaus on the snail that correlates with the position of the hands. Then the cuckoo will sound the correct number of times depending on how far the rack tail had to fall to reach the current plateau.

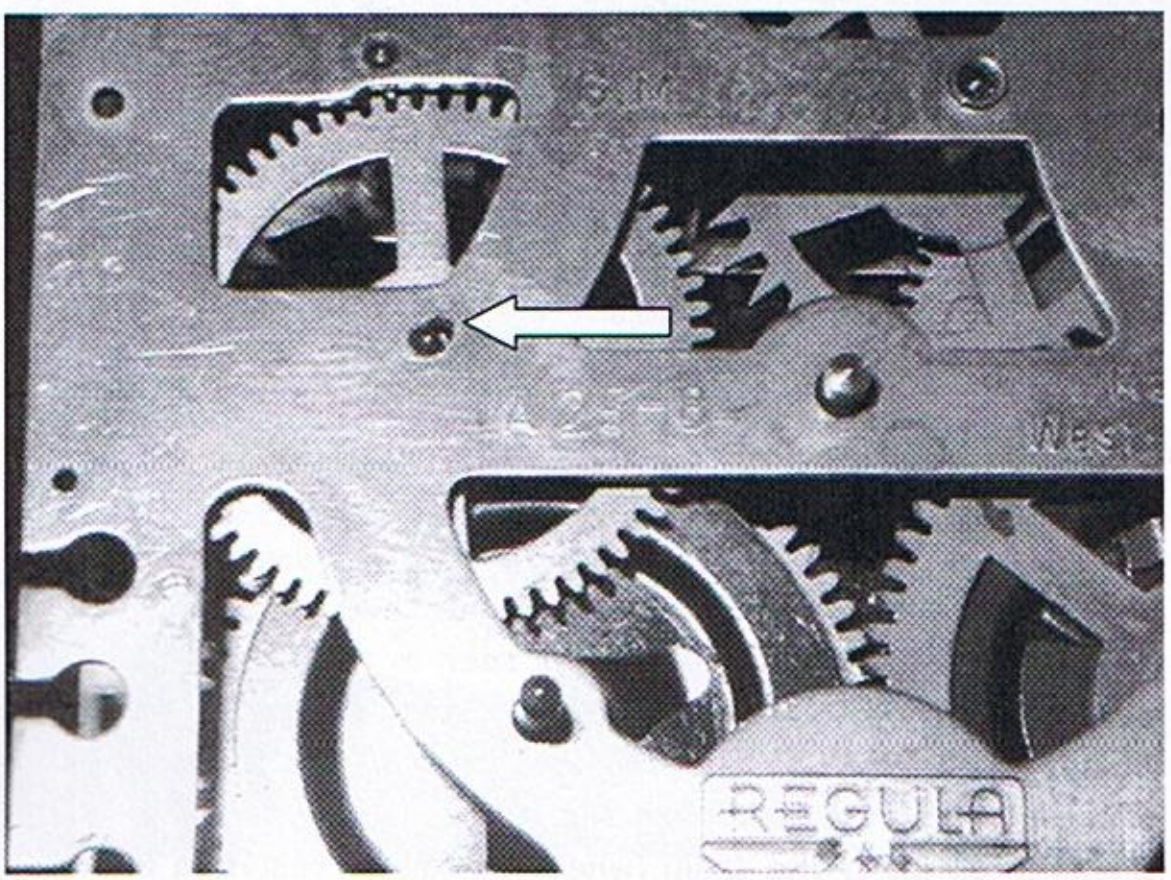


Check for pivot wear:

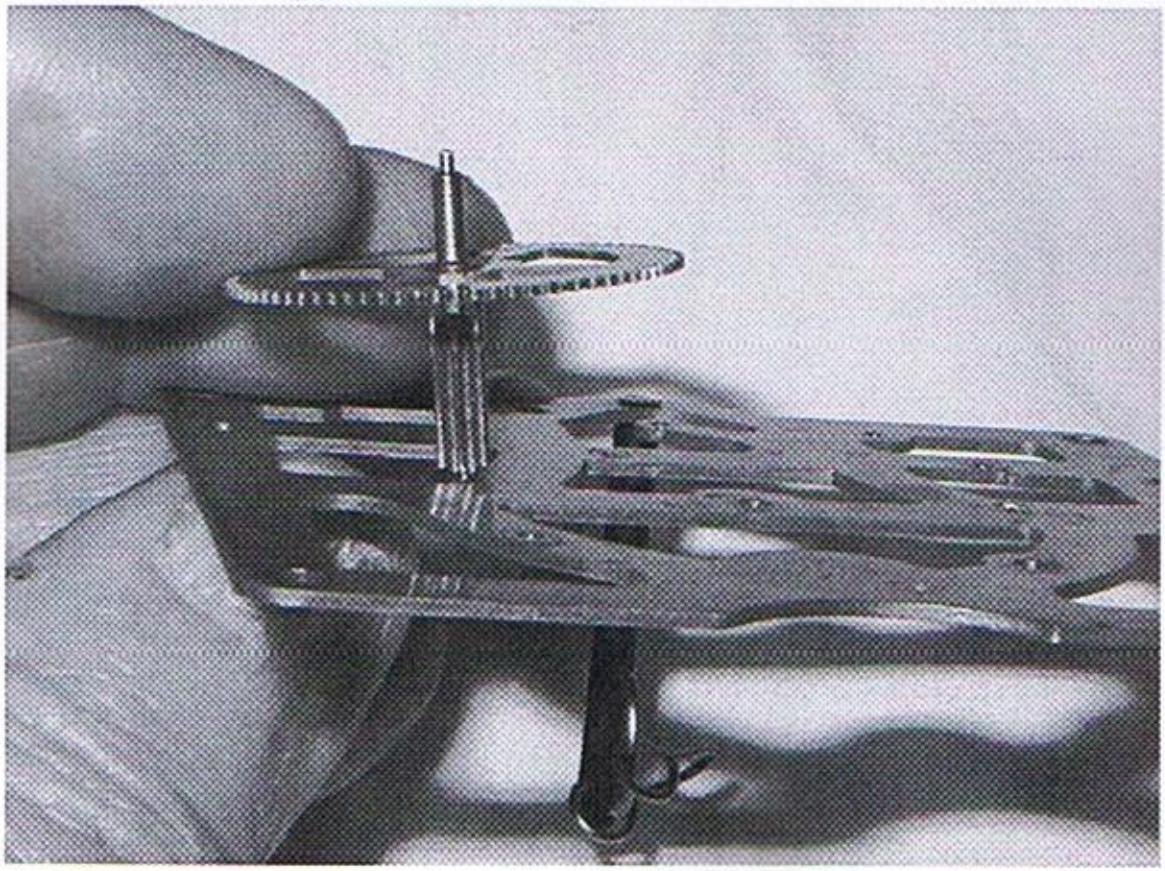


Nothing will hinder proper function of the clock like worn pivots. Look for jiggling pivots (the things that look like blunt needle points that are seen on the back and front brass plates of the movement). You can make them jiggle by manipulating the wheels (gears) as seen in the photo: Place your finger against the teeth of the largest wheel (The one the chain goes on). Apply pressure as if to rotate the wheel first one direction, and then the other. This action will transfer all along the train (wheel assembly) resulting in "jiggling" pivots if they are worn. Test both the time and the strike trains. Re-bushing is indicated if the jiggling is excessive.

Make a chart showing which pivots show sufficient wear to warrant bushing installation. Bushing installation is required if the pivot will freely move side-to-side a distance, within it's hole, equal to one forth the diameter of the pivot or more.



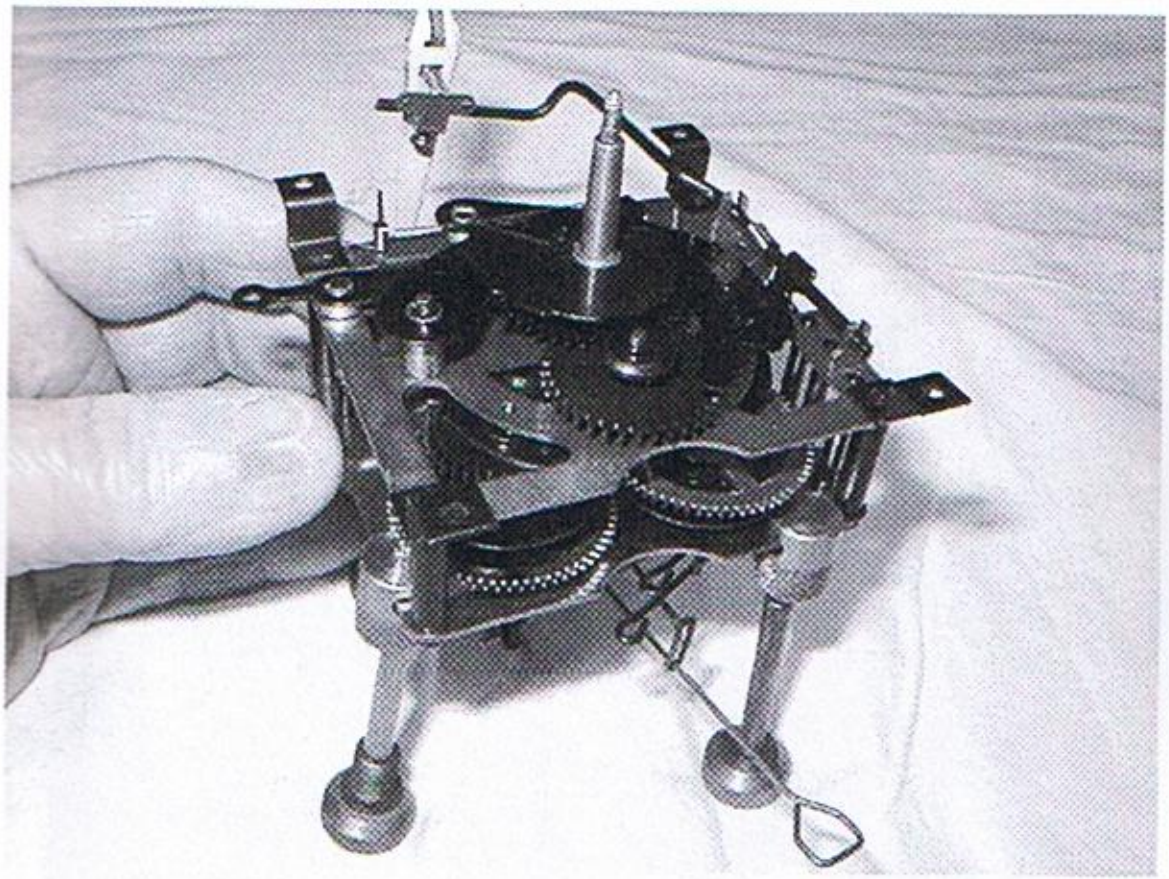
Here is another way to tell if pivot hole wear is great enough to need bushing: After disassembly, place the pivot back into it's correct pivot hole in one of the plates (having laid aside the other plate), and see if the wheel freely tips more than fifteen degrees from the normal perpendicular. This would indicate enough wear to require bushing.



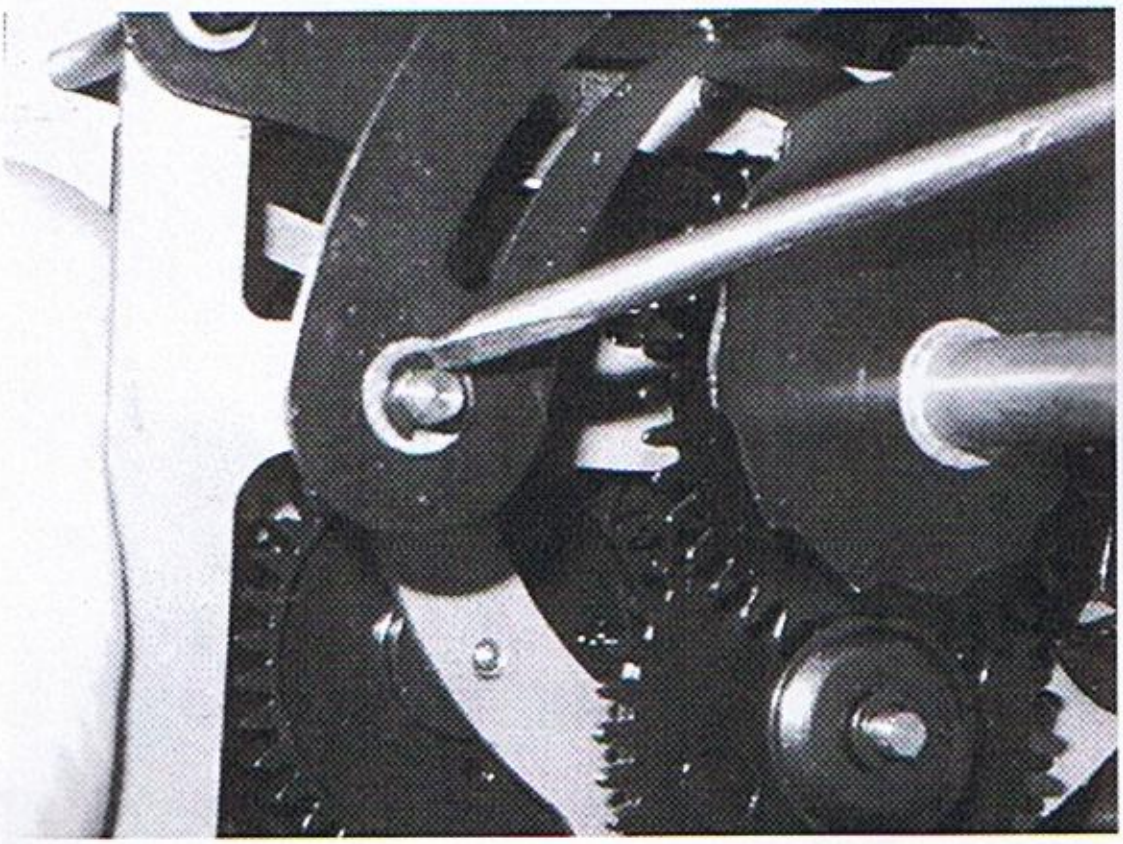
Movement disassembly is more easily accomplished using assembly legs which clamp on the plates. This will hold the movement flat and secure while allowing the protrusions to clear the workspace below.

TIP: An alternative method is to place the movement on a small open-top cardboard box.

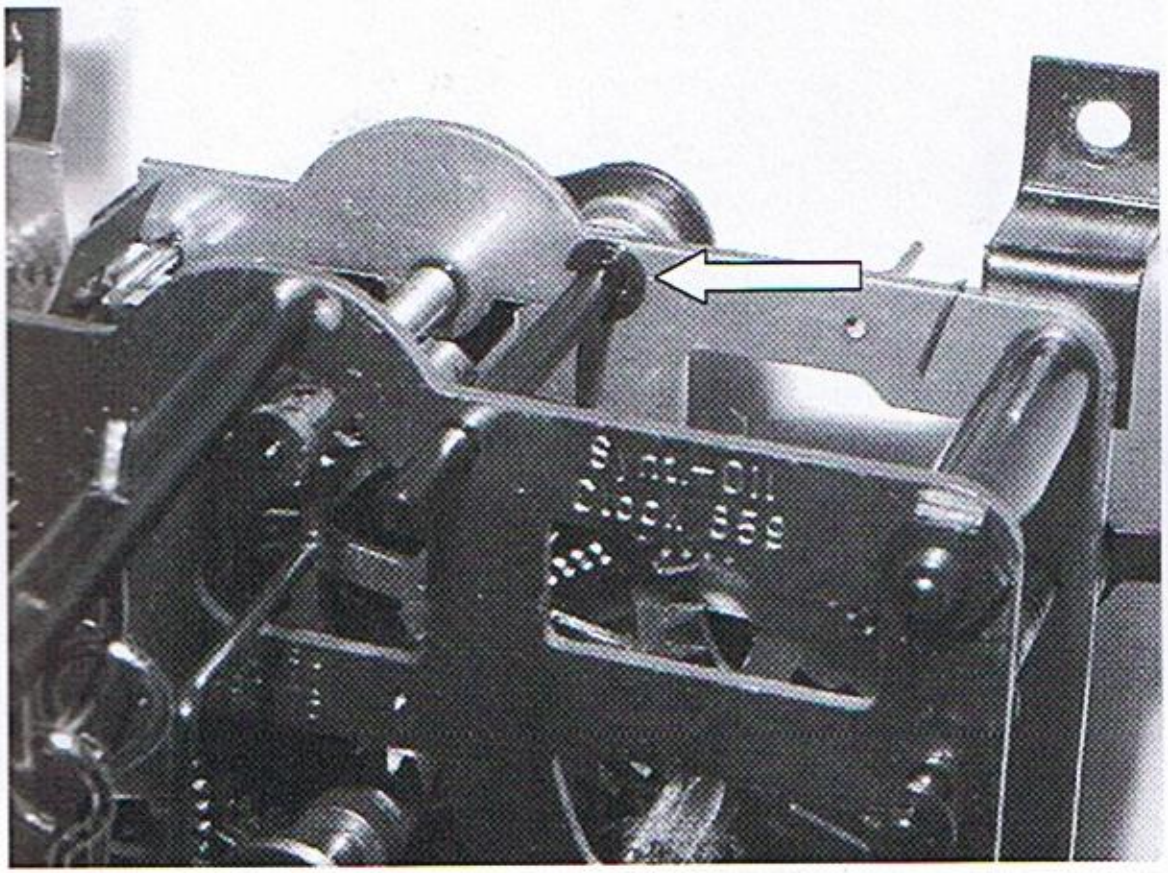
Start by attaching the assembly legs to the back plate so that the front of the movement is facing up.



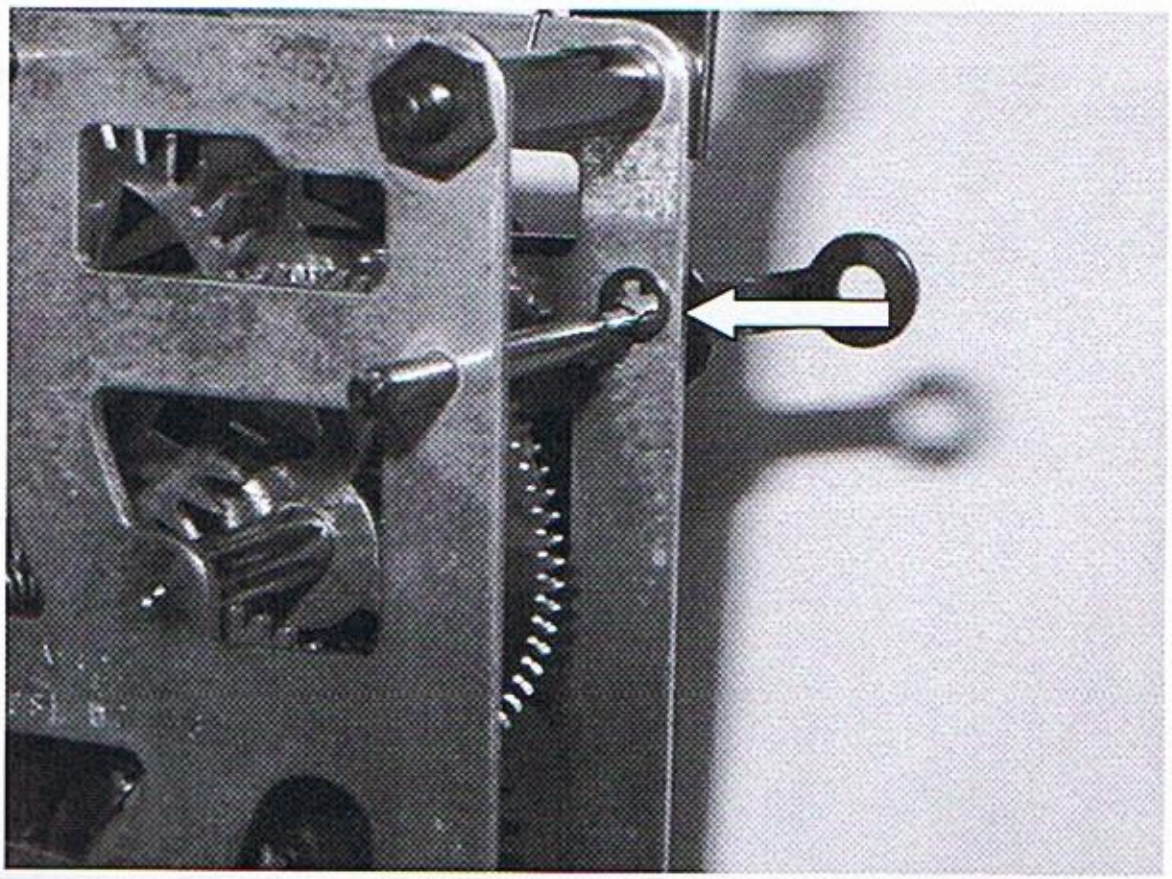
Remove the attachments and levers from the front of the movement before disassembling the movement. Start by removing the retainer clip that holds the rack.



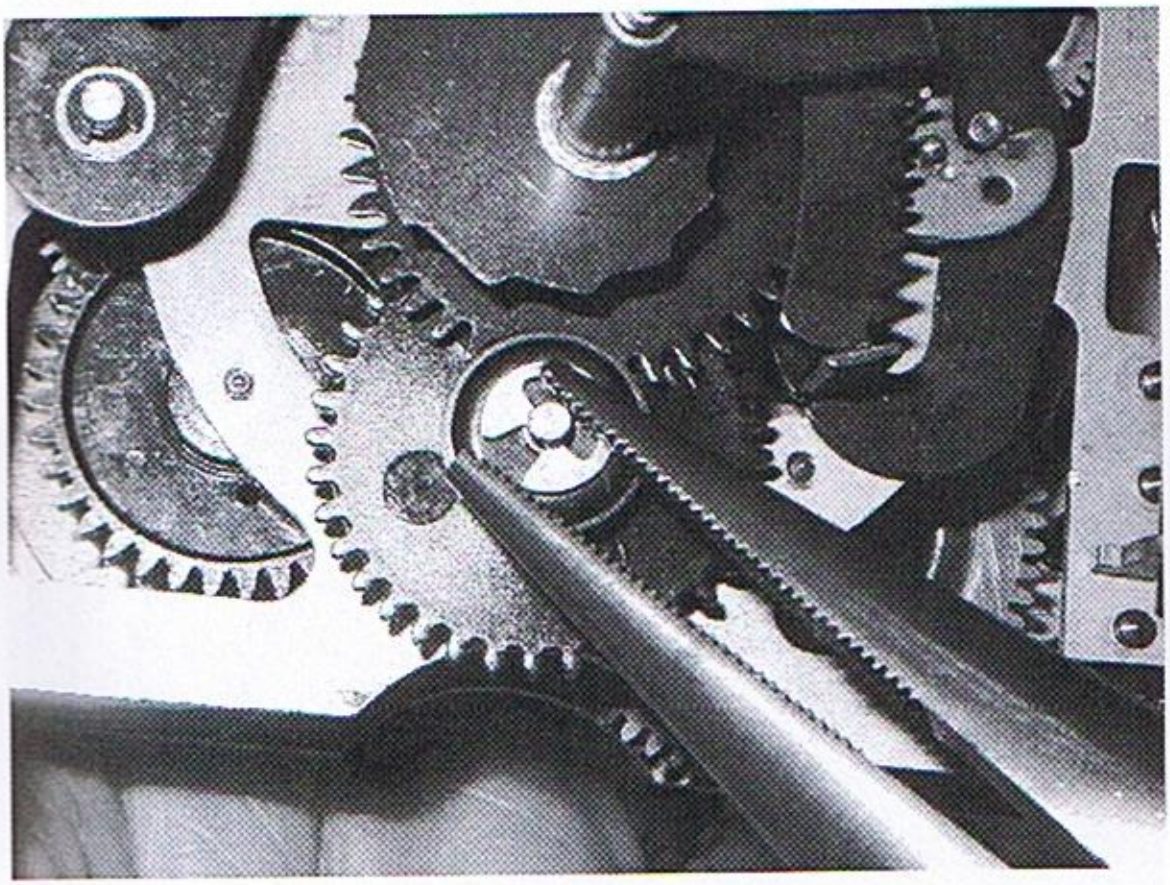
Remove the clip that retains the rack-stop.
This clip is (usually) on the inside of the front plate.



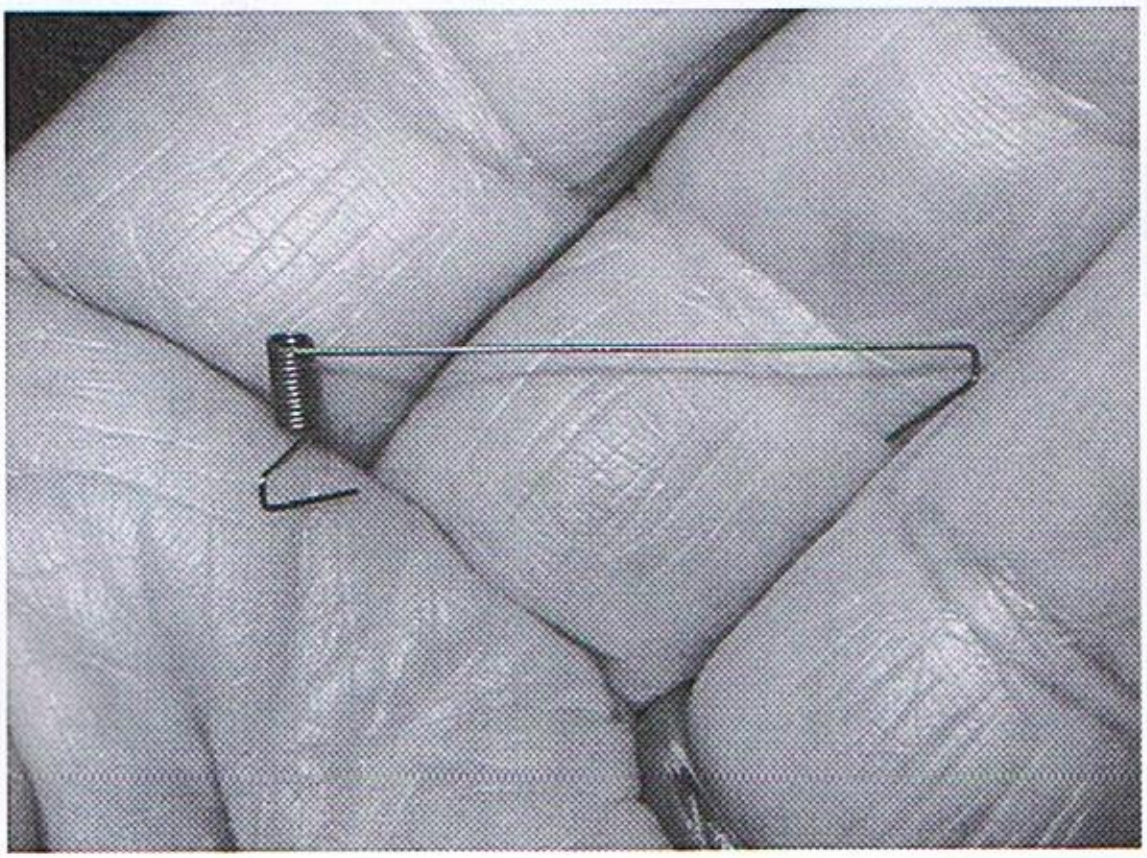
Remove the clip from the strike-activating arm.



Remove the clip that retains the washer that keeps the motion wheels engaged.

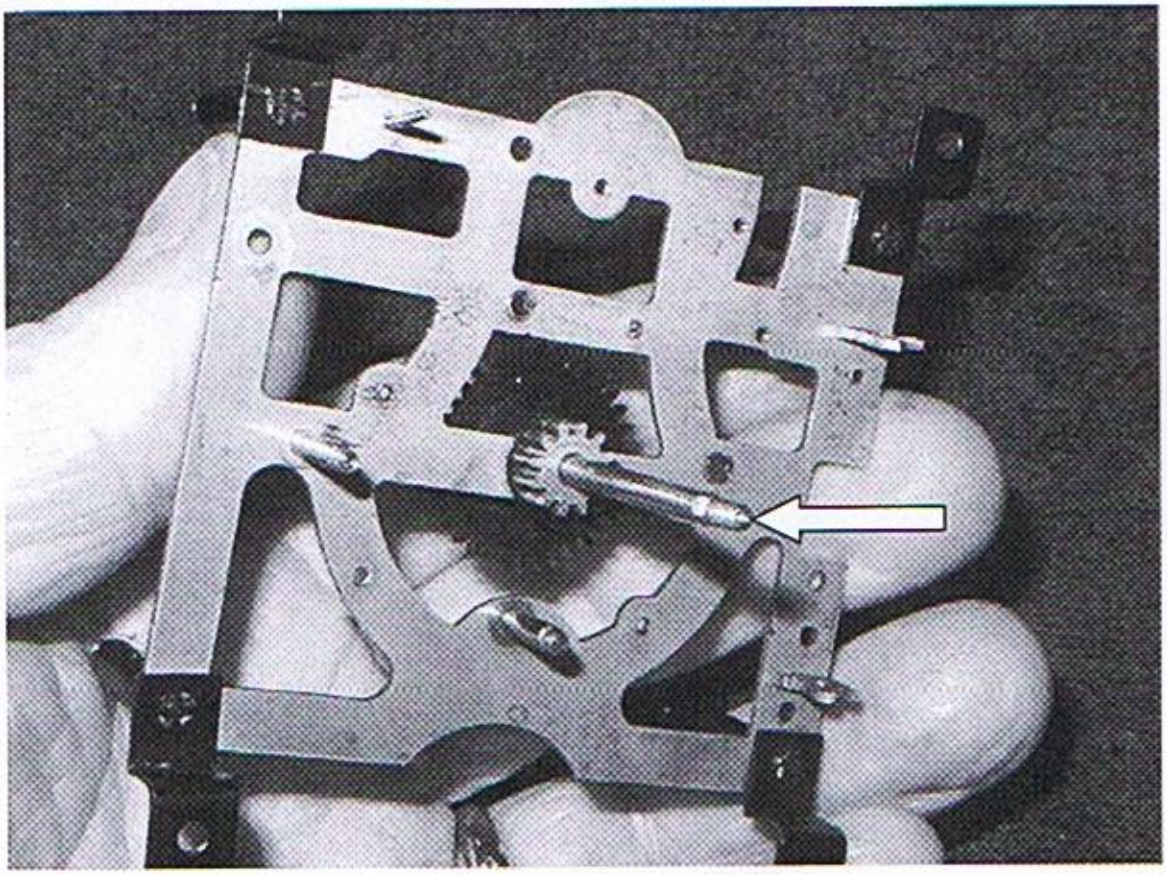


You can use a small screwdriver to snap the clips off, or you can use the needle nose pliers. Then remove all the hardware. Make a mental note of the order and placement of the hardware, including the small steel wire spring that is attached to the strike-activating arm.

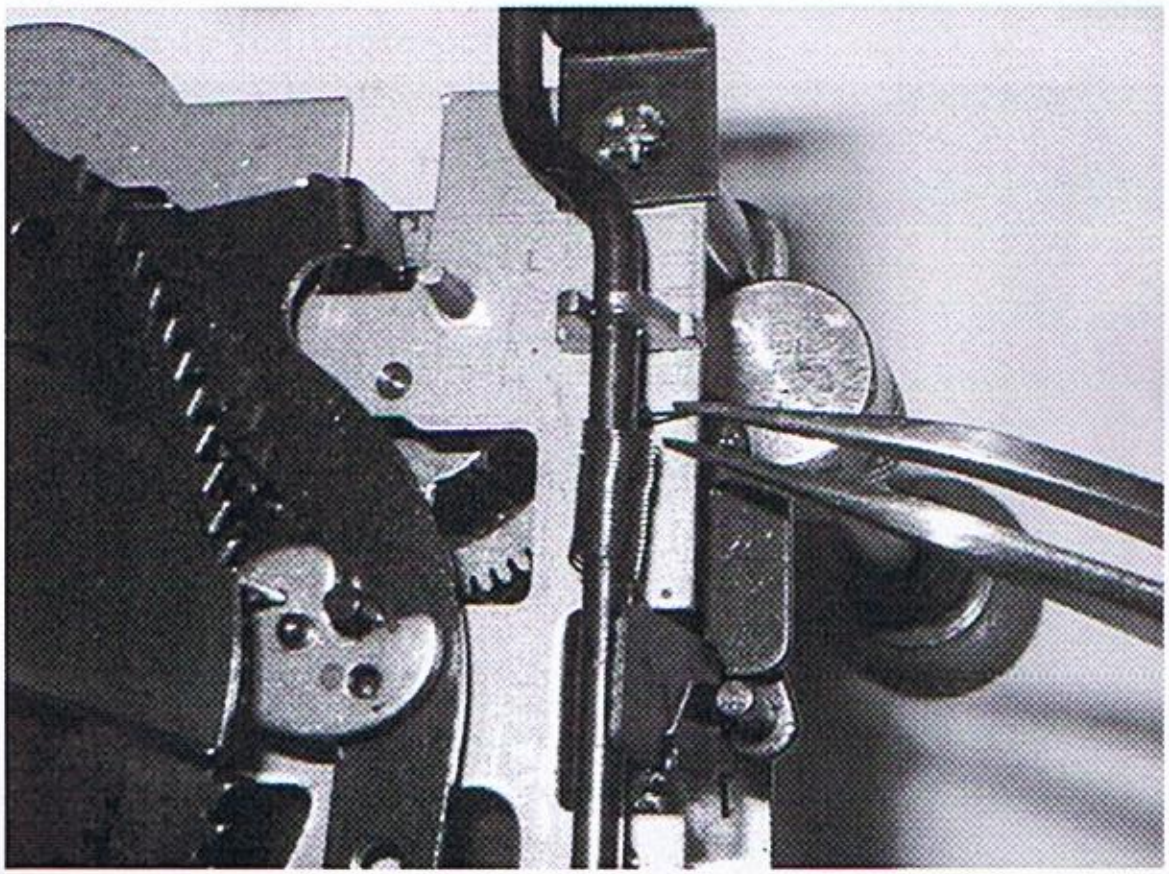


TIP: Remember to place all small parts into a cottage cheese container or similar receptacle.

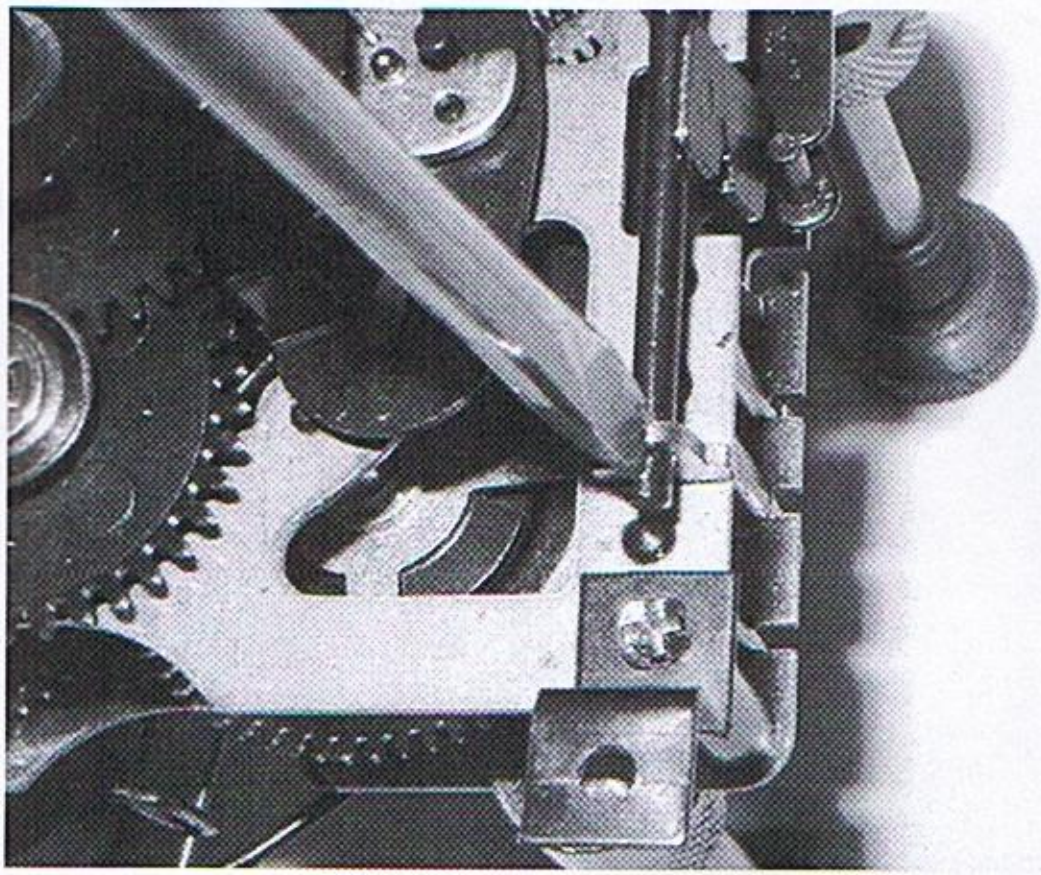
SPECIAL NOTE: Do not attempt to remove the hand shaft from the front plate. This is the one bit of instruction that is unique to Cuckoo clocks. Unlike most other movement disassembly, it is not advisable to try to remove the shaft from a Cuckoo movement. Most other types of clock movements require removal to facilitate re-assembly later. Cuckoo clock movements assemble nicely with the handshaft in place.



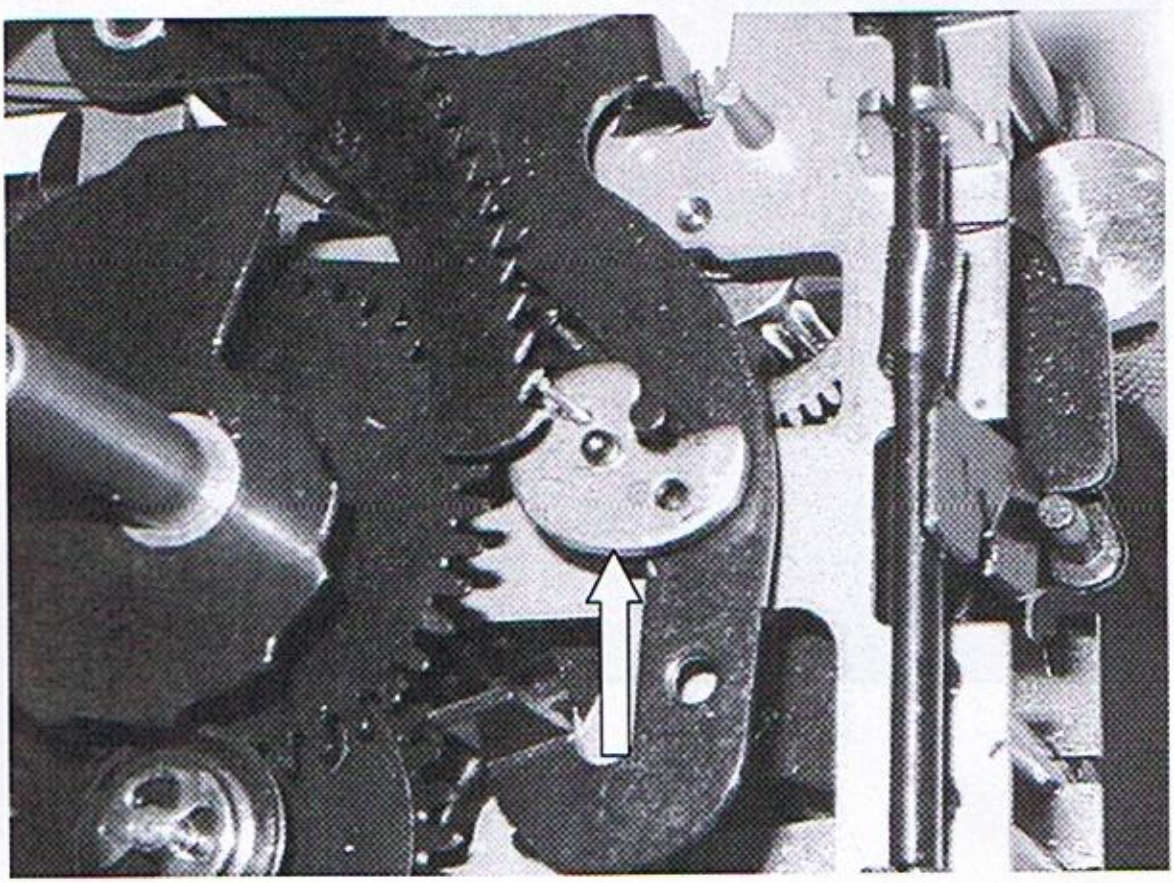
Release the small brass wire spring from the bird arm.



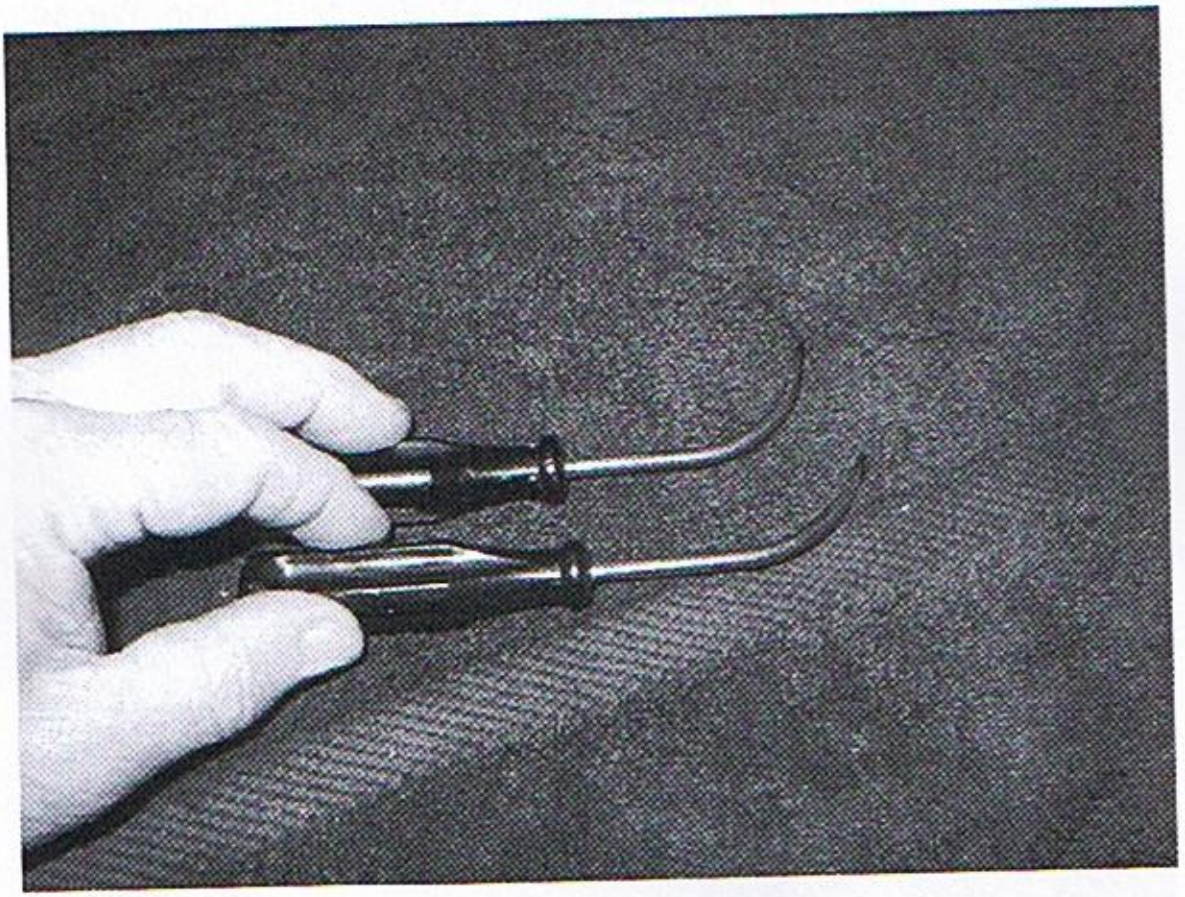
Then remove the bird arm by spreading the upper and lower bearings slightly with a screwdriver.



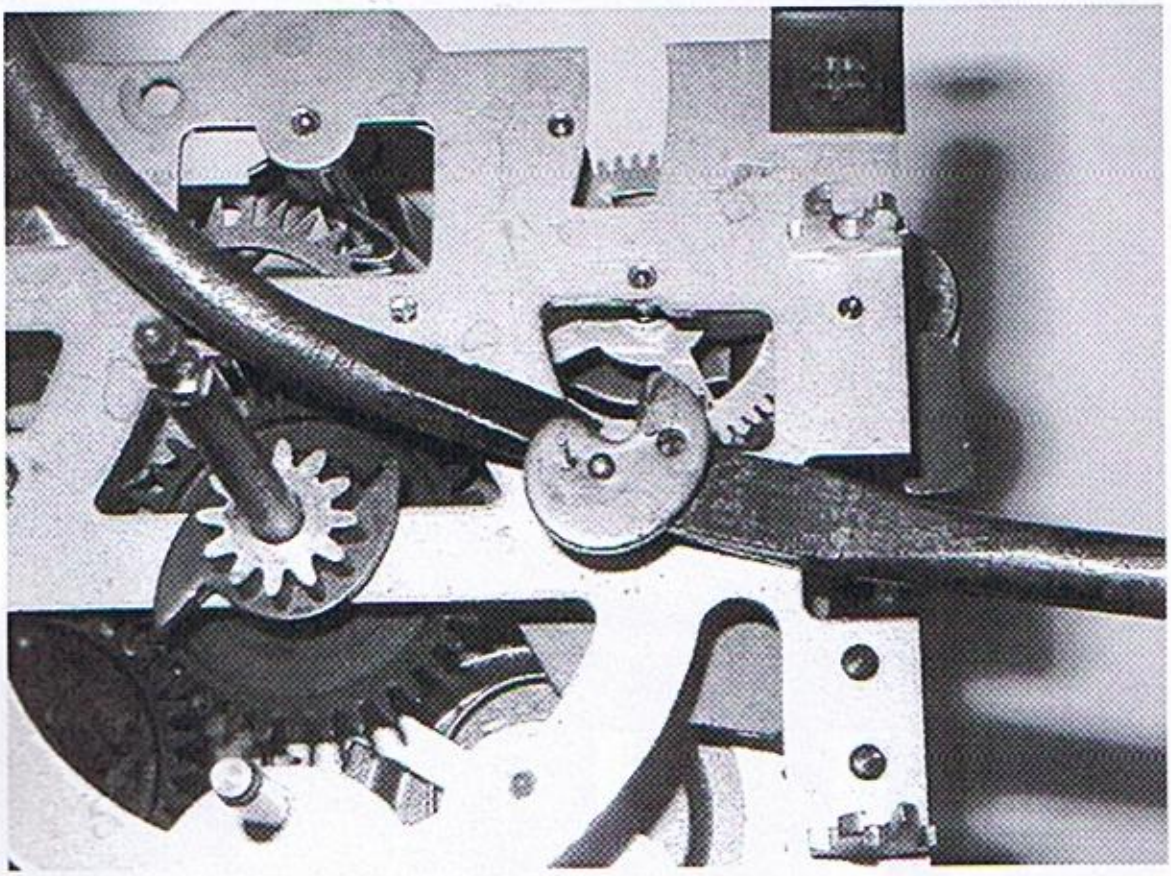
Next remove the gathering pallet. This is the small, flat, roughly oval-shaped brass disc about the size of the end of your smallest finger. It has a short piece of needle-size wire protruding from it. As the gathering pallet turns, this wire engages the teeth on the edge of the rack and lifts the rack one tooth per revolution. This is the way the mechanism counts the number of times the Cuckoo makes its' sounds depending on the hour being signaled.



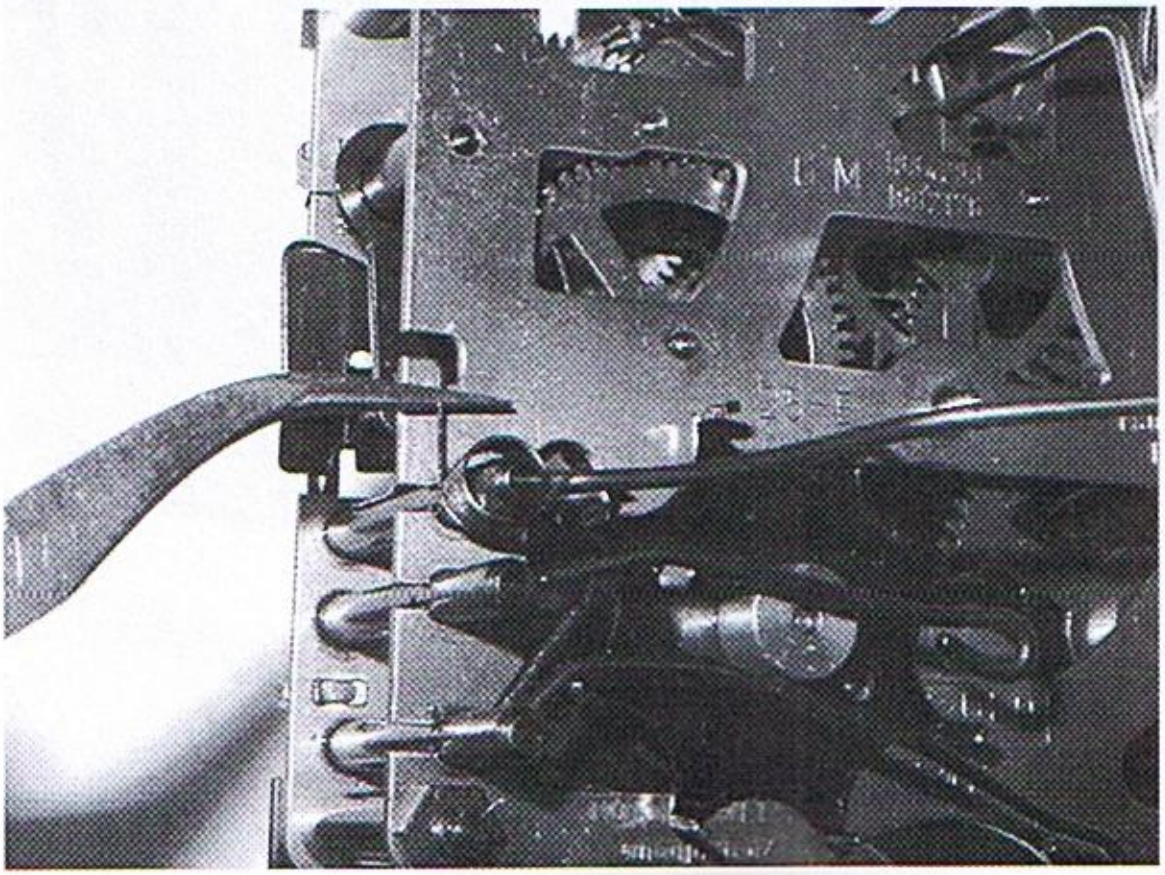
The best way to remove the gathering pallet is to use a pair of screwdrivers that have been heated and bent to form a couple of "priser" bars.



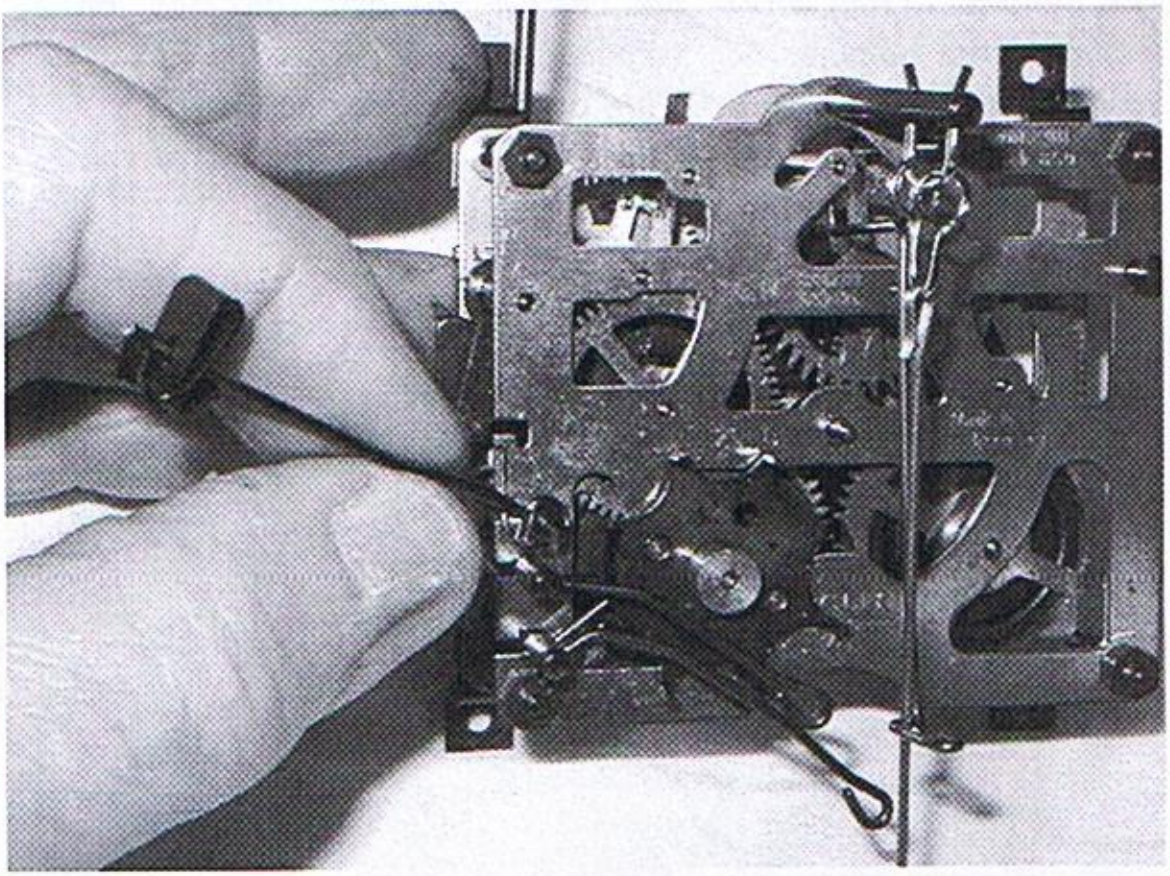
After positioning the ends of the priser bars under opposite sides of the gathering pallet, apply upward pressure to the gathering pallet by pushing one handle away from you and pulling the opposite one toward you. Such action will greatly multiply the force of lifting. Be careful to apply the same force to each priser bar or you will bend the shaft that the gathering pallet is mounted on. Also take care where you rest the priser bars. You may wish to place a bit of flat wood or firm cardboard under the resting points to protect the front plate from damage.



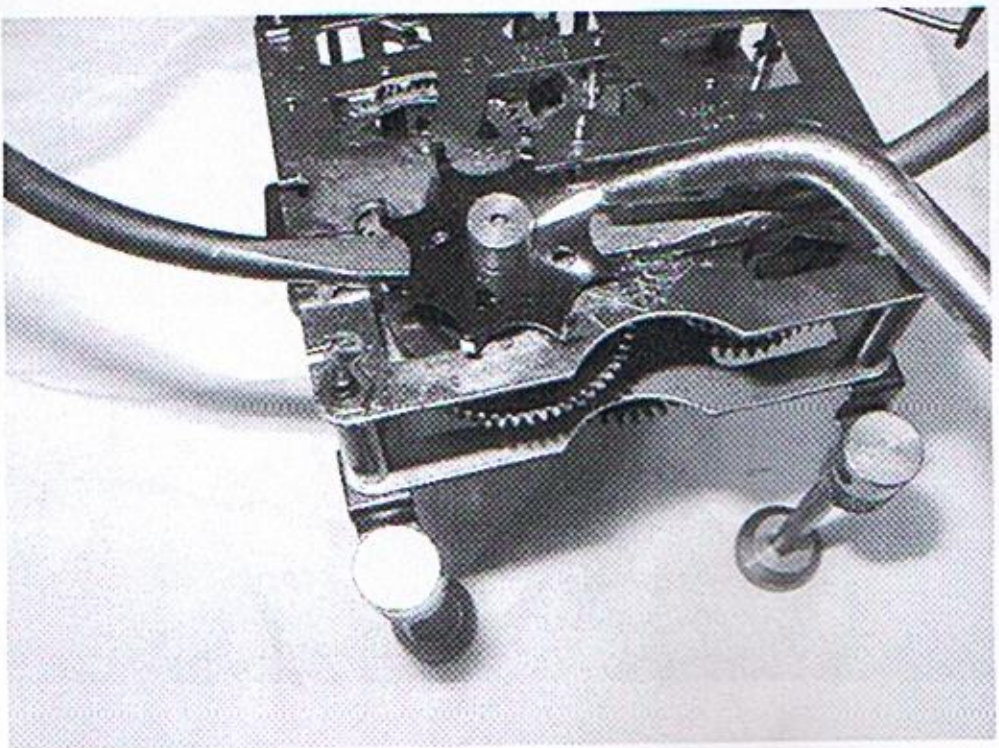
Now turn the movement over and remove, from the back of the movement, the arms that were previously connected to the bellows-lifting wires, and remove the arm that has, on its' end, the hammer for striking the gong. The first step is to release the end of the fine brass wire spring on the hammer arm. Just release the end that is attached to the plate. Leave the spring itself on the hammer arm.



Then rotate the hammer arm counter clockwise till you can slip the hammer's shaft backwards out of the movement. The two bellows lifting arms below will release the same way.

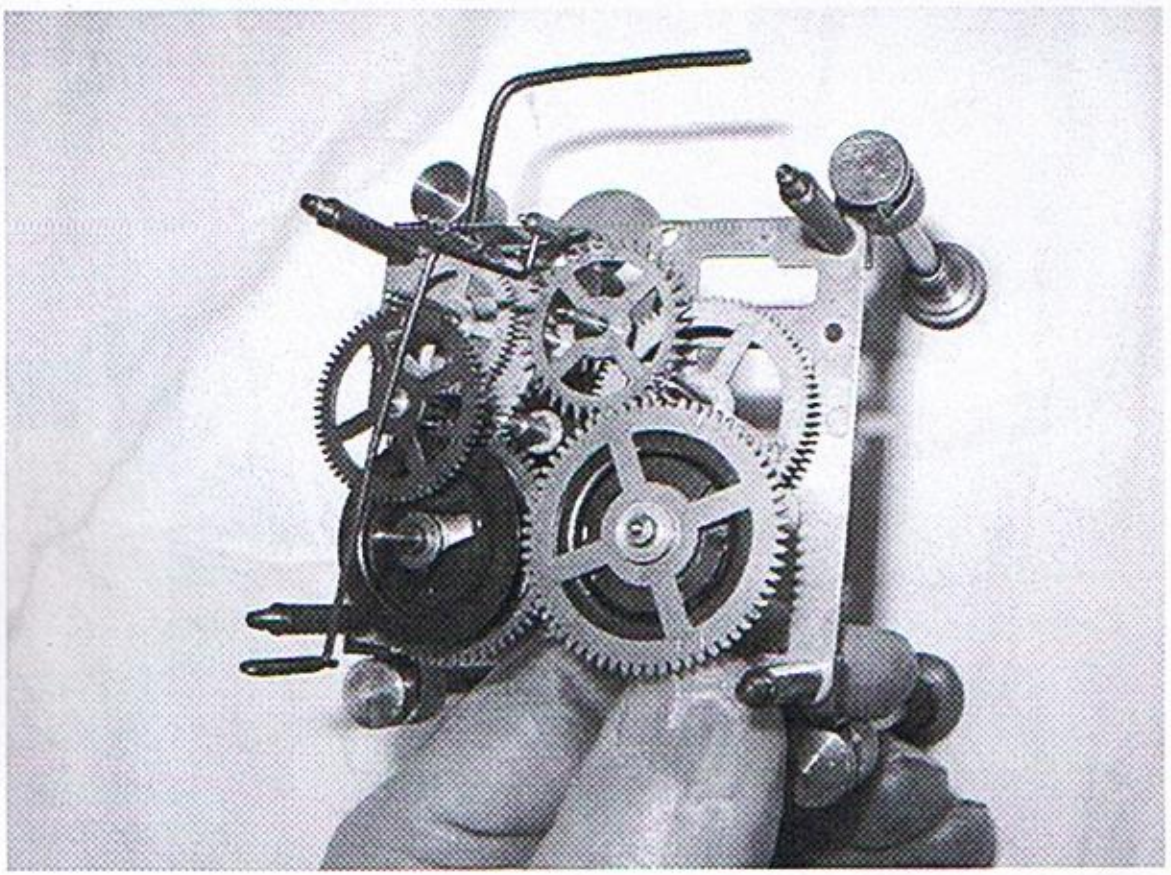


The pinwheel that creates the bellows activity must be removed. This is the round black thing about the size of a quarter. It has little black fingers around the outer edge. I call this the bellows-lifting wheel. Removal of the bellows-lifting wheel was an easier matter on the older Regula movements. The hub of the lifting wheel had a set screw which, when unscrewed, allowed the wheel to slip off. Newer models have a press fit that requires heat for removal. Place the tips of your priser bars under opposite sides of the wheel so you can lift the wheel off its shaft when the heat is applied. The heat must be a very small, very hot flame applied only to the brass hub in the center of the wheel. The heat will expand the brass and make the hole larger, thus releasing the press fit. Pry the wheel off before the brass cools. You will need to either purchase a replacement wheel that has a setscrew, or drill and tap the old part and fit it with a setscrew.

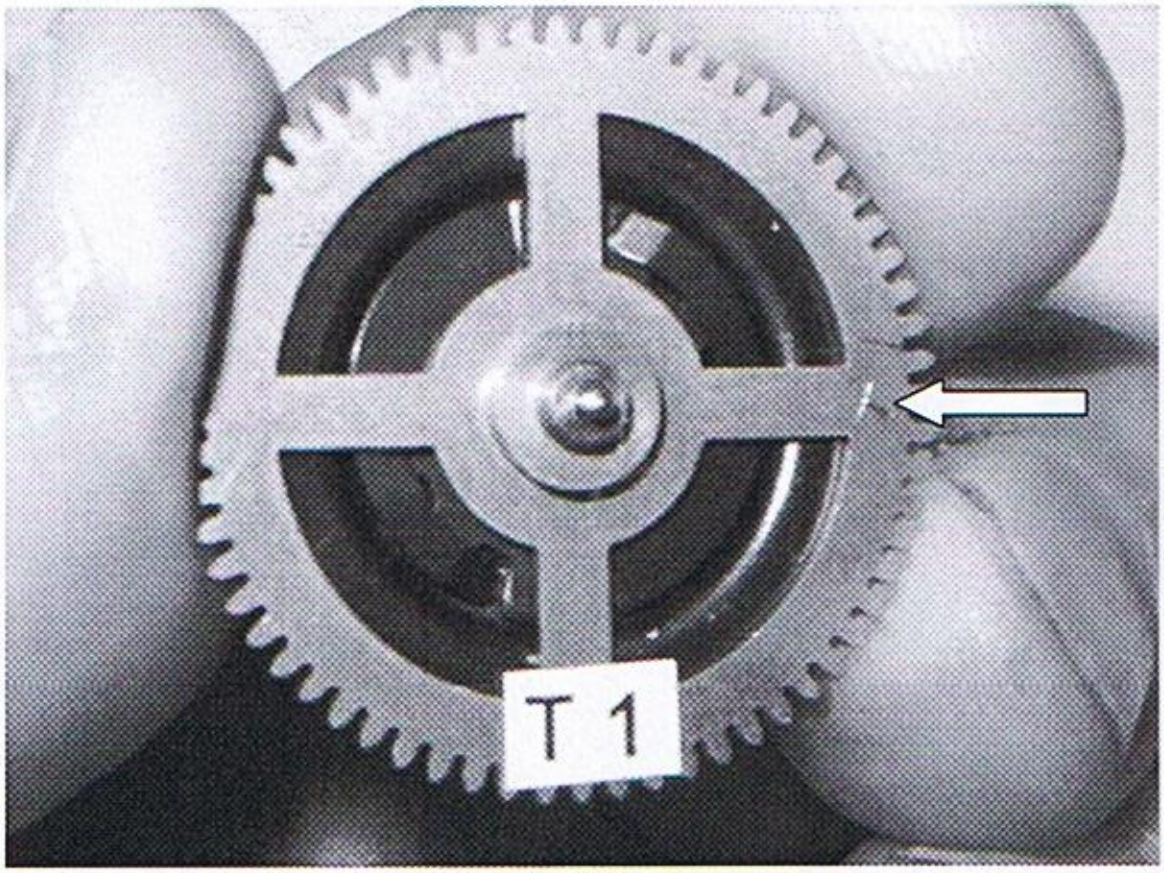


CAUTION: Propane torches do not deliver enough concentrated heat to a small area. You NEED an "Oxy-acetylene" tank set with a very small torch tip.

The front plate is now ready to be removed. Turn the movement over and unscrew the four nuts at the corners of the plates and lift the front plate off. Try to keep the wheels (clock term for gears) in their respective locations. Now is the time to mark each wheel so you can identify its' position and also prevent inverting them when reassembling the movement.

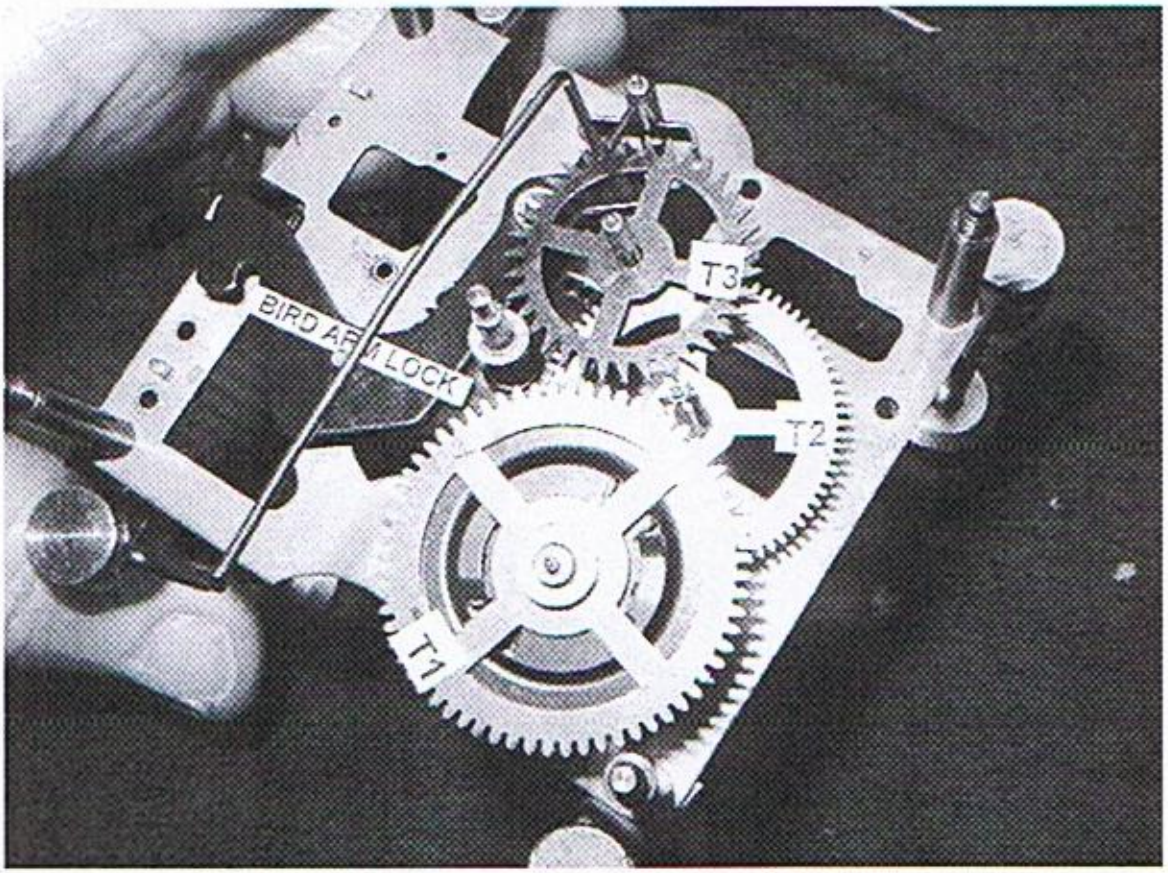


Using a small metal file sharpened to a point, scribe identifications on the upper face of all the wheels.



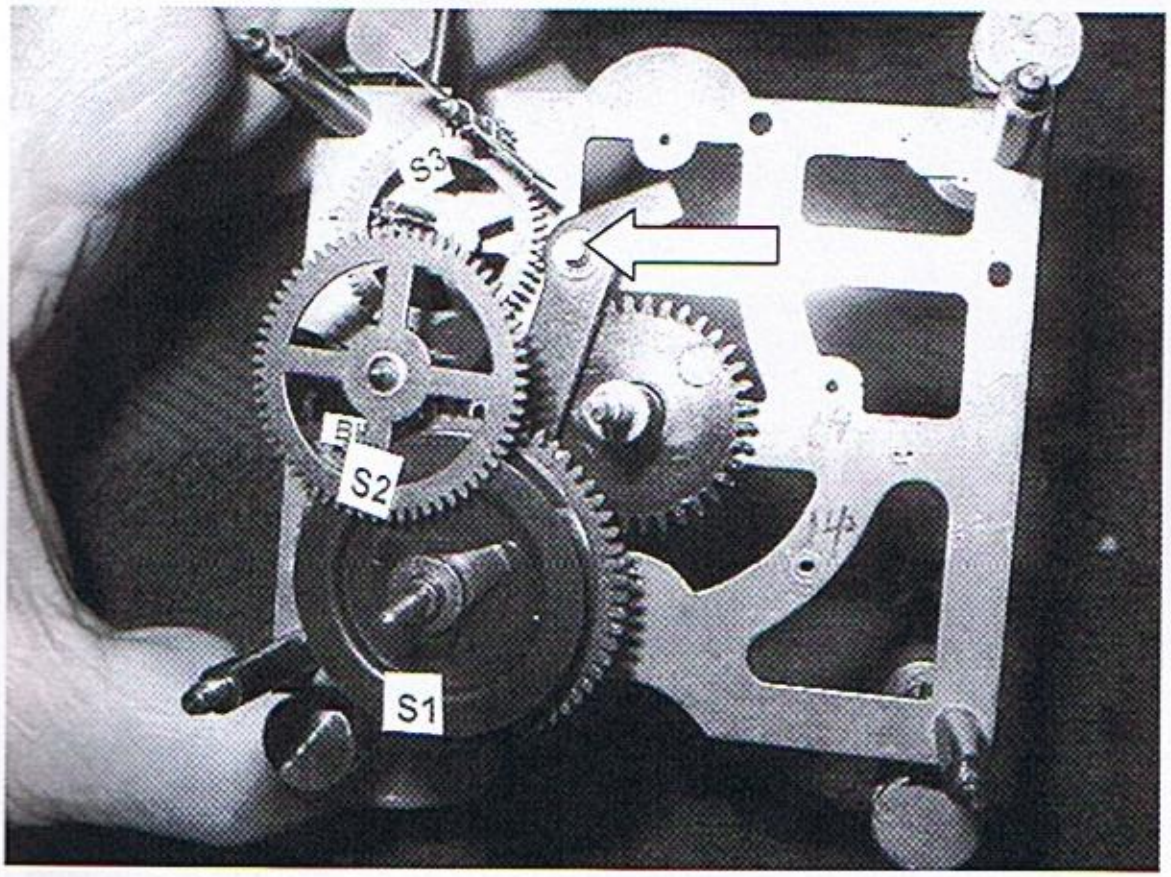
Replacements for defective "going" or drive wheels are available through Timesavers*.

Start with the first wheel on your right. The "first wheel" is the one that the chain wraps around. That is the number-one time wheel, sometimes referred to as the "going" wheel. Mark it "T1". On the next wheel mark "T2". It is the one impelled *by* "T1". "T3 is the one impelled *by* "T2". The last thing in the train is the verge. You do not need to scribe the verge.

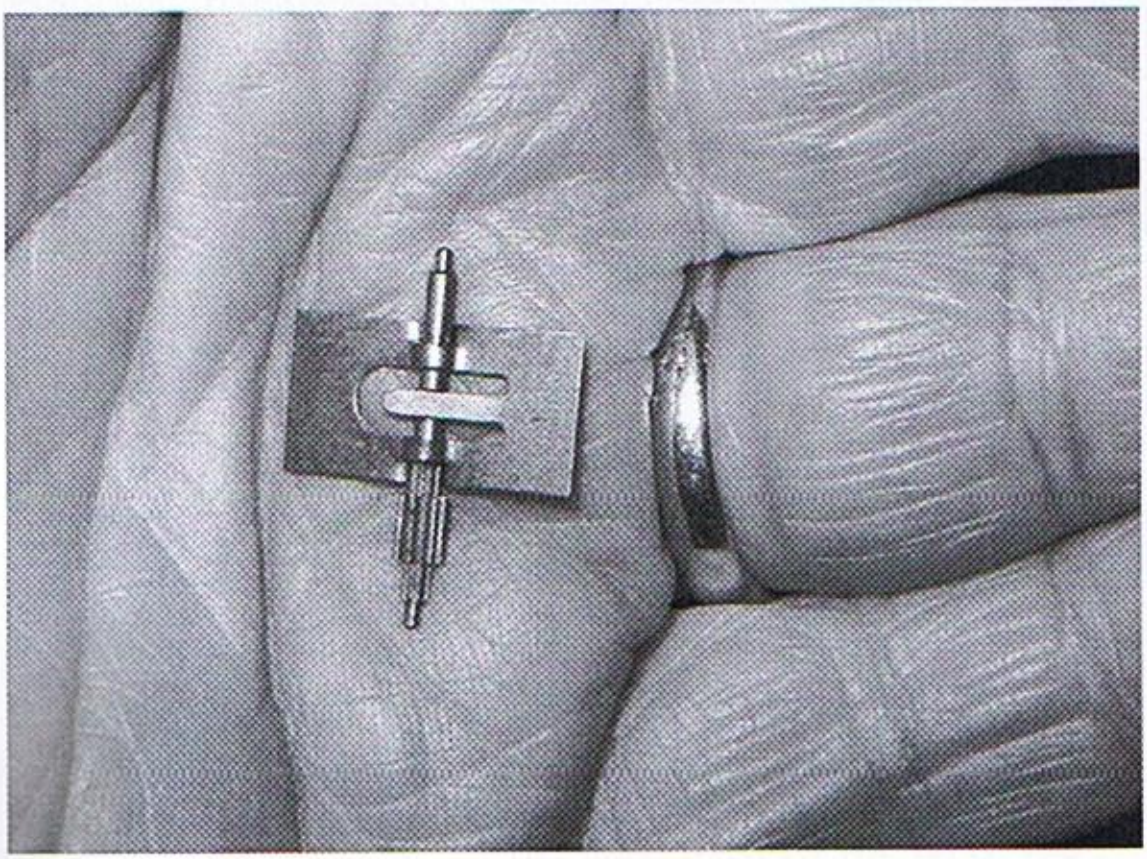


Follow this pattern also on the gear train on the left. The train on the left is the one that makes the Cuckoo sound. It is the strike train. "S1", "S2", "S3". The fourth position is the governor fan. Mark it "4" on that portion of the fan nearest the back plate. Remove all the loose parts.

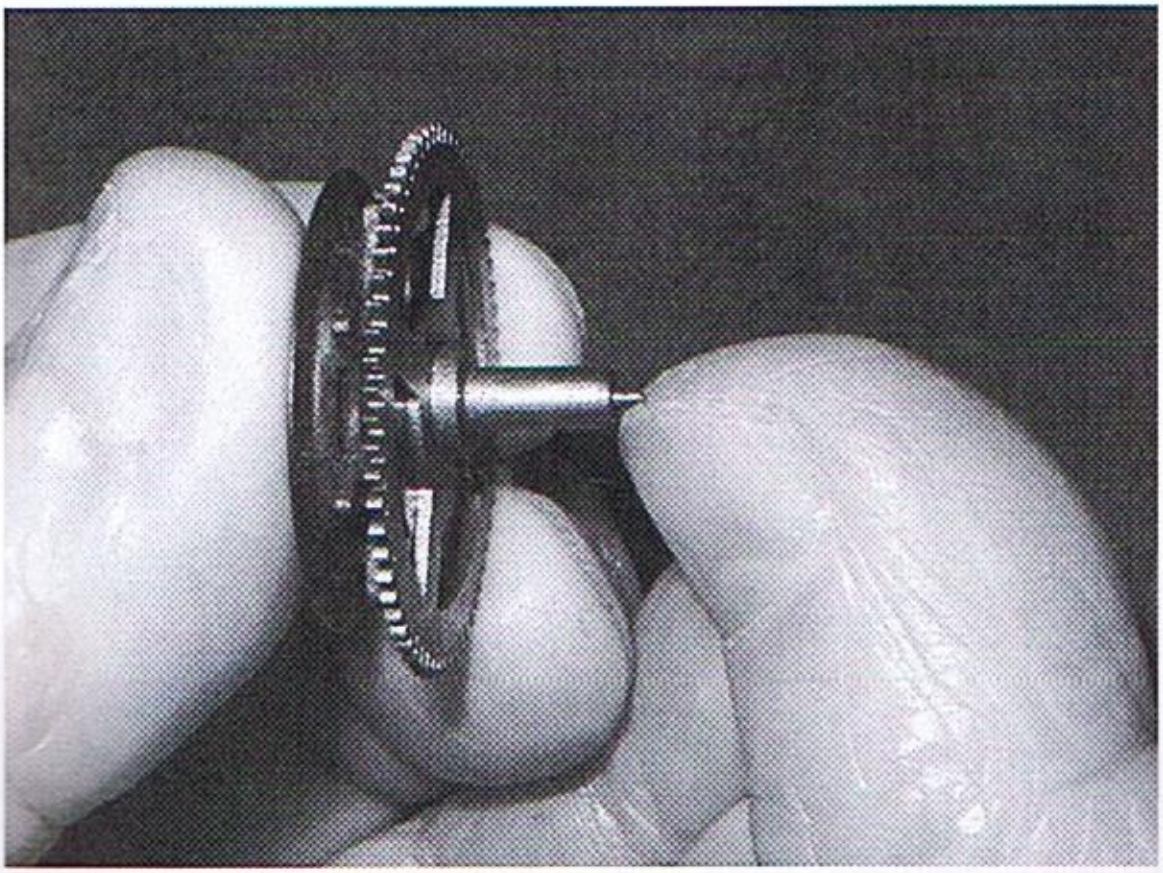
Remove the retainer clip from the bird-lock arm as indicated by the arrow. Remove the bird lock arm. There is a clearer identification of the bird lock arm later in the book.



The fan is common to all mechanical clock movements that have a striking train. The purpose of the fan is to keep the striking, or in our case the Cuckoo sound, steady and slow. The fan encounters wind resistance as it spins. This resistance is what slows and evens the speed.

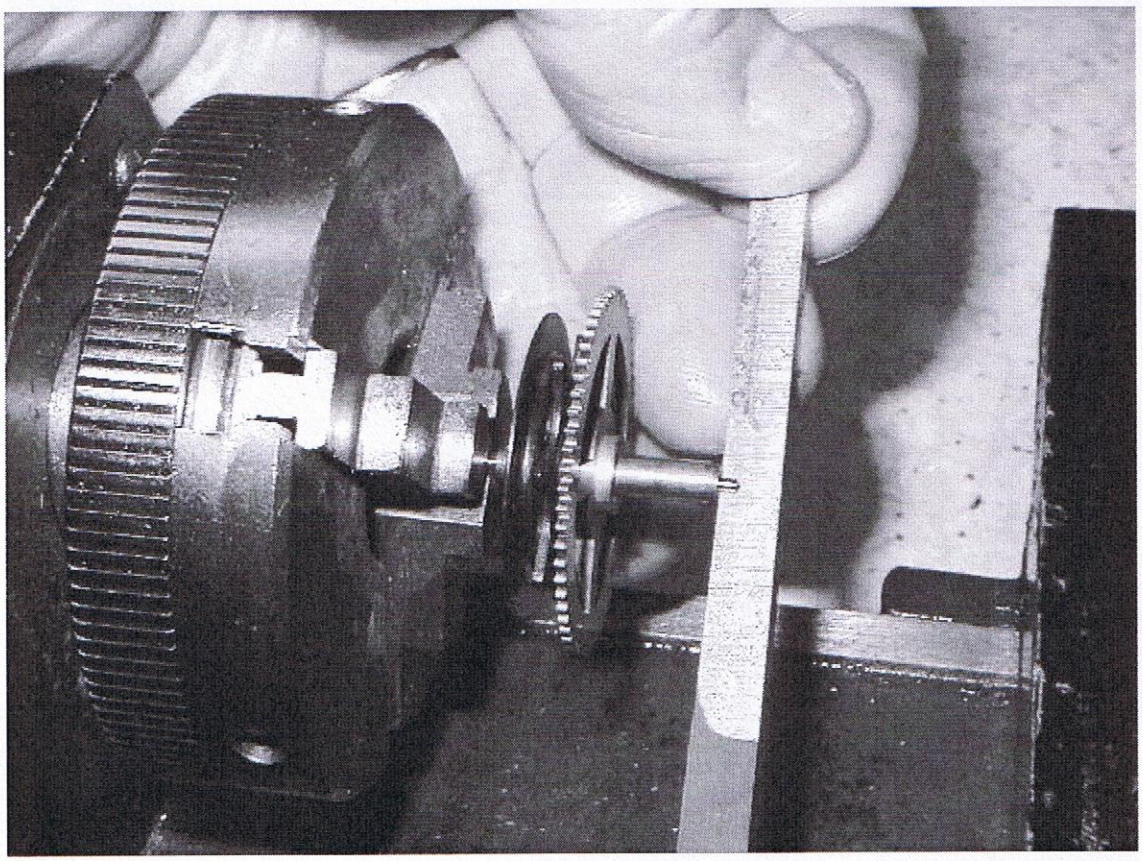


Check for scoring on each of the steel pivots. Slide the edge of your fingernail over the pivot to see if you feel scoring.



If scoring is detected, you will need to polish the pivot or replace the wheel with a good used one (buy up a few movements for parts). Polishing is done using a "burnisher" and a lathe. The burnisher is a very, very fine file that is held against the pivot as it spins in the lathe. A good burnisher will have two grades. One end is fine, the other end is finer still. The courser end is used first to remove a very small amount of metal in order to smooth up the scoring. The finer end is used next to polish the pivot so it will wear a long time and not chew up the pivot hole prematurely.

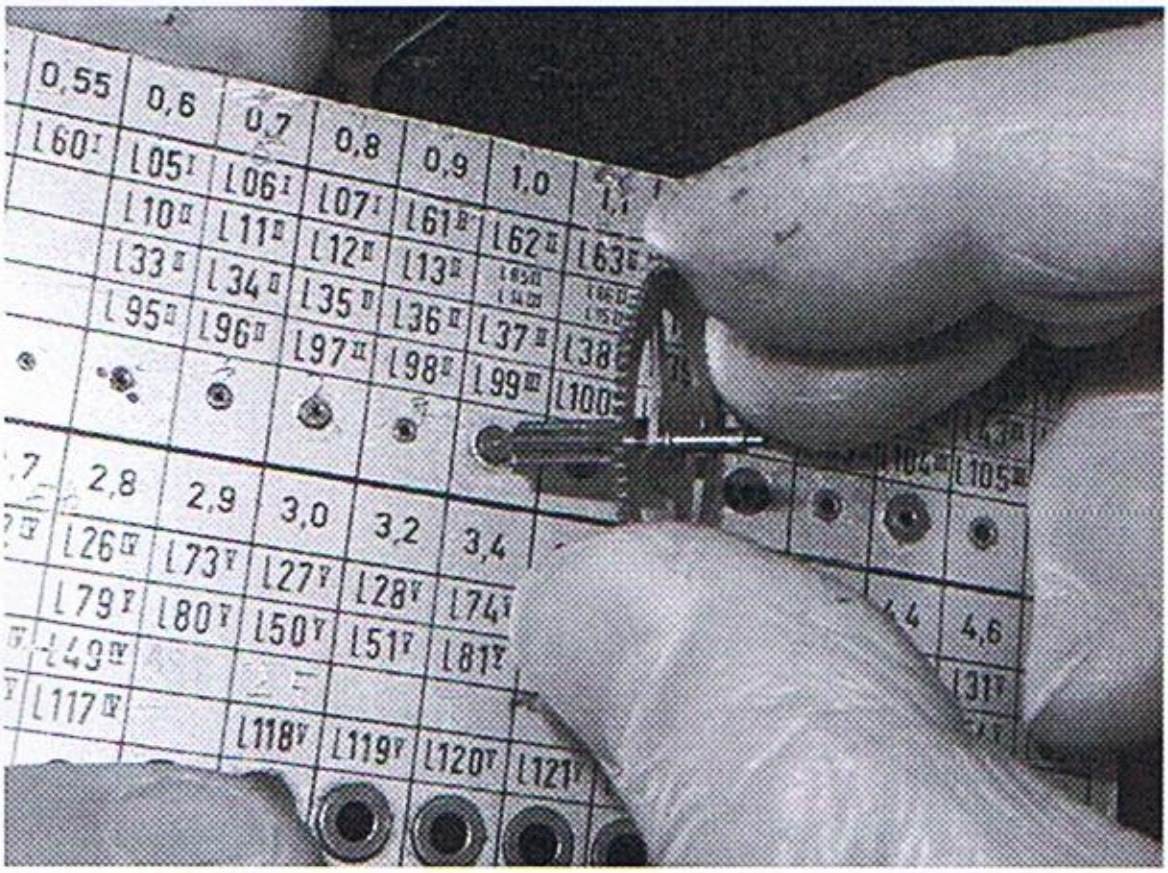
The burnisher is held under the pivot and moved slowly from one end of the burnisher to the other while the lathe is turning at top speed. Be careful to keep the flat side of the burnisher parallel with the pivot so as to not create a tapered pivot.



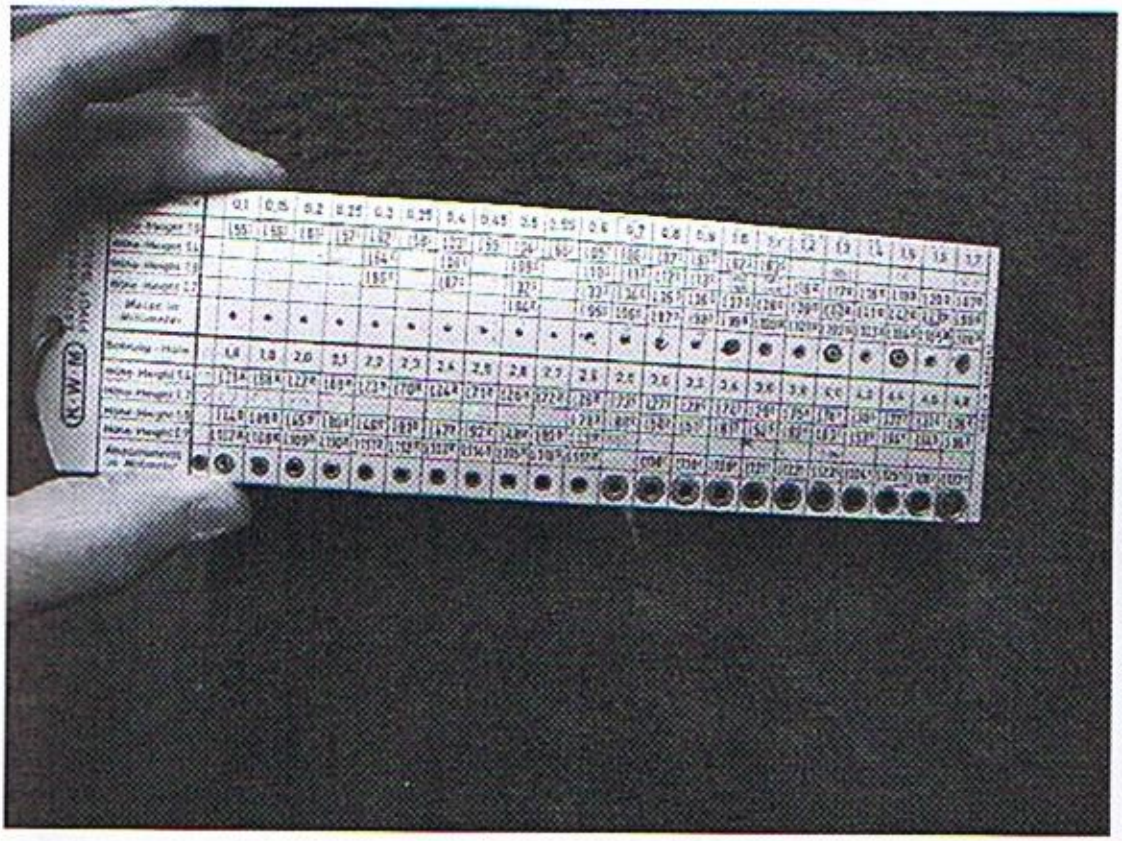
TIP: always dip the burnisher in very light oil before applying the burnisher to the spinning pivot. Lamp oil is good, but always use rubber gloves to protect your skin from the solvents, and be careful to keep lamp oil away from open flame. The purpose of the oil is to prevent the cutting face of the burnisher from getting clogged with metal that is removed from the pivot. You will ruin a good burnisher very quickly if you attempt to polish pivots dry.

You can also polish the pivots using a drill press, but not as conveniently.

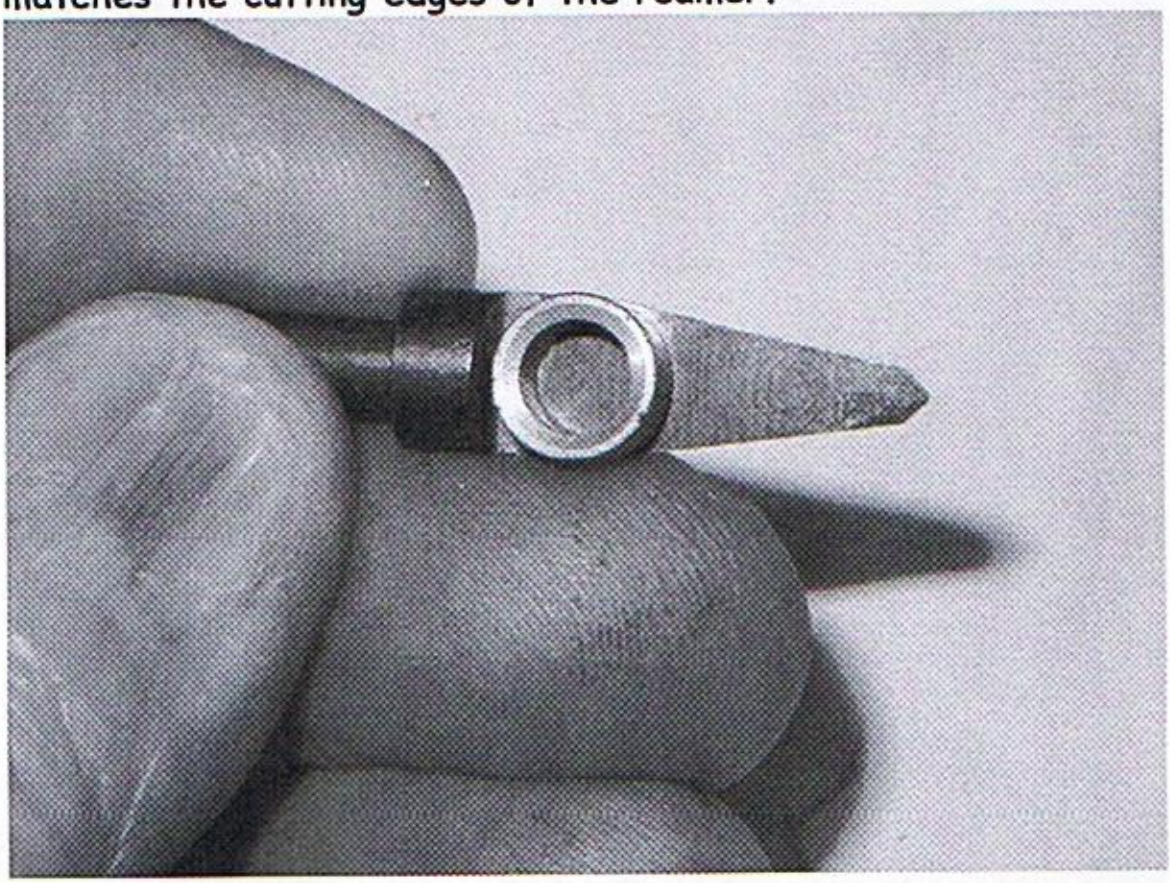
The bushing process is next. Determine the size of each bushing by trying the pivot in your bushing size-guide. Choose the bushing one size smaller than the one into which the pivot fits freely. You will enlarge the small hole in the bushing with a "broach" after pressing the bushing into the plate.



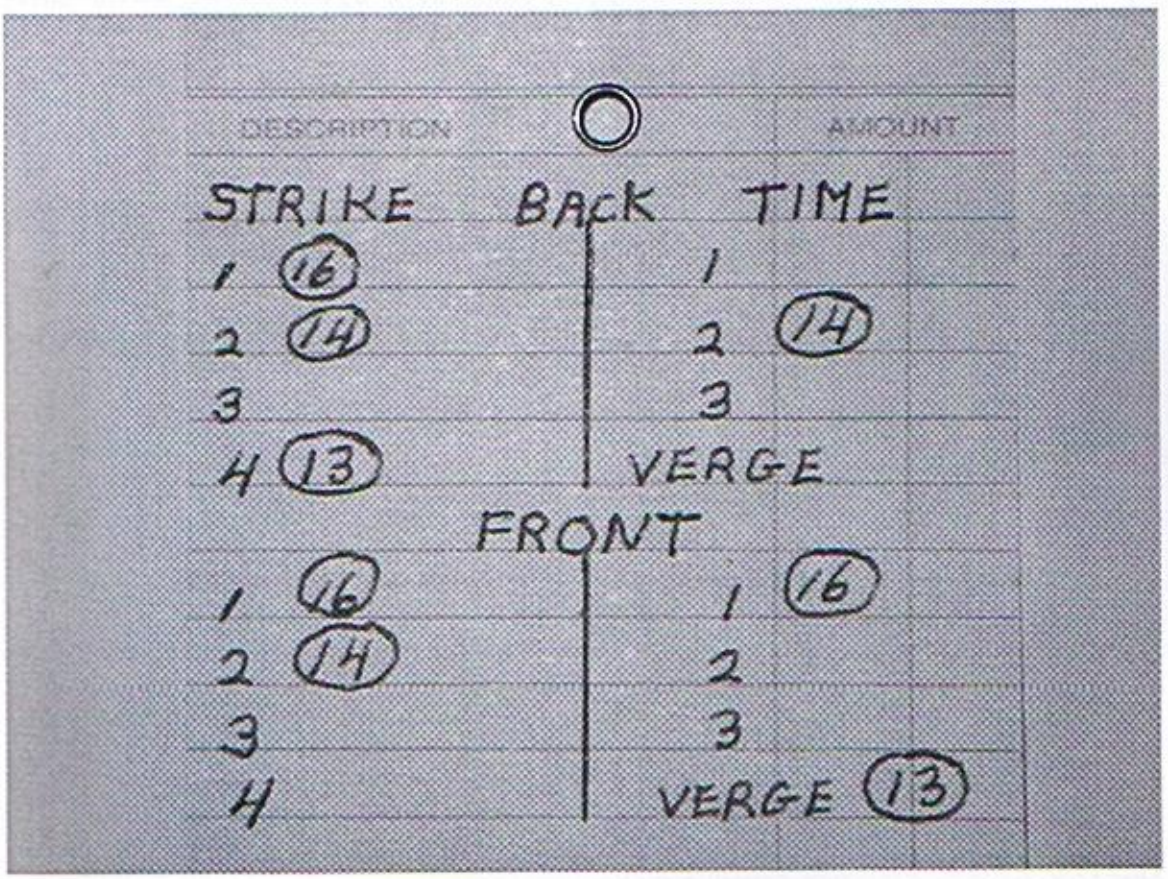
Bushing size guide --------- (*Timesavers #13483)



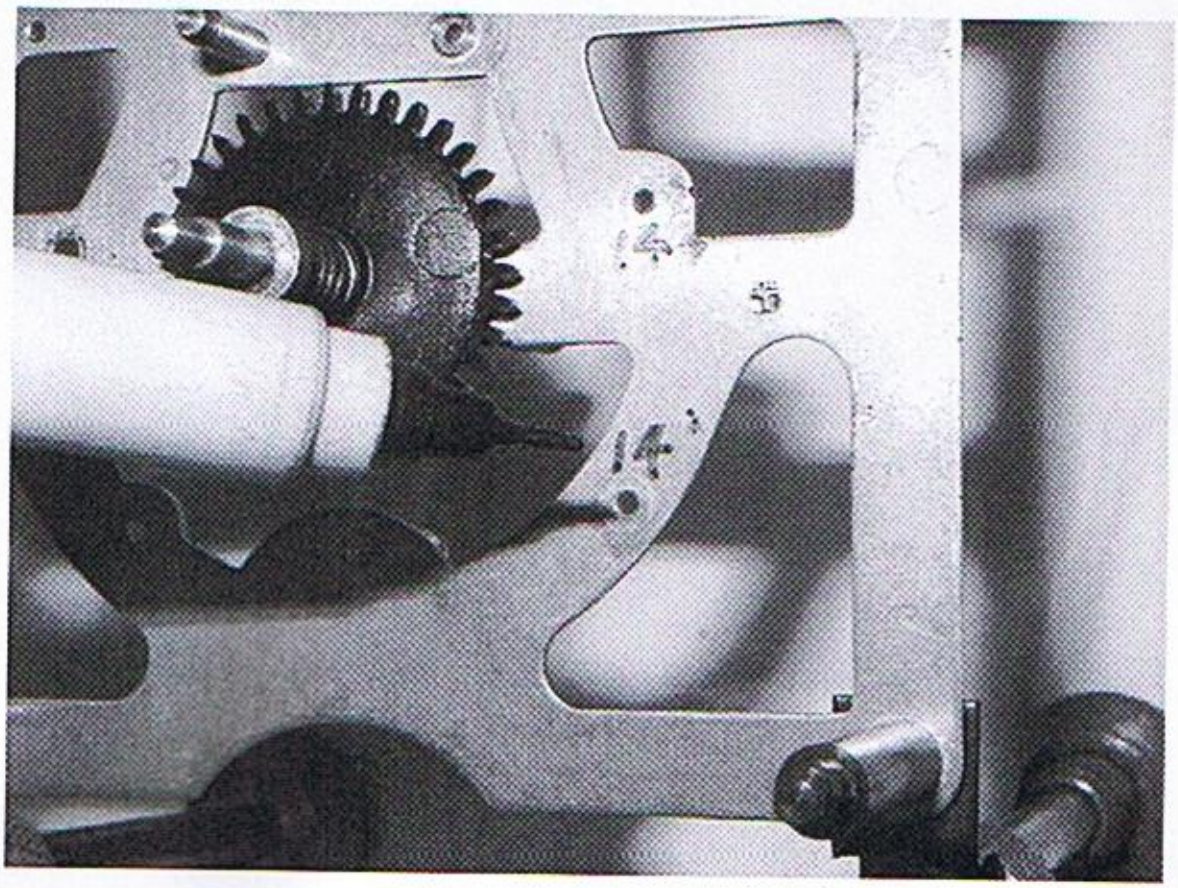
Next determine the proper size reamer for making a hole in the movement plate to receive the bushing. An easy way to choose the right reamer is to lay the bushing on the flat side of the reamer to see if the outside diameter of the bushing matches the cutting edges of the reamer.



Write the bushing number on your chart.

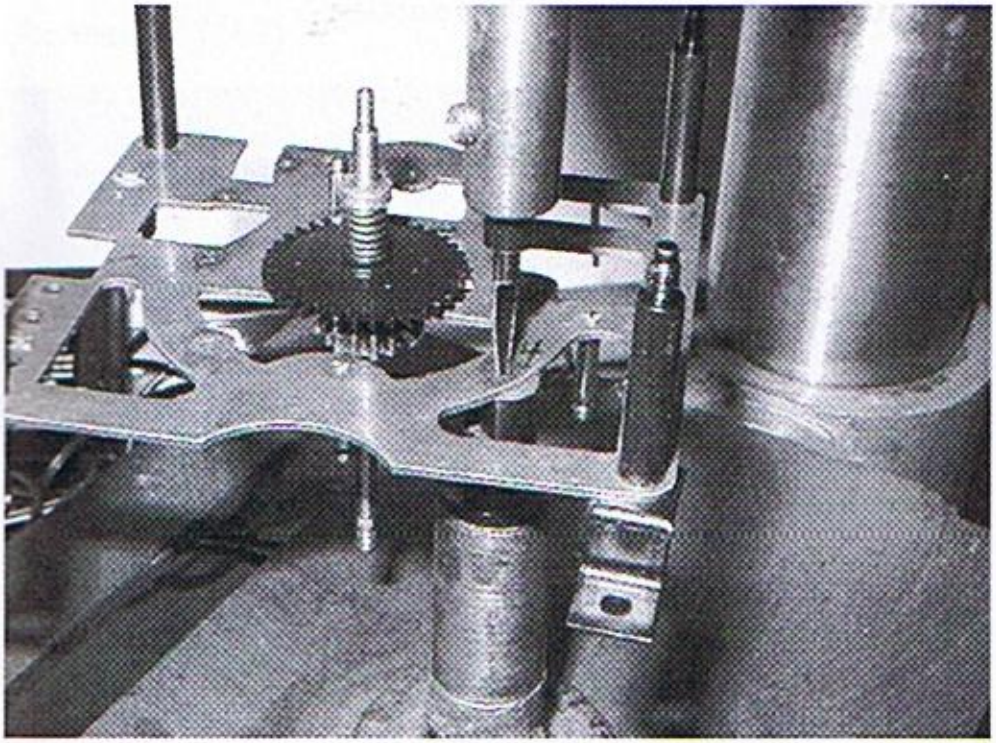


When your chart is complete, mark the plates accordingly so you will know what size, and where, to put each bushing. I use an ultra fine "Sharpie" pen to mark the inside of the plates. This marking comes off during the cleaning process.



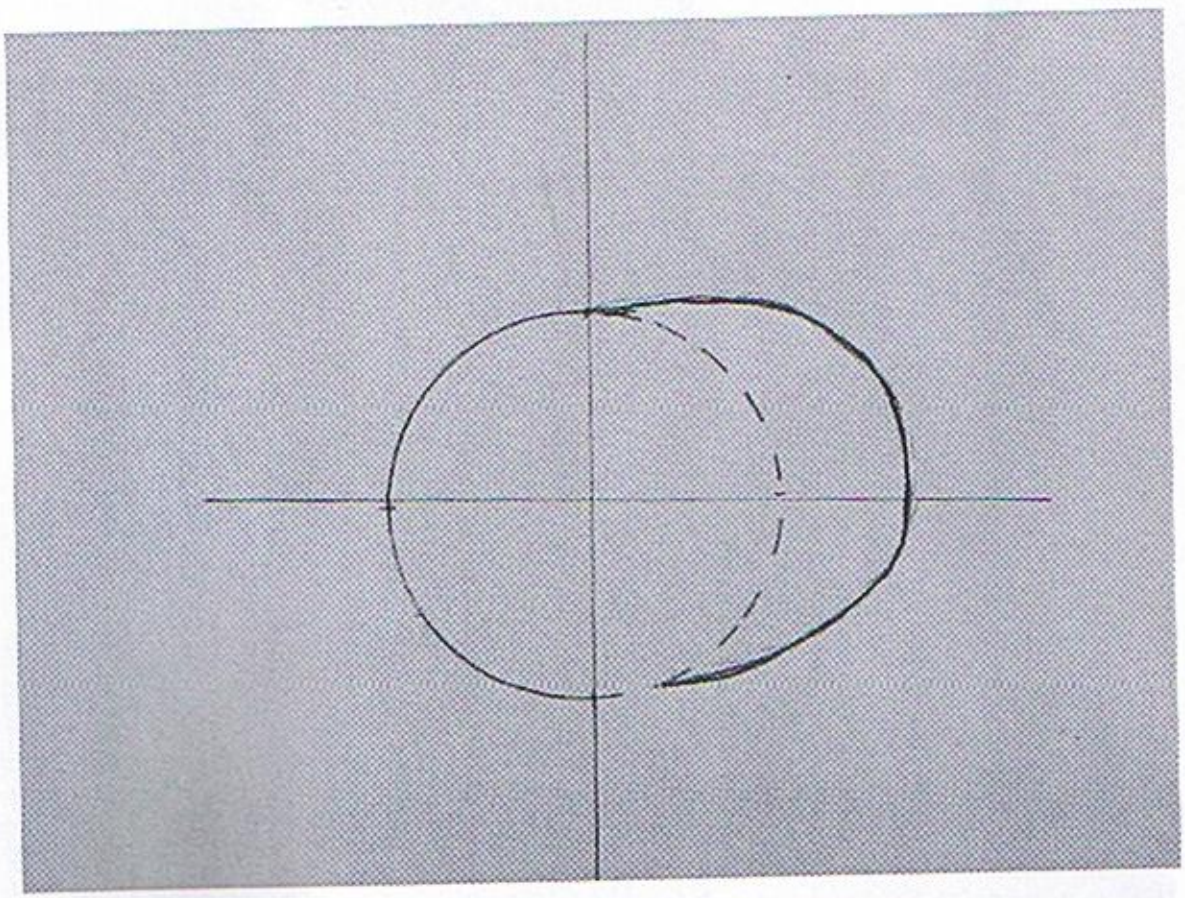
Now ream all the holes according to the marks on the plate. Make sure to use the right size reamer for each of the bushings, and ream from the inside out.

The following picture shows the method I use for reaming holes in the movement plates. I use a drill press with a reamer driver I made. The part below the plate is an anvil that was made for a commercial bushing machine. The tube into which the anvil is inserted is a piece of small steel pipe machined to receive the anvil.



IMPORTANT NOTE: It is important to maintain the location of the original pivot hole. You will need to compensate for wear by removing more metal from the un-worn side of the hole in order to end up with a round hole whose center is located where the center of the original pivot hole was. This measure is needed only when the pivot hole is extremely worn.

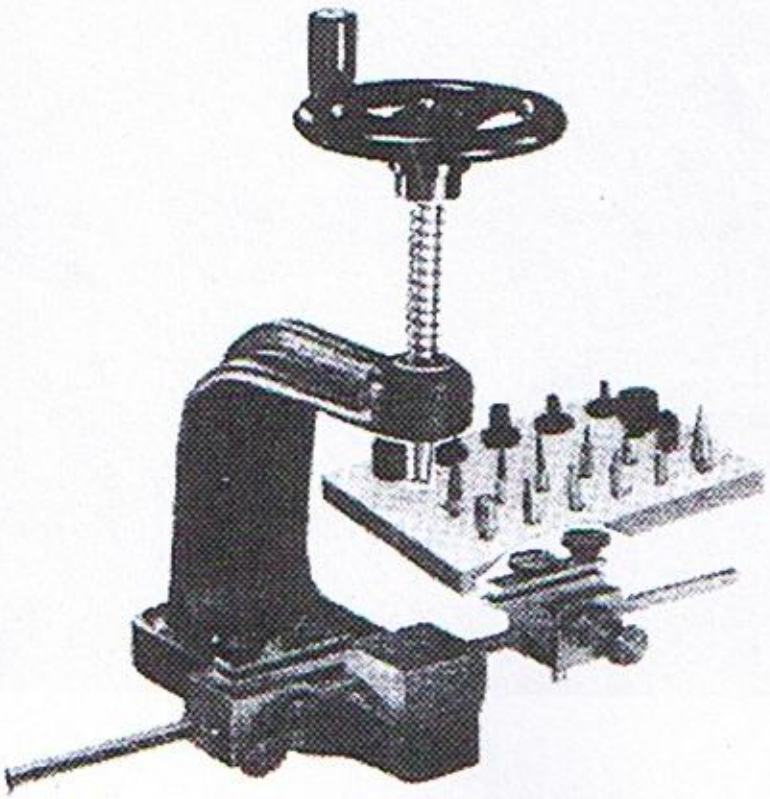
This picture shows the true center of the pivot hole via the crosshairs, before it was worn out. The dotted line represents the original circumference of the hole. The solid line to the right represents the worn area. The left side of the hole is where you need to remove more metal in order to restore the centerline. One way to do this is to apply sideways pressure on the plate while reaming.



Install all the bushings in the plates. Reamers are designed so that the reamed hole will be just slightly smaller than the outside diameter of the bushing. When the bushings are pressed into the holes, they will be held in place firmly. This is called "friction-fit".

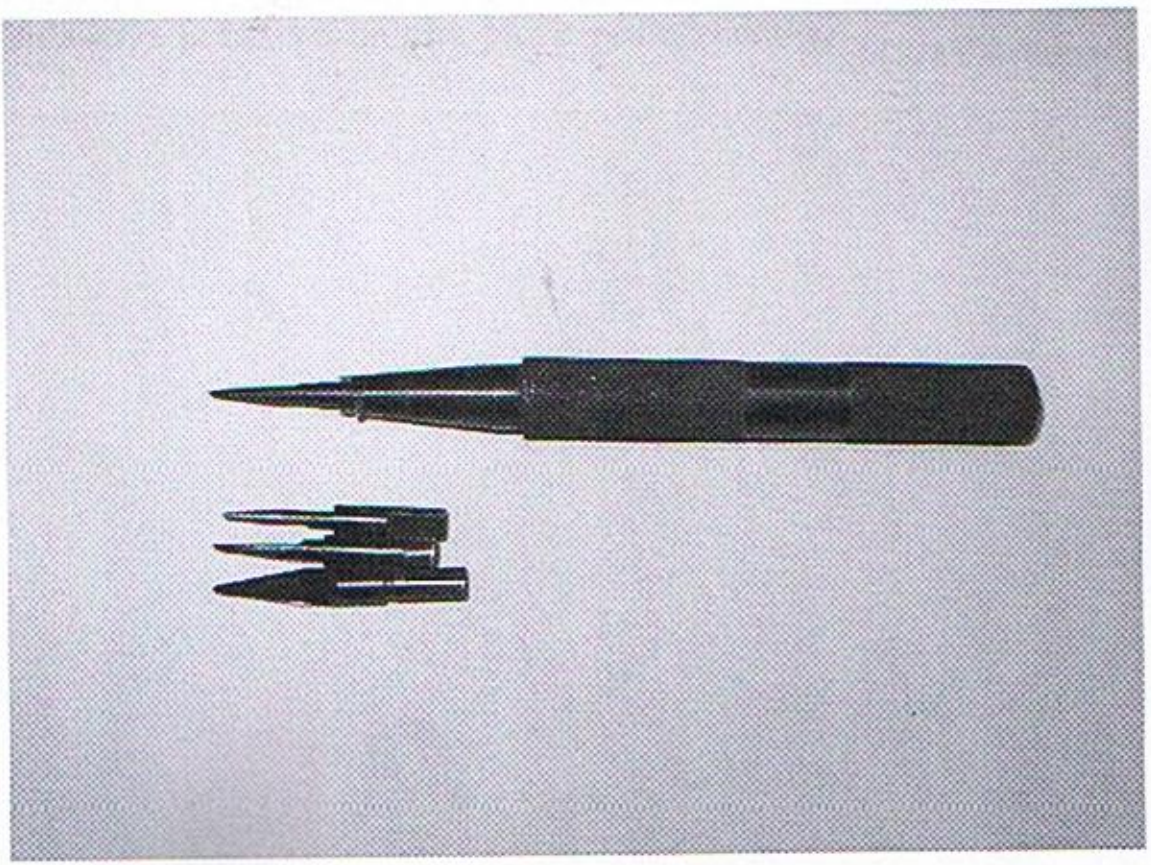
The recommended way to ream the plates and install the bushings is to use an elaborate bushing tool that reams the holes perfectly perpendicular to the plate, and, also presses the bushings into the reamed holes nice and squarely.

(Ronnell #TM2)

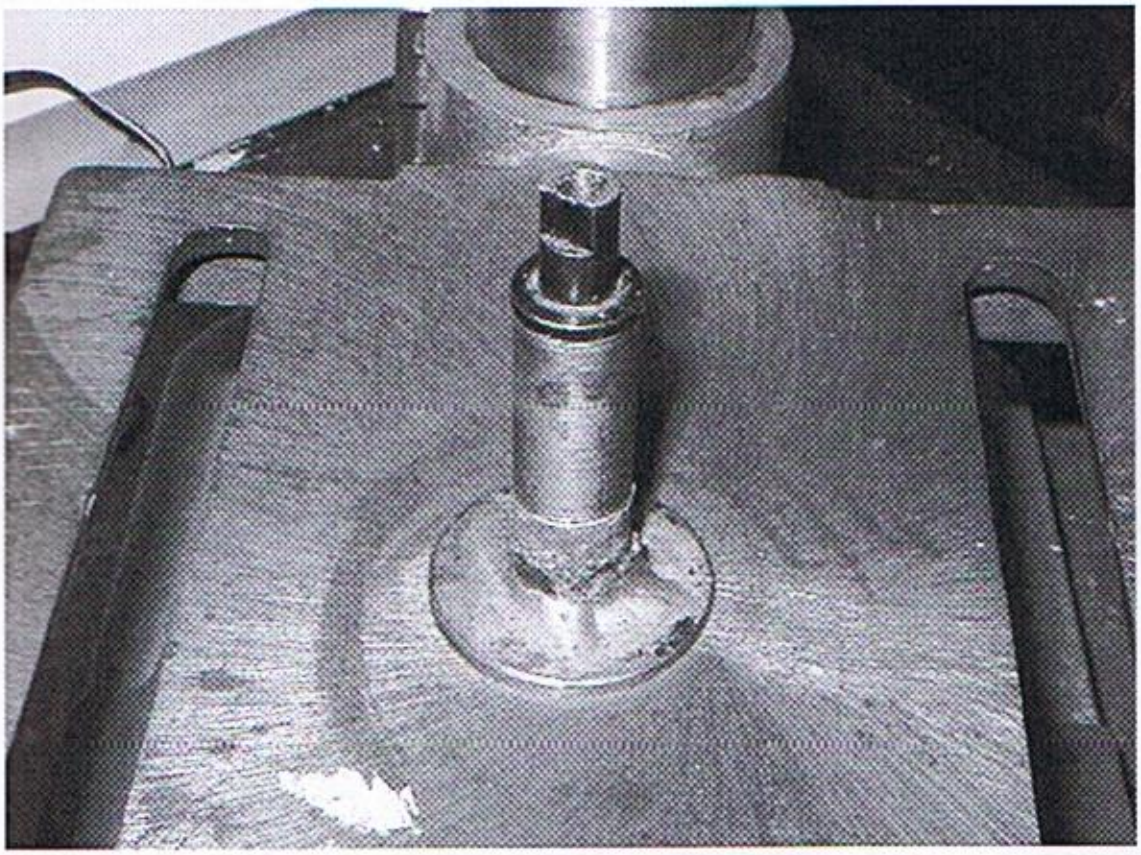


Item No. **TM-2**

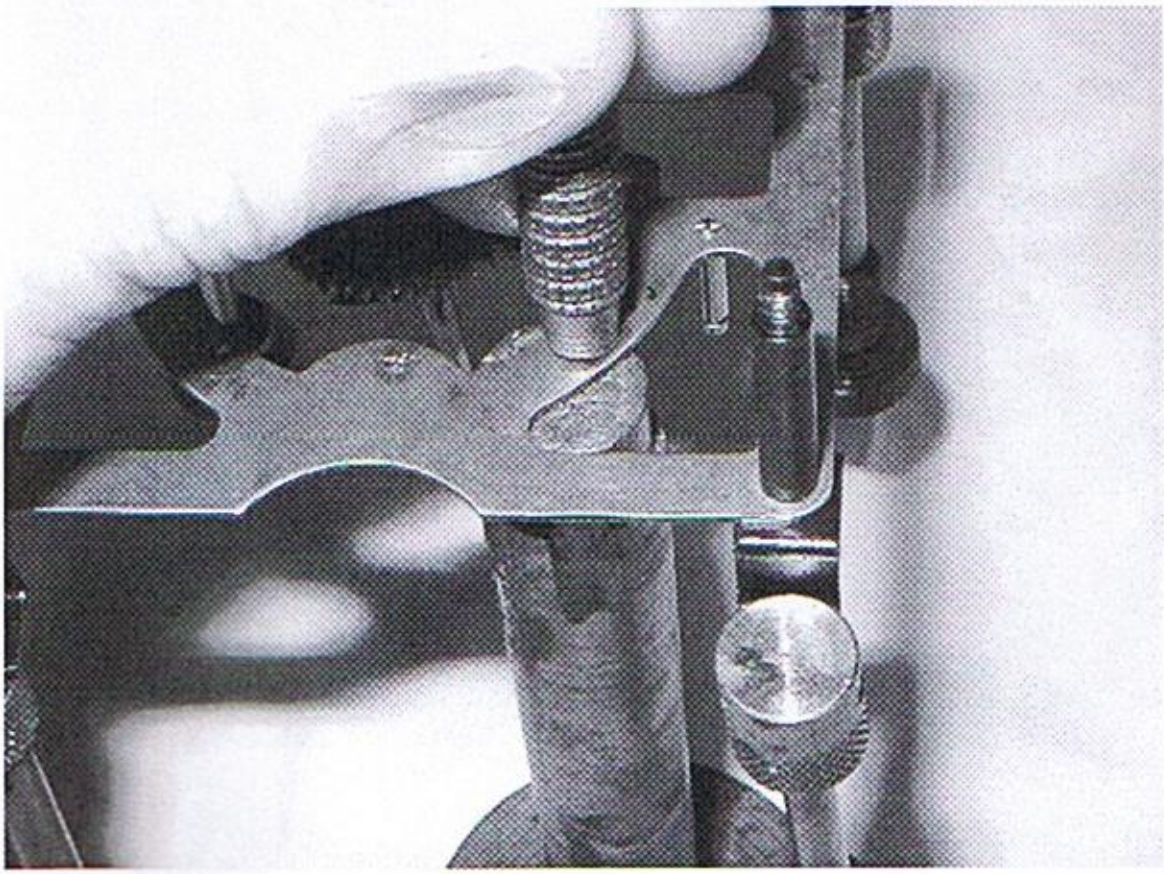
An alternative way to ream for bushing is by using a hand held tool (*Ronnell #TR-39,With the following reamers TR-02K, TR-03K, TR-04K) Always keep the reamer at a good right angle to the plate if you choose to ream by hand, or you will have an angled hole.



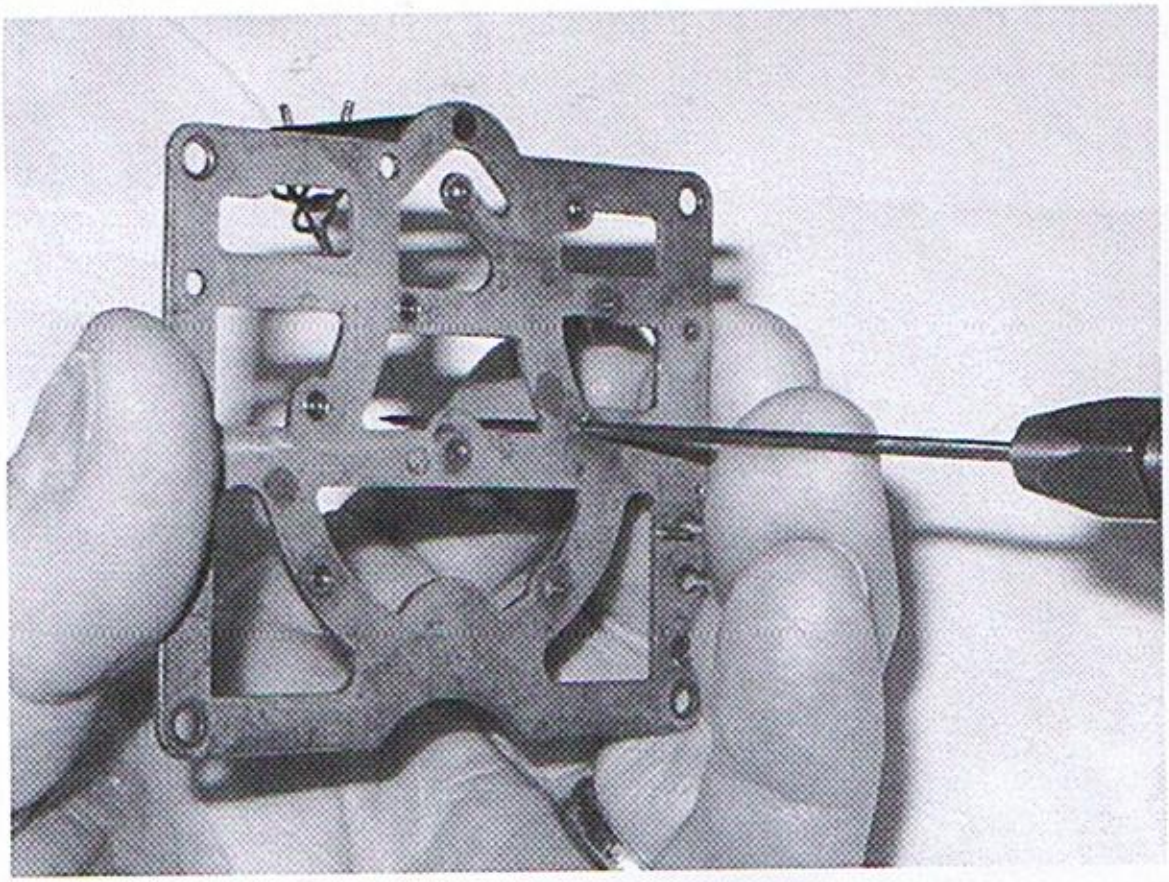
A drill press running at its' slowest speed is a really good method. This photo shows one size anvil and its' supporting tube I made for this purpose. You can do the same if you have a lathe, or you may wish to consider buying some of the attachments that are made for the expensive bushing tools. (#Timesavers #23488, #15213)



Then tap the bushings into place with a flat-faced punch and a small hammer. Support back side of the plate with a metal stand or similar tool.



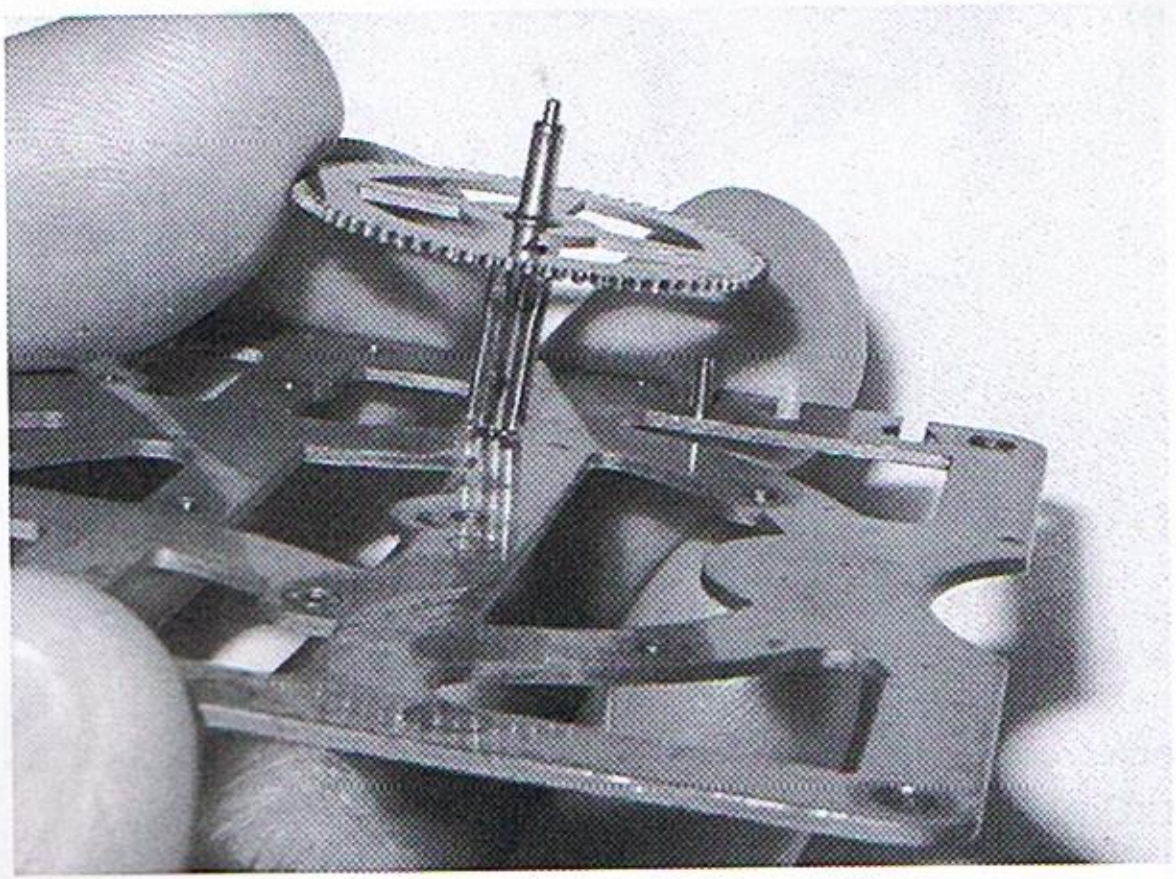
Once the bushings are in place, use the correct size tapered cutting broach to relieve the small hole in the bushing just enough to allow the pivot to fit in freely, but not too much or you will have a hole that is, in effect, a worn out pivot hole. This is where practice is required. Broach the hole a little, and then try the pivot. Keep doing this till the pivot fits well. Always try to keep the broach at a perfect right angle to the plate.



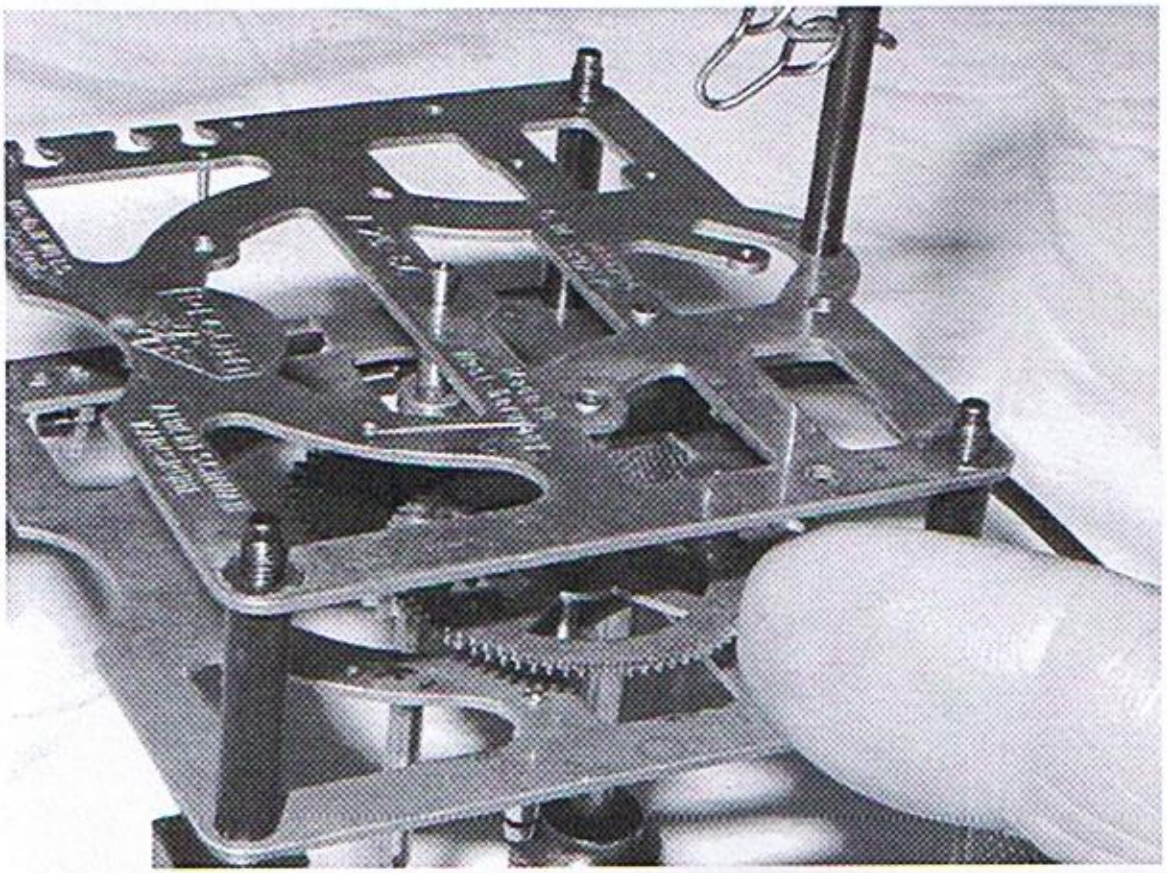
~Enlarge the hole in the bushing first with your tapered <u>cutting</u> broach enough to receive the pivot.

~Then use your tapered smoothing broach to smooth up the inside of the hole. This is done by inserting the broach, first from one side of the plate, and then the other. This will minimize the tapered effect caused by the tapered broaches. Smooth-broaching should be done on all the pivot holes to reduce friction, even on the holes you did not bush. Always dip the smoothing-broach in oil prior to inserting it into the hole. Cutting broaches, on the other hand, are used dry.

Check to see that the wheel will freely lean in all directions about 5 degrees from perpendicular. If you installed a bushing on the top plate, check this bushing also.

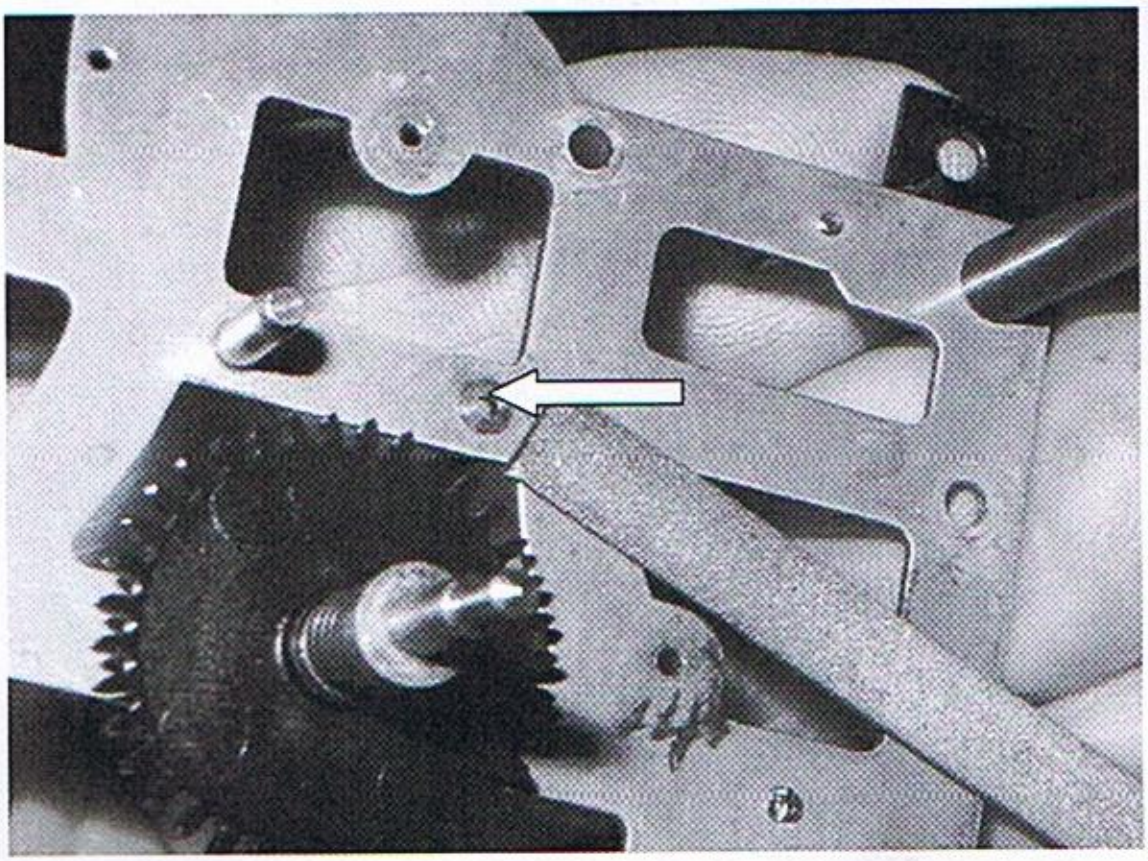


Then fit the wheel into the proper location between the plates and finger tighten the nuts that hold the back plate and spin the wheel to be sure it spins freely.

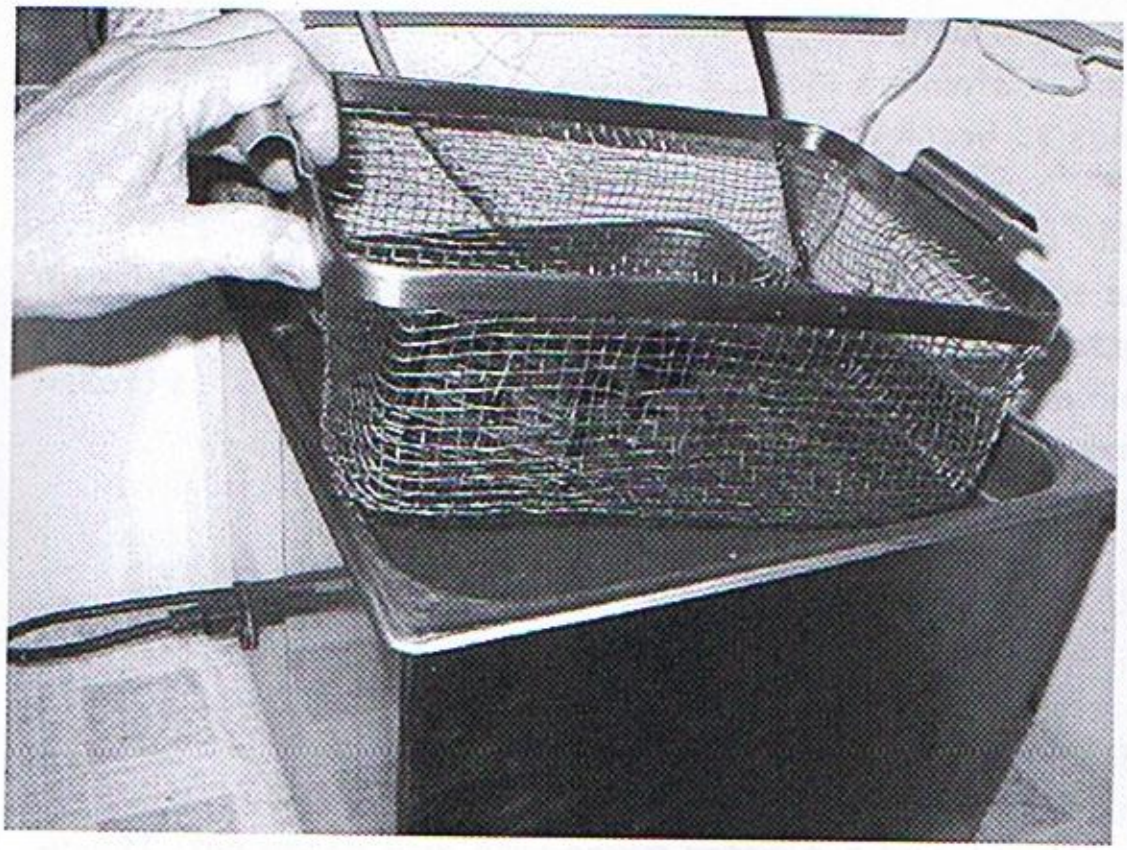


Also be sure the arbor has "end shake", that is, a slight movement laterally. You don't want the plates squeezing against the shoulders of the arbor, as this will stop the clock. If there is no end shake, you will need to remove the top plate, set the wheel aside, and file the bushing face flush with the inside of the plate.

Follow the same procedure till all the bushings have been broached and smooth-broached. There are also pivot cutters available that do a cleaner job without scratching the inside of the plate. (# Timesavers #20025, 20026, 20027, 20028, 20029)



It is time for the cleaning process. Cleaning in a commercial clock cleaning solution, using a heated ultrasonic tank, is the best way. These tanks come with a stainless steel basket. Place all the parts in the basket and suspend the basket in the solution for cleaning.

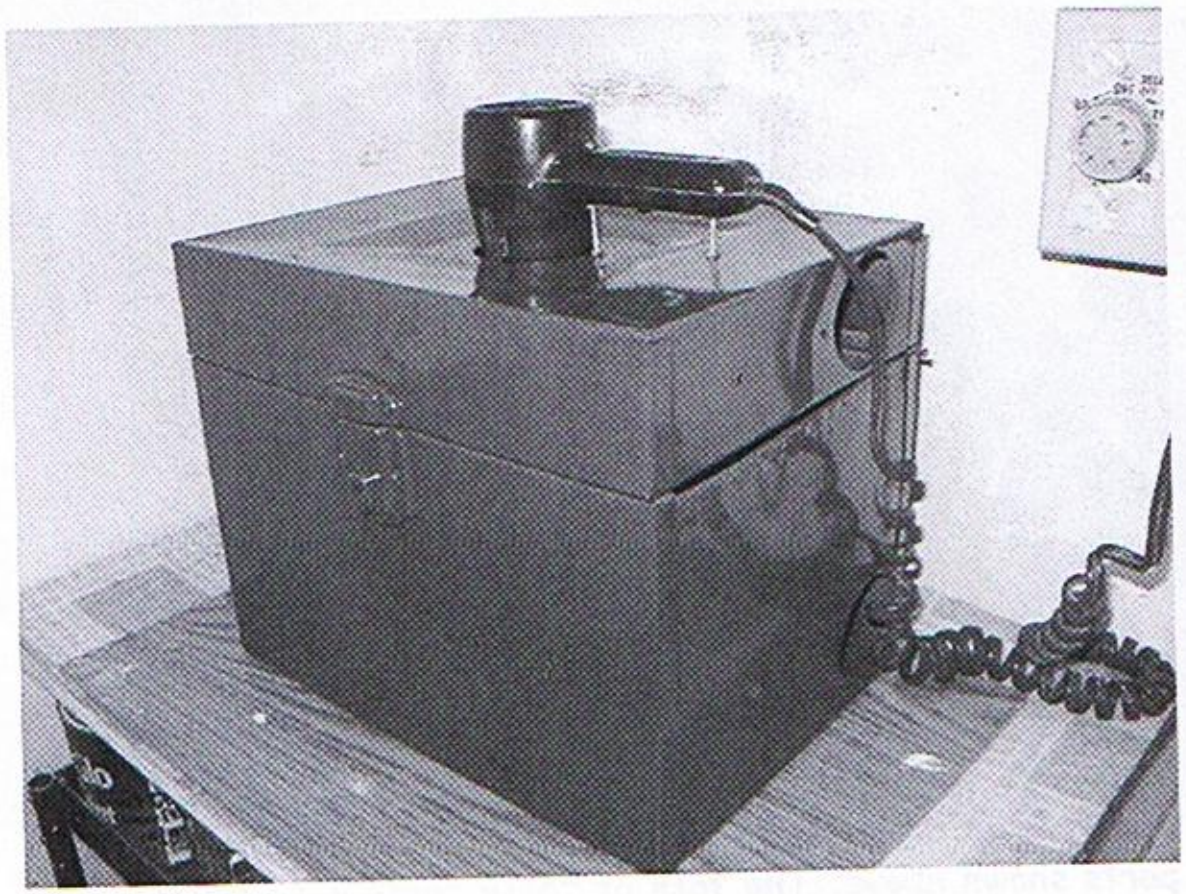


These tanks are expensive, so here are some alternatives: You can use the same commercial cleaner that is sold for use in Ultrasonic tanks. Dilute with water as recommended. You can use it unheated, in any inert container such as plastic, glass or stainless steel. I would not use plain steel, as it tends to break down the solution.

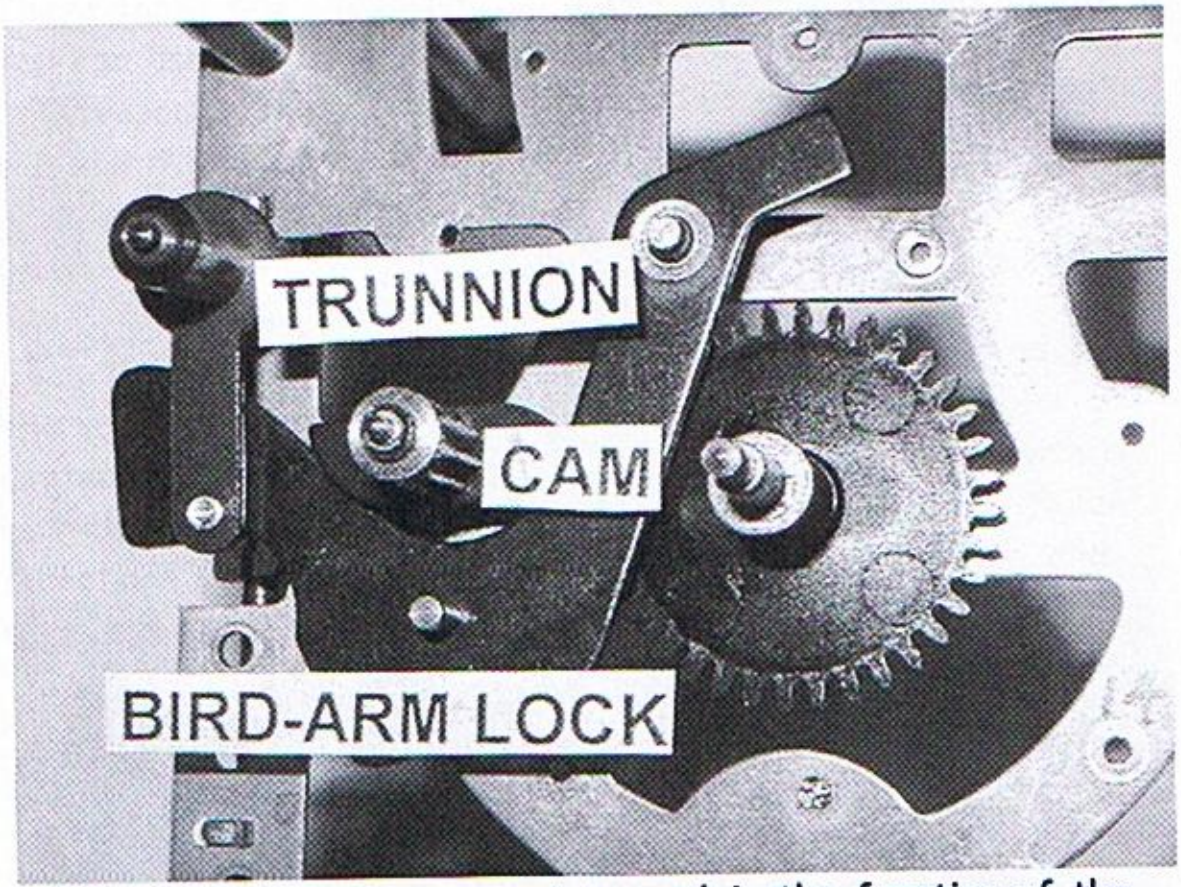
Soak the parts for about 10 - 15 minutes. Remove parts from the solution. Use a toothbrush to remove any clinging bits of contamination. Then rinse parts in hot water, and dry with a hair dryer. Whenever handling these strong chemicals, follow directions on container, protect your hands with gloves, and wear eye protection. Be sure to have adequate ventilation.

TIP: As a substitute for an expensive cleaning tank, your kitchen dishwasher will do a pretty fair job of cleaning a movement. Do this before disassembling the movement and after removing the bird. You can always do any needed follow-up cleaning by hand, after disassembly, with a toothbrush and hot water mixed with dish detergent. If you use detergent, be sure to rinse parts well, because residual detergent can defeat the function of the oil.

TIP: I made a clock movement dryer using an old letter file made of metal and a hair dryer utilizing some large holes in both sides of the metal file box to allow airflow. Caution: As a safety precaution, don't follow my example.

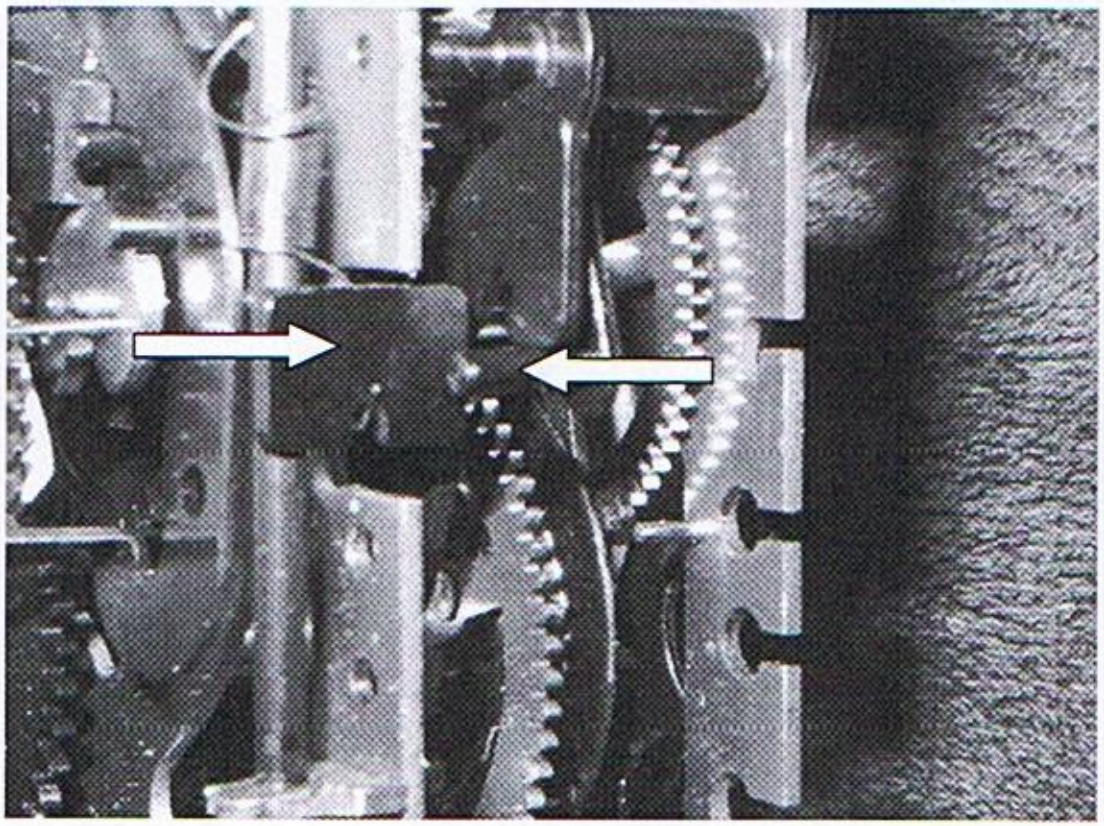


REASSEMBLY: Attach the assembly legs to the front plate, or place front plate face down on a small open top cardboard box. Install the bird-arm-lock on its' post, and snap the retainer clip in place. Set the trunnion pivot in its hole.

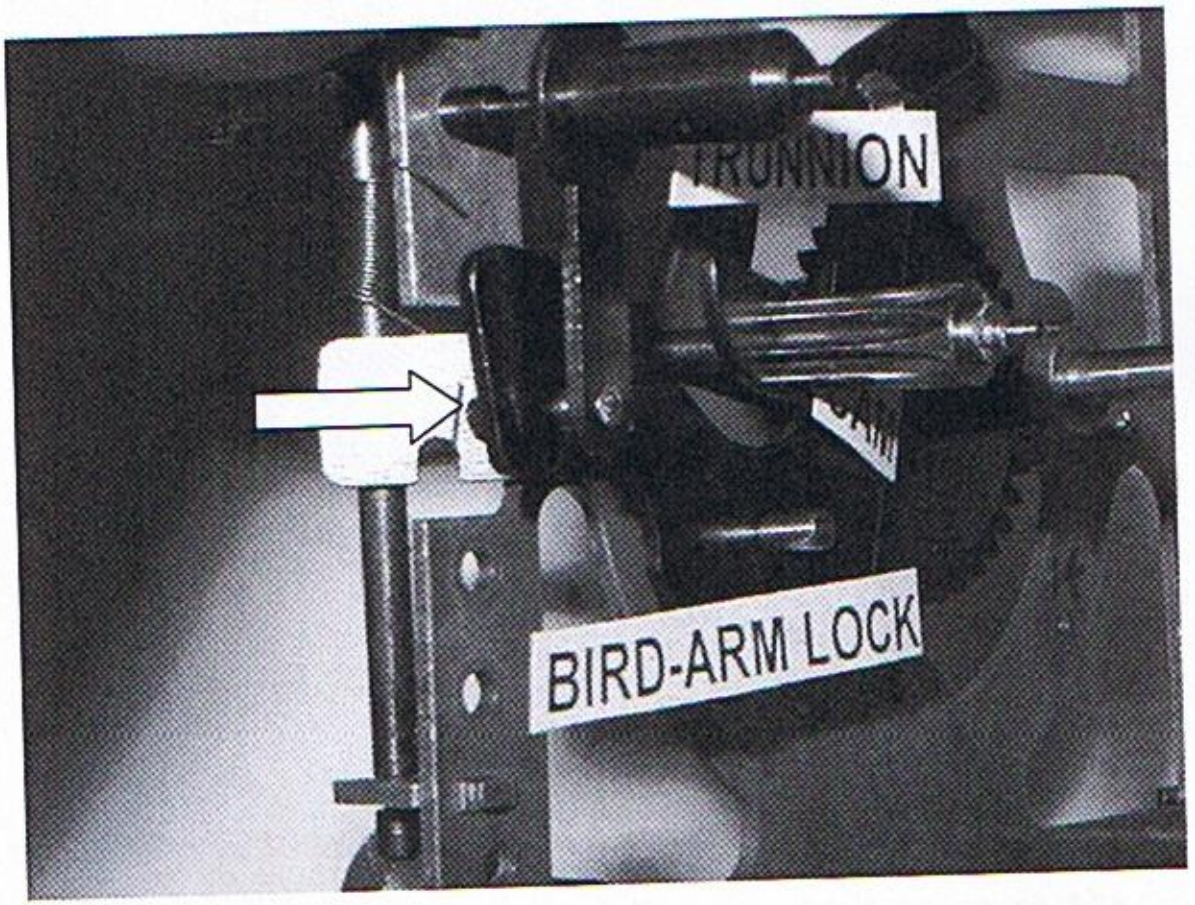


Allow me to digress a moment to explain the function of the parts shown above. The task of these parts is to cause the bird arm to swing outward so the bird appears in the then-open door, and remain in the outward position till the cuckoo sound has completed signaling the hour.

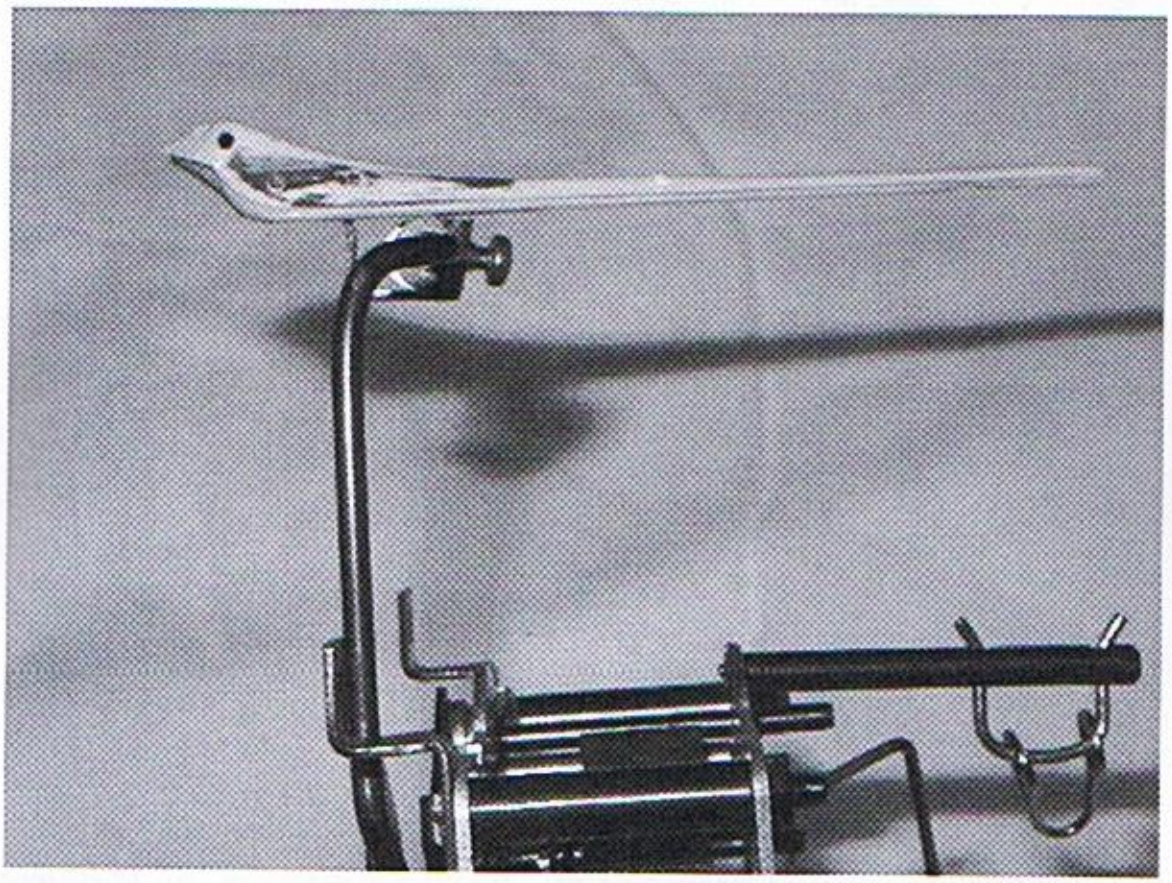
This is how it works: When the hour, or half hour is reached, the strike train is set in motion. The cam raises the trunnion. The pin in the other end of the trunnion (arrow on right) snaps into the bird arm lock. Simultaneously, that same pin presses against the flap on the bird arm (arrow on left).



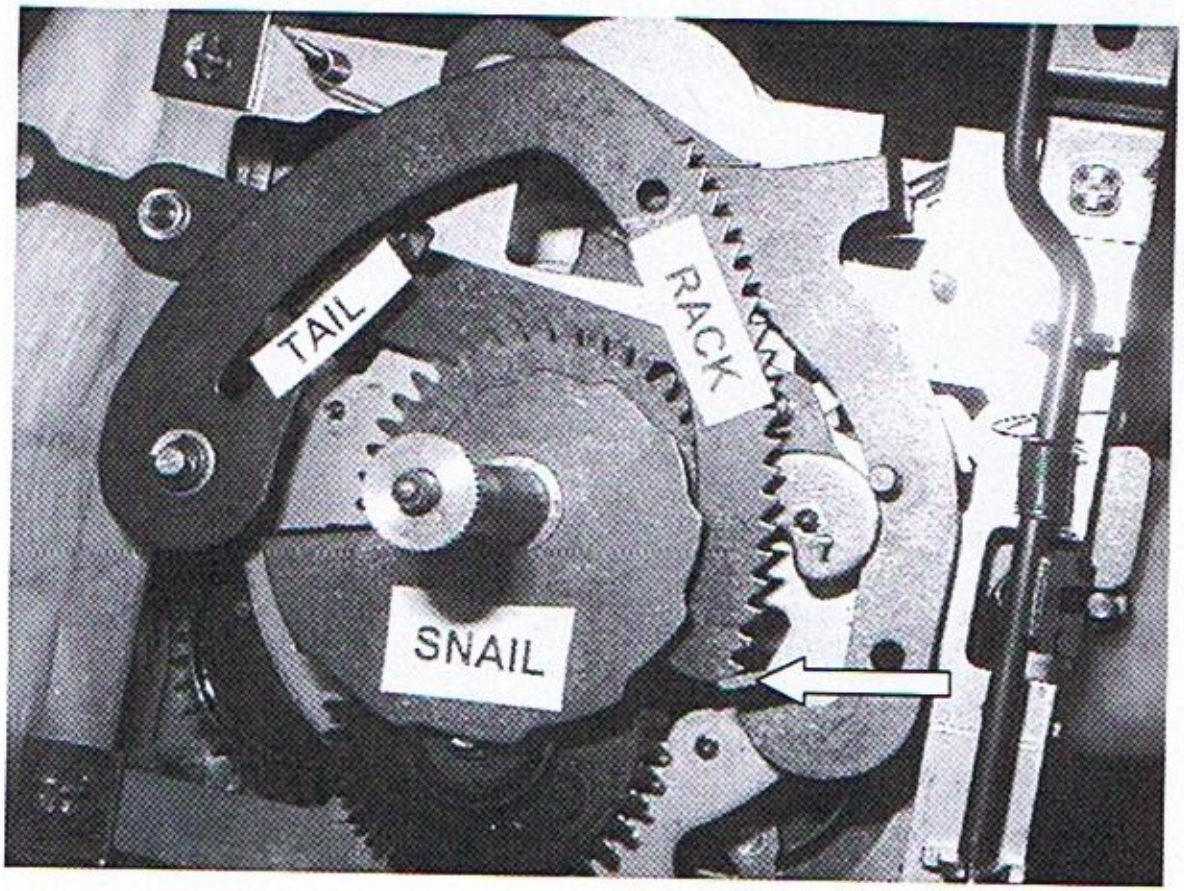
Bird-arm locked position.



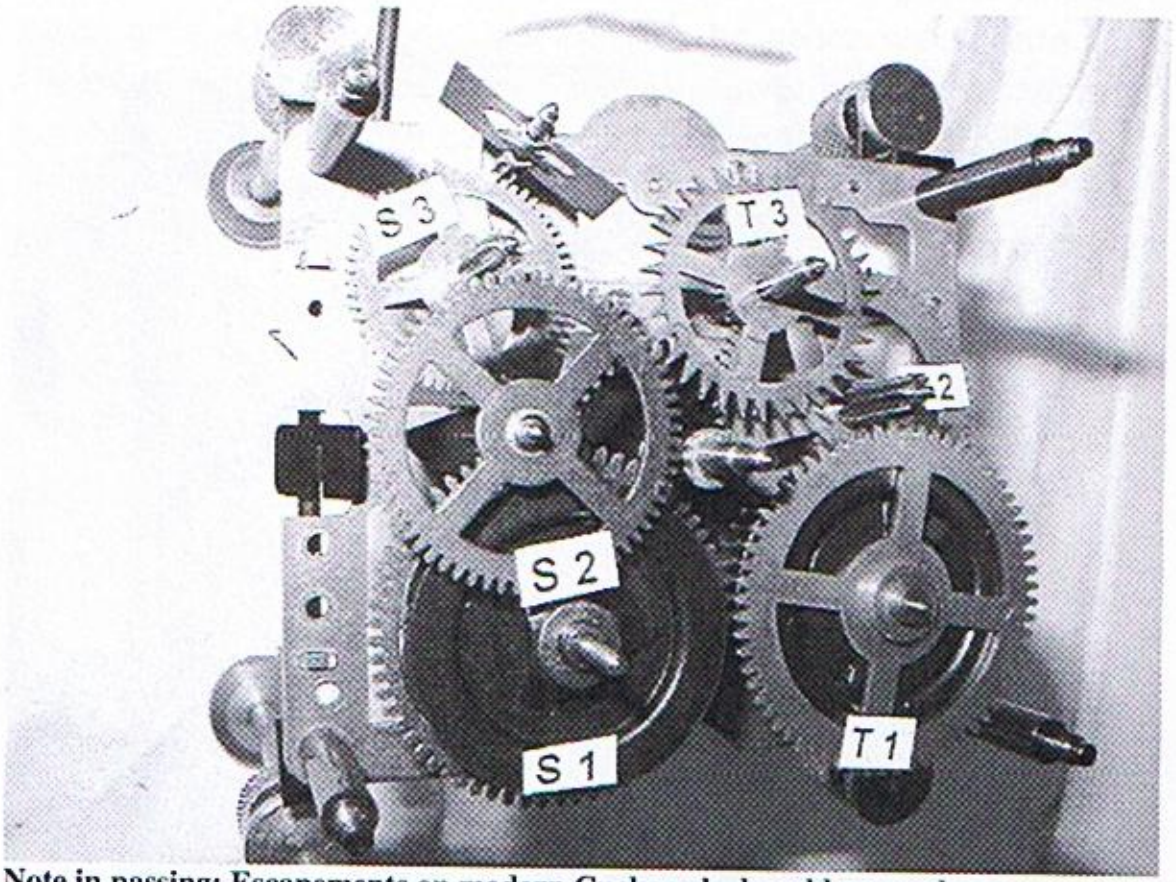
This causes the arm to rotate just enough to throw the bird arm outward.



The bird will then stay in the out position till the "strike-stop arm" (on the front of the movement) drops into the stop position under the end of the rack. The arrow points to the end of the strike-stop arm.

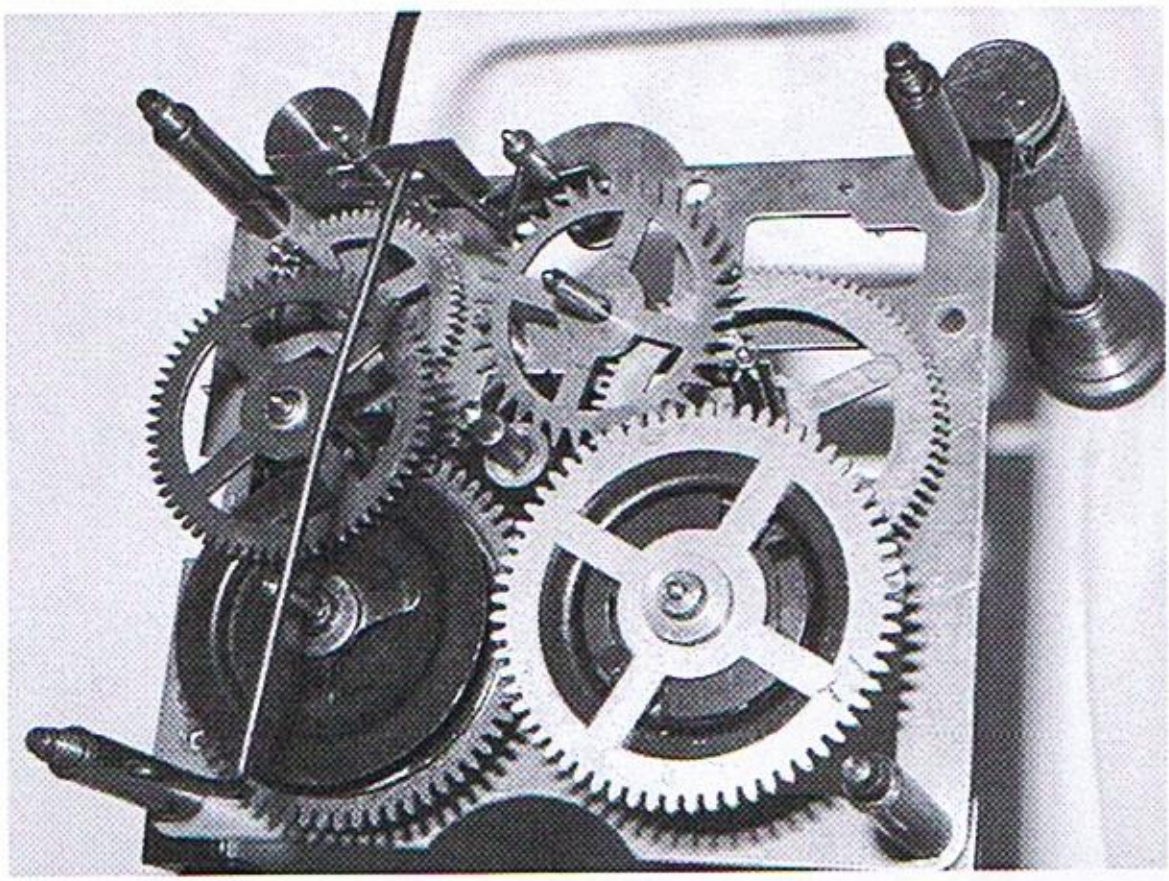


Now, let's continue with the re-assembly: With the assembly legs attached to the front plate, insert all the wheels into their respective pivot holes in the front plate starting with the larger, lower wheels, such as T1 and S1 and work up to the highest numbers. Be sure the wheels are right side up. Set the verge pivot in its' hole.

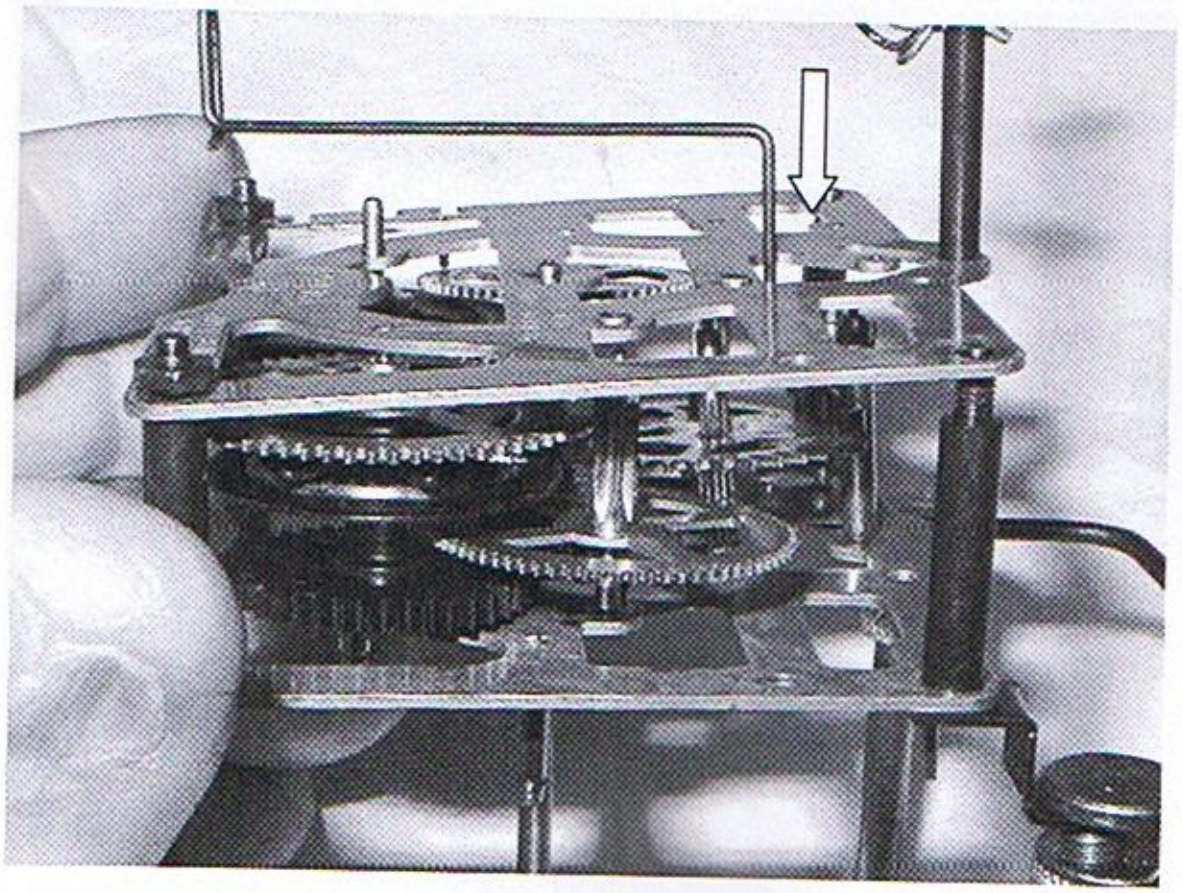


Note in passing: Escapements on modern Cuckoo clocks seldom need any adjustment or repair. Attempts to adjust the depth of verge engagement usually result in broken parts and added frustration. My advice is don't try this type repair till you have done a thorough study of escapements. If the clock is not running, look for other reasons such as: worn pivots, friction from tight pivots, failure to smooth broach pivot holes, bent pivots, dragging pendulum hanger, inadequate weights, poorly adjusted beat.

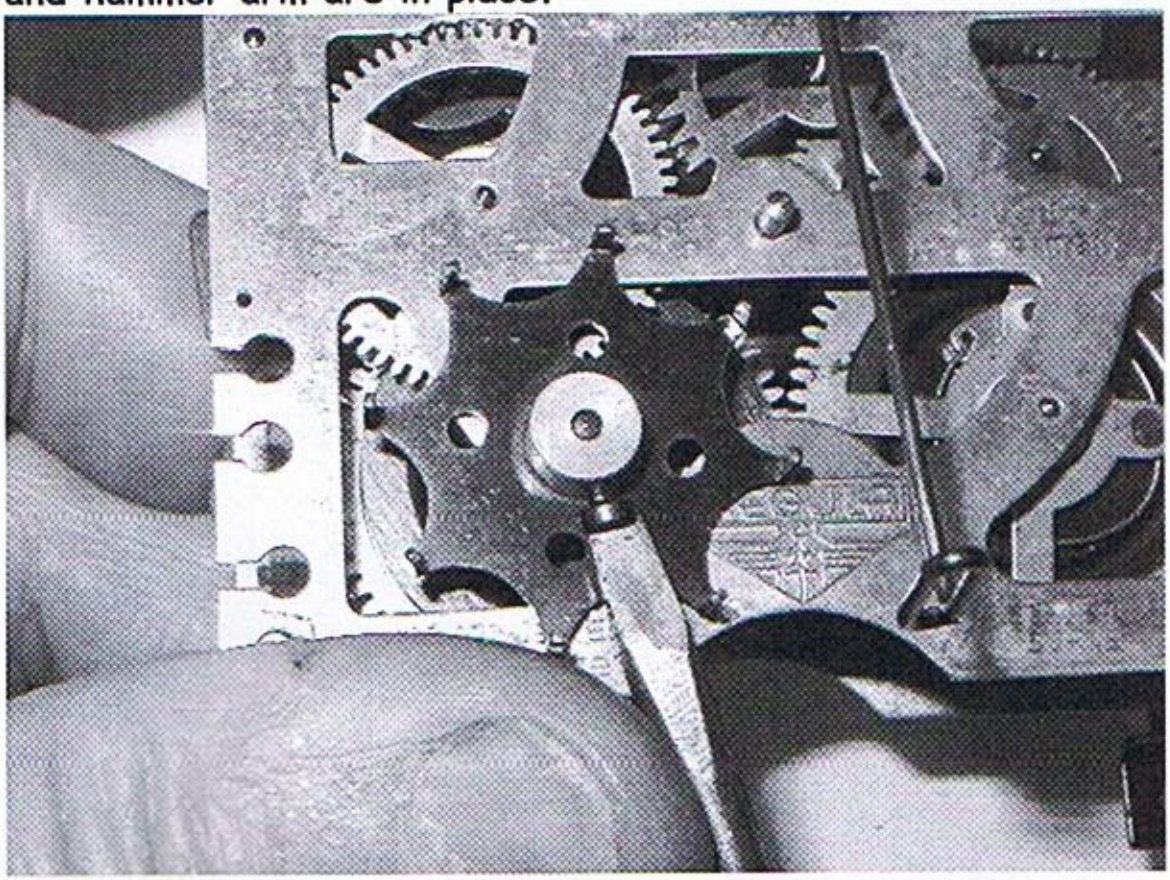
This photo shows the internal parts with the front plate removed.



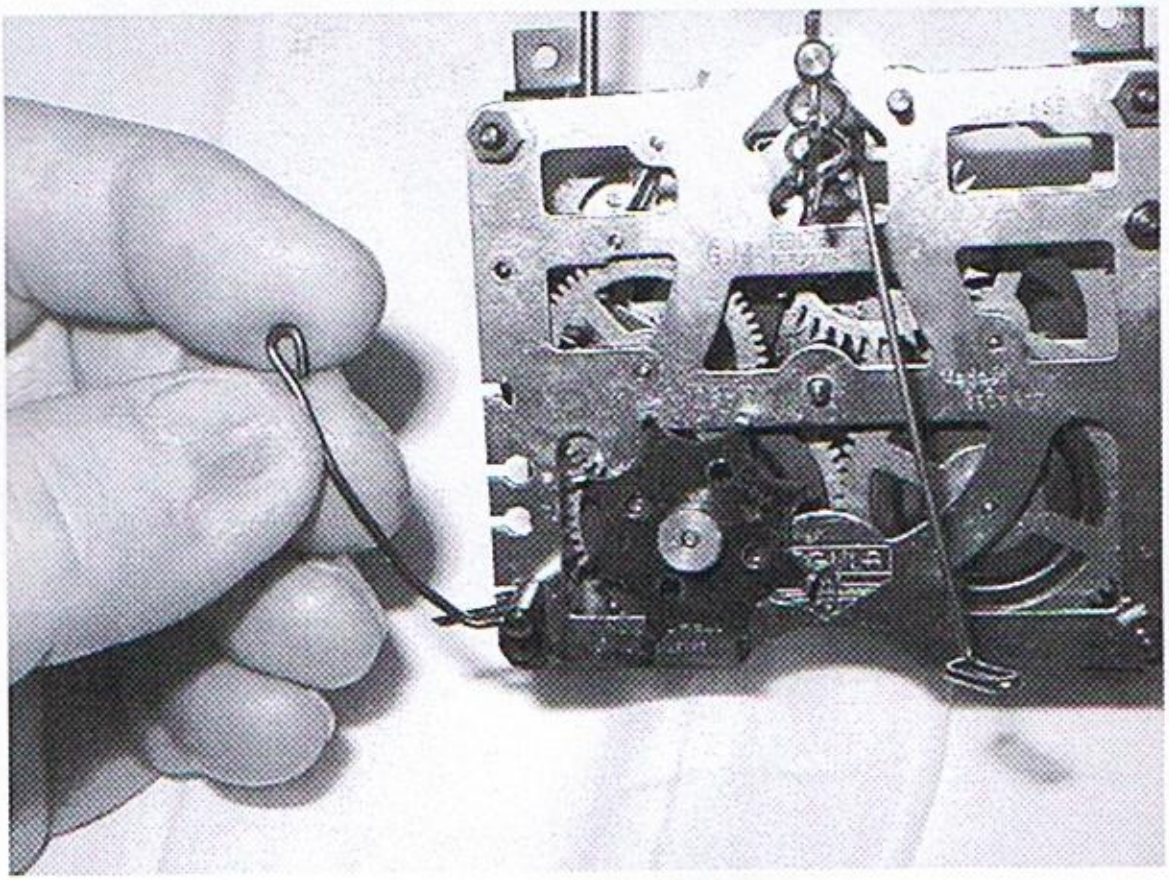
Slip the crutch end of the verge assembly through its' corresponding hole in the back plate (arrow). Then fit the back plate onto the lower 2 pillars and finger tighten the 2 lower nuts. One-by-one, manipulate the upper pivots into their pivot holes in the upper plate (a good pair of hemostats are helpful here). Use caution not to bend the pivots. Bent pivots happen when the back plate nuts are too tight and you must force the upper pivots into position. This re-assembly is tedious at first, so practice, practice, practice!



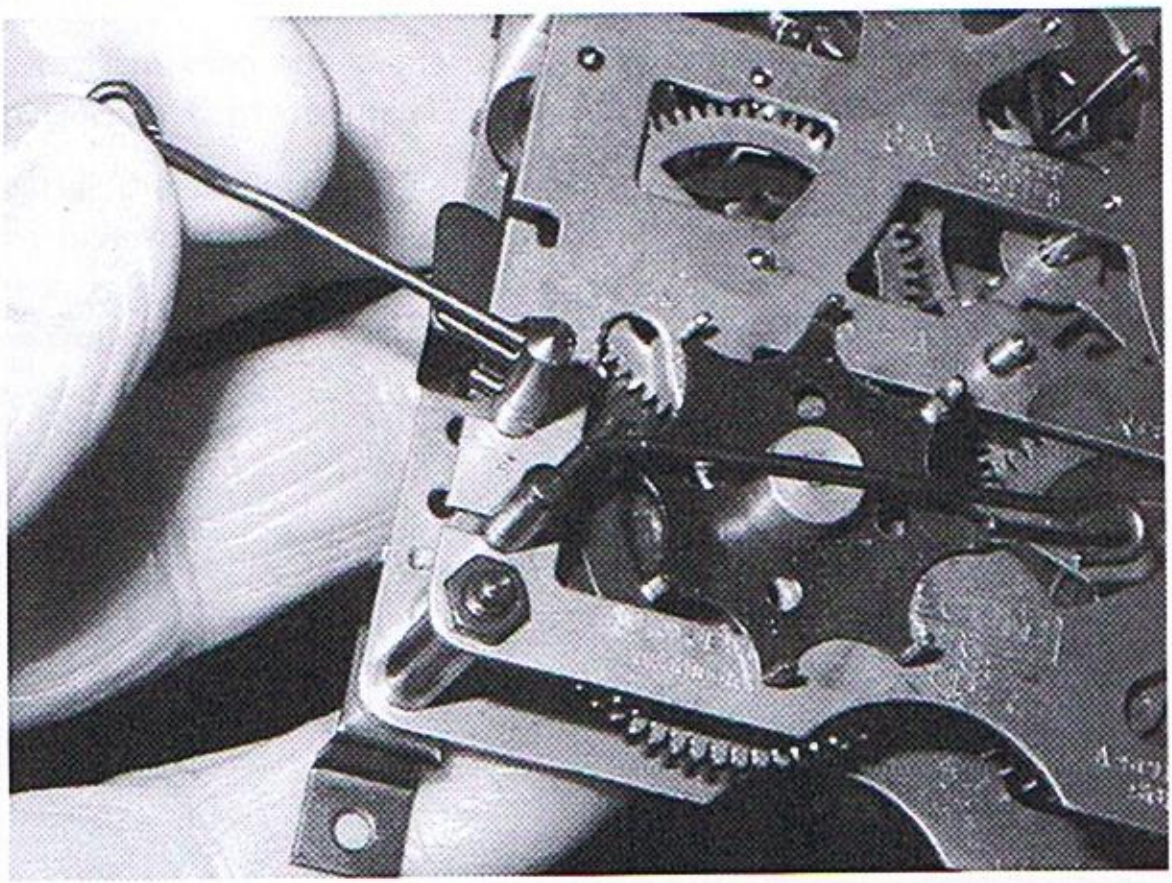
Install the bellows-lifting wheel that activates the hammer and bellows (*Timesavers #20764 if you need a replacement). Just snug the setscrew for now, and tighten later. You will need to rotate the wheel a little after the bellow lifting arms and hammer arm are in place.



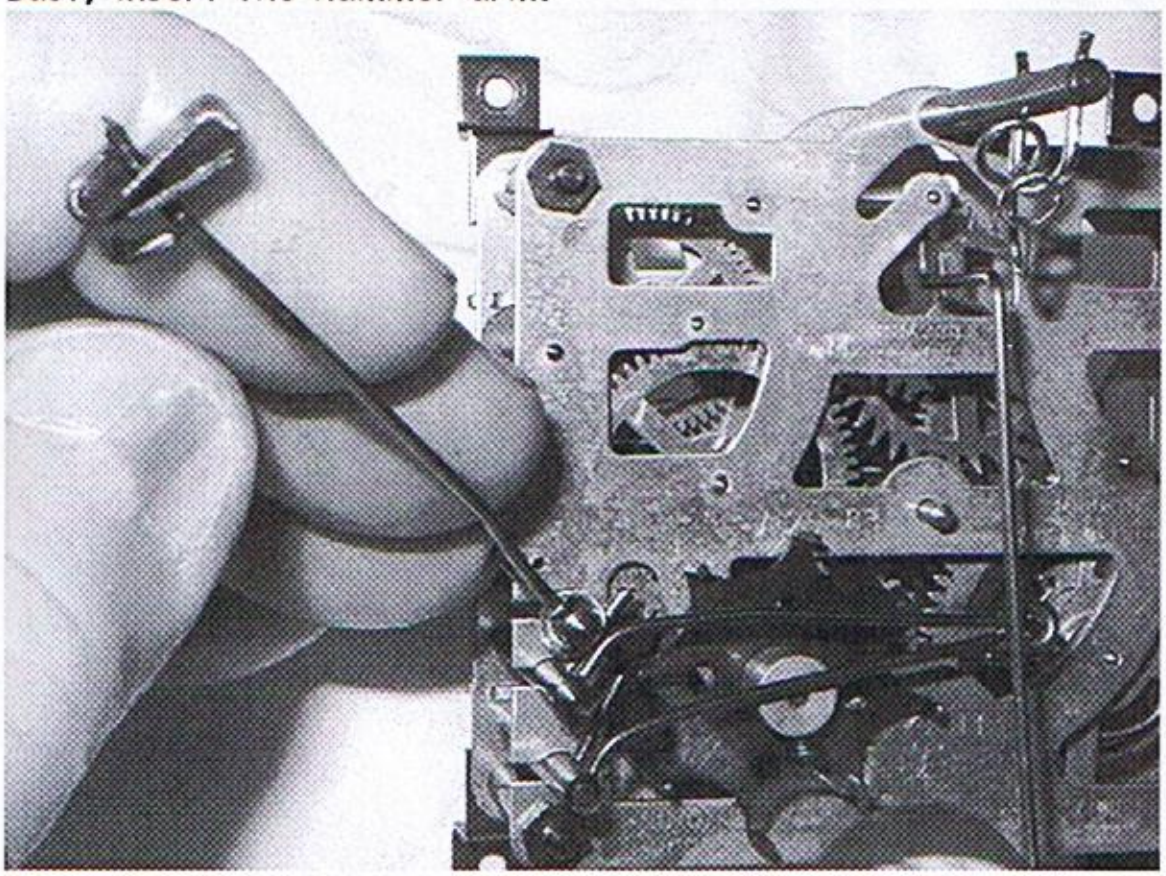
Replace the bellows lifting arms. The longer one goes in first and is the lowest. Slip it in as shown. Then rotate it clockwise to its' operating position.



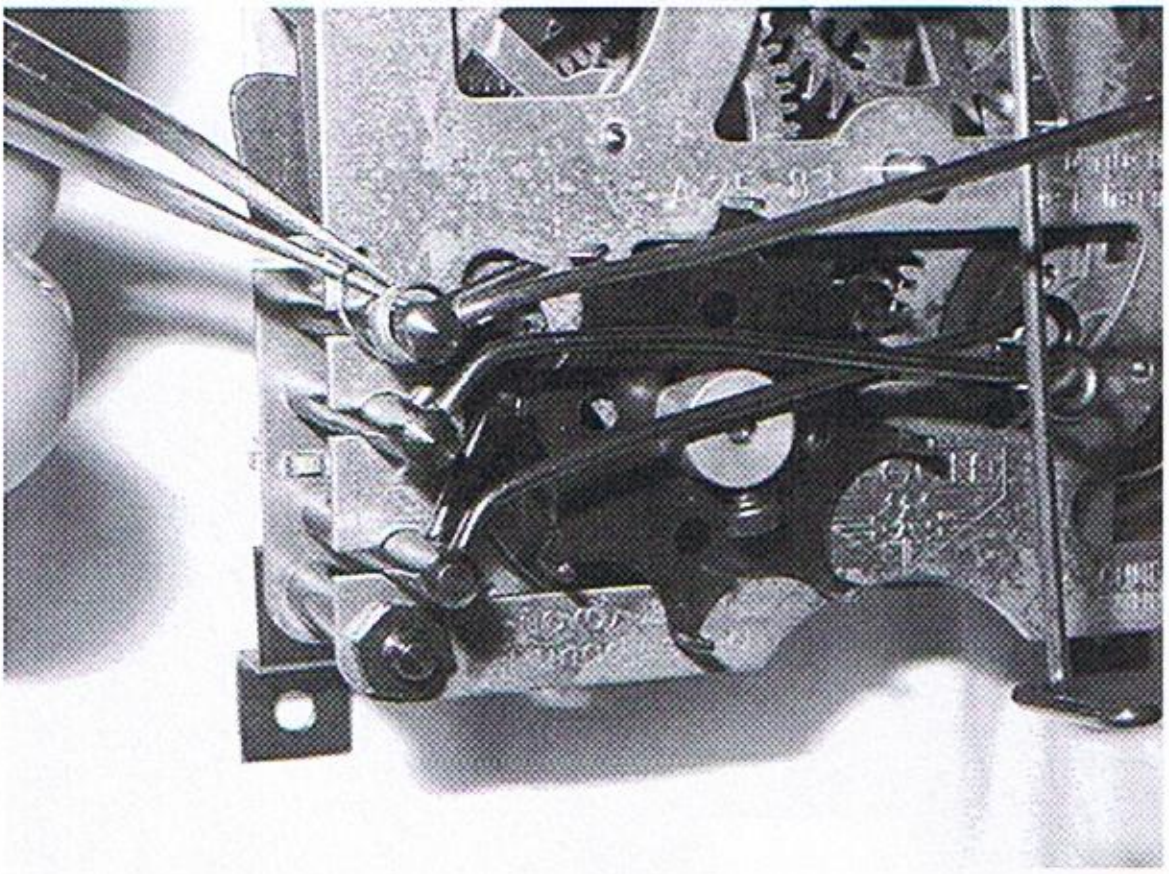
Then insert the shorter arm.



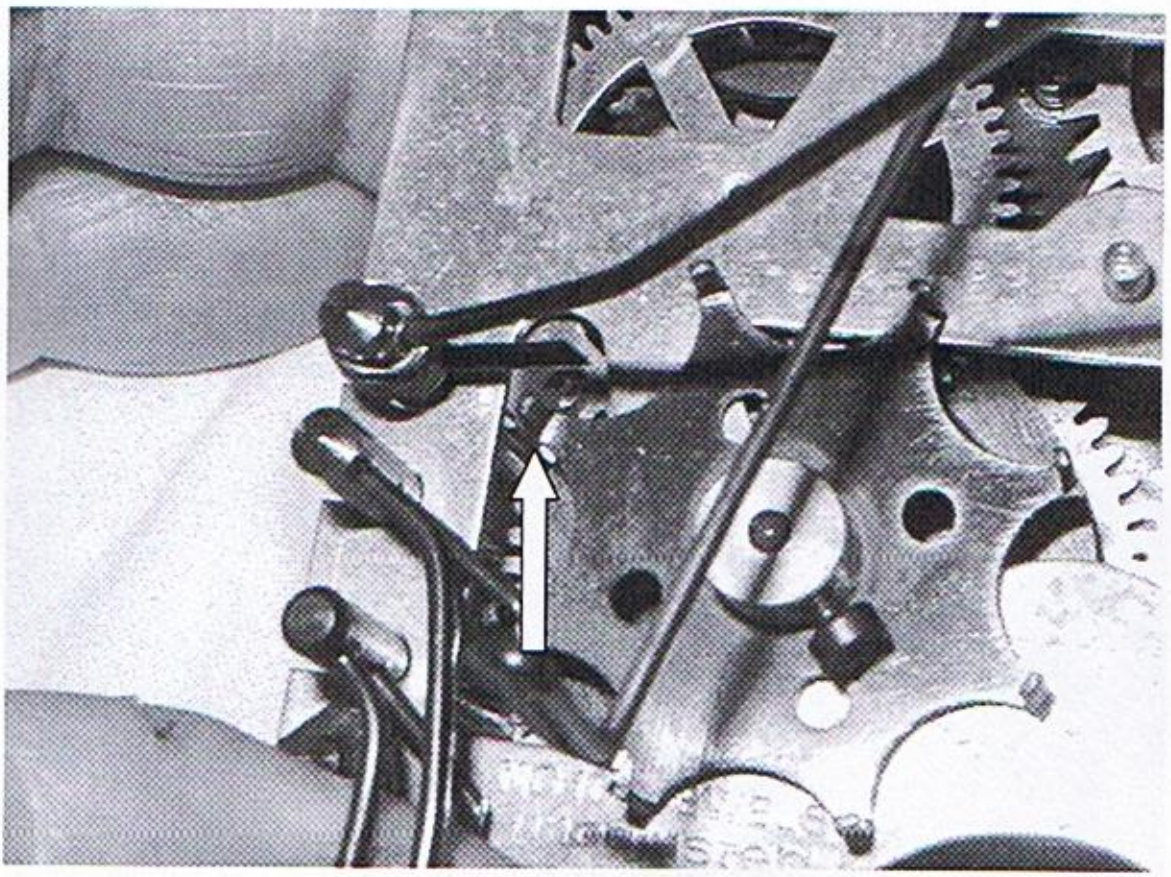
Last, insert the hammer arm.



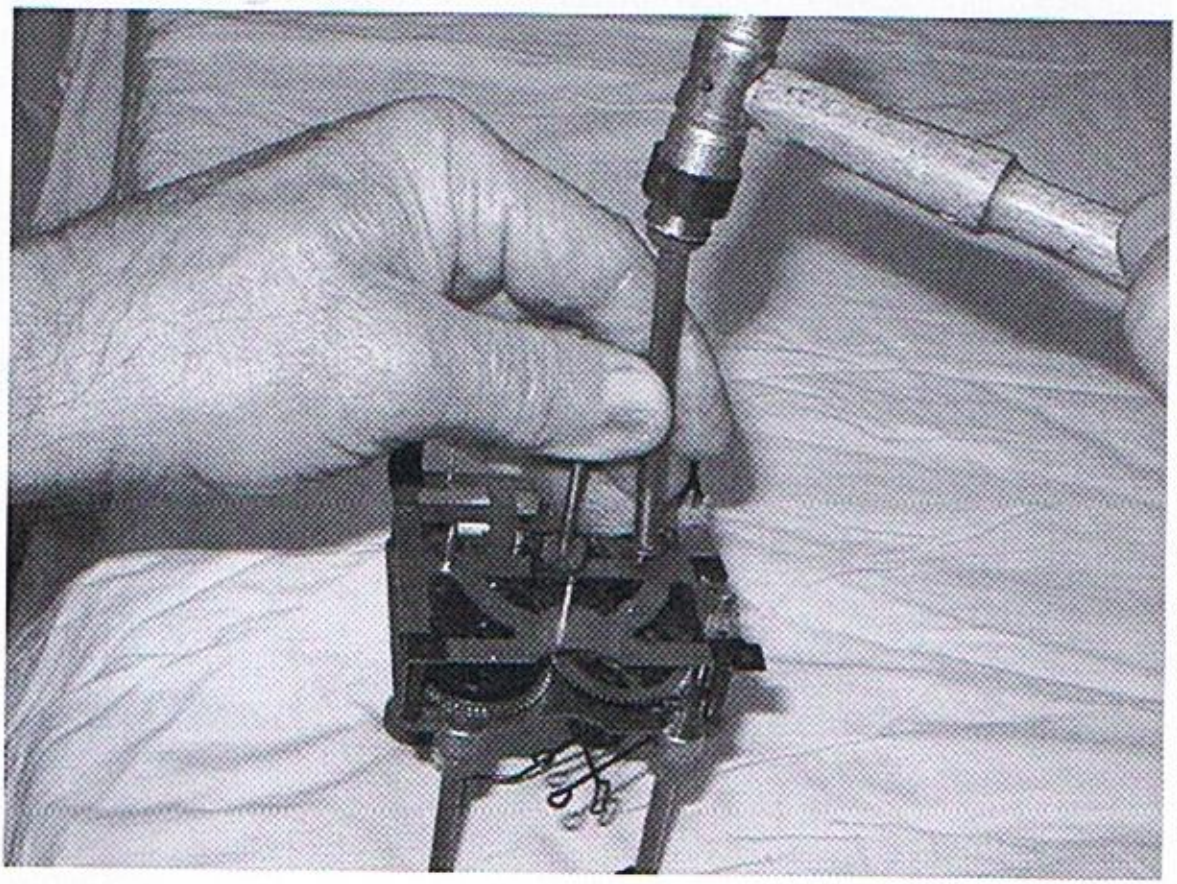
Don't forget to anchor the brass wire spring.



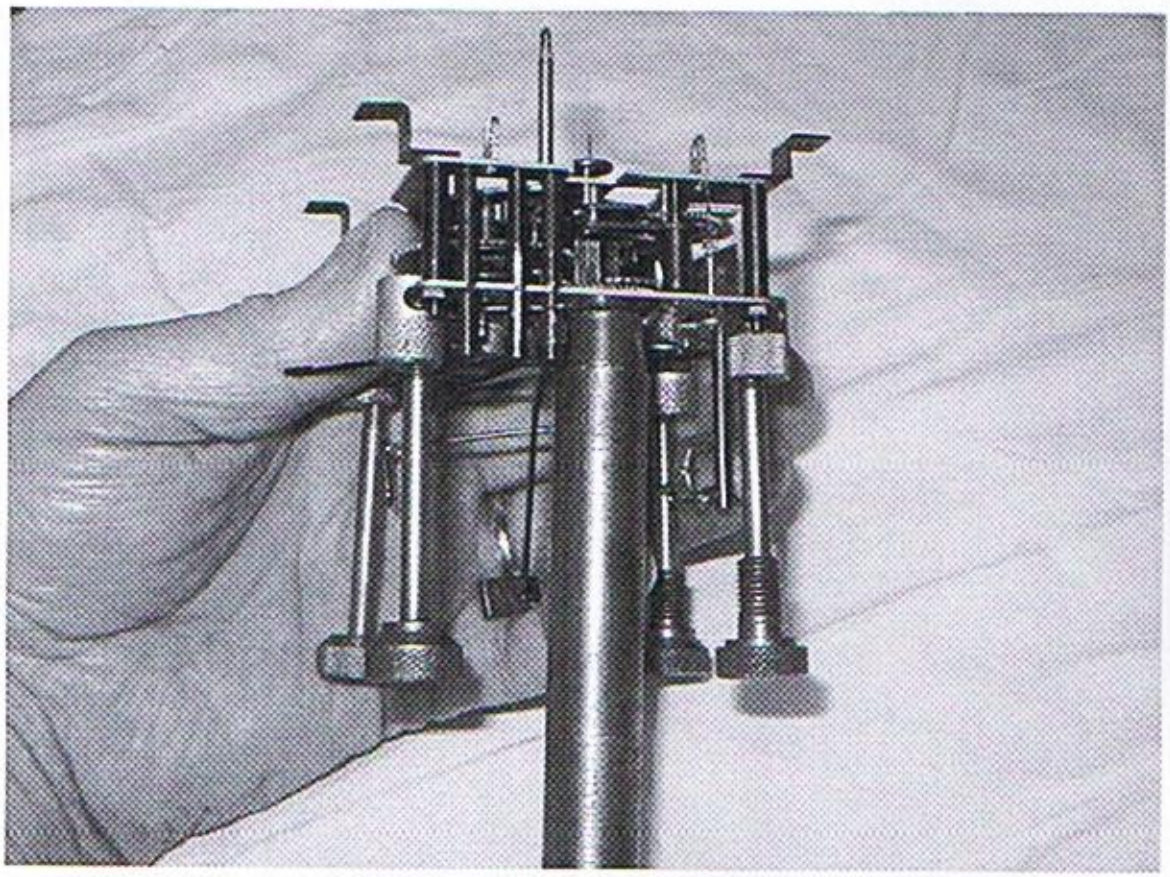
Position the bellows-lifting wheel so that the bellows on the left sounds last, and the hammer is positioned to strike first at the next sequence. Tighten the setscrew.



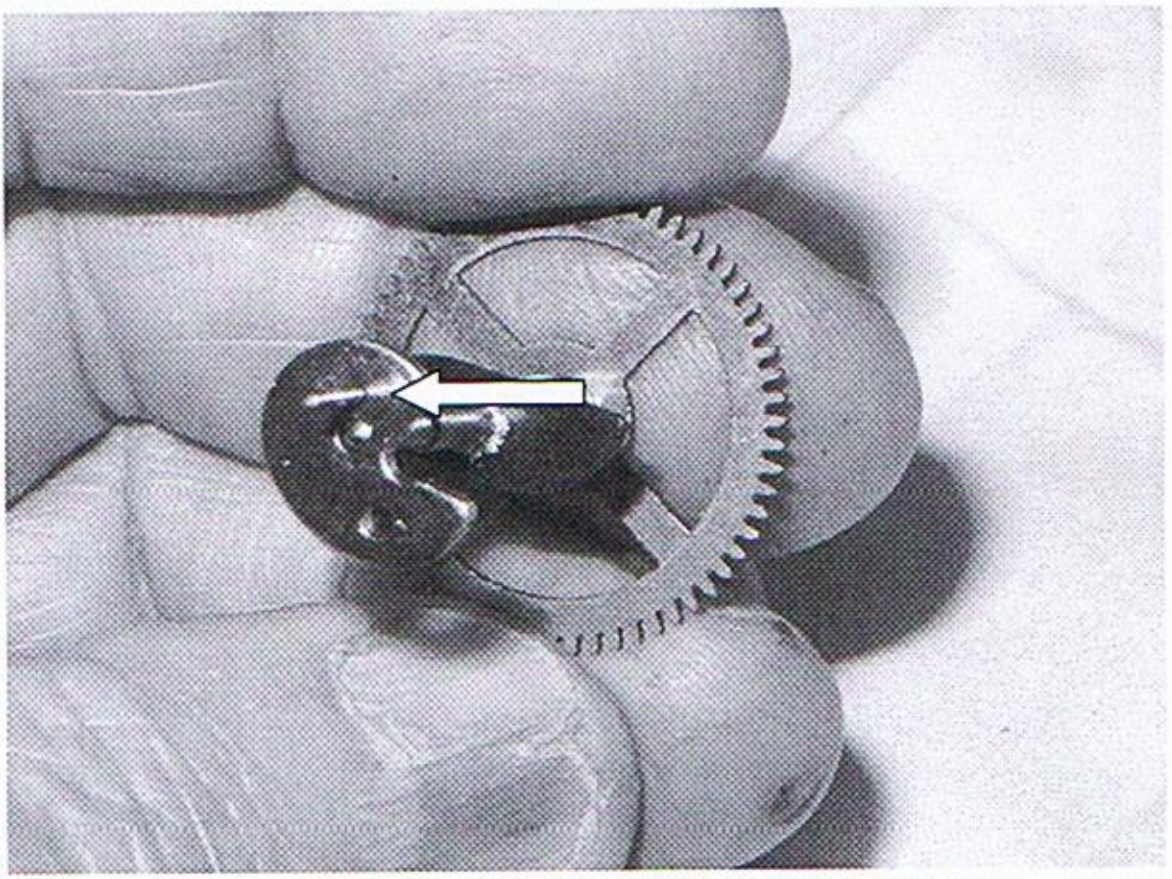
Turn the movement over and attach the assembly legs to the back plate, and install the gathering pallet. It must be positioned precisely in order for the cuckoo sound to stop when it reaches the correct number. First drive the gathering pallet onto its' shaft fairly snugly.



It is best, when driving the gathering pallet on, to support the other end of the arbor with a copper faced anvil (I made this one). I use copper so the force of hammering does not deform the delicate pivot.

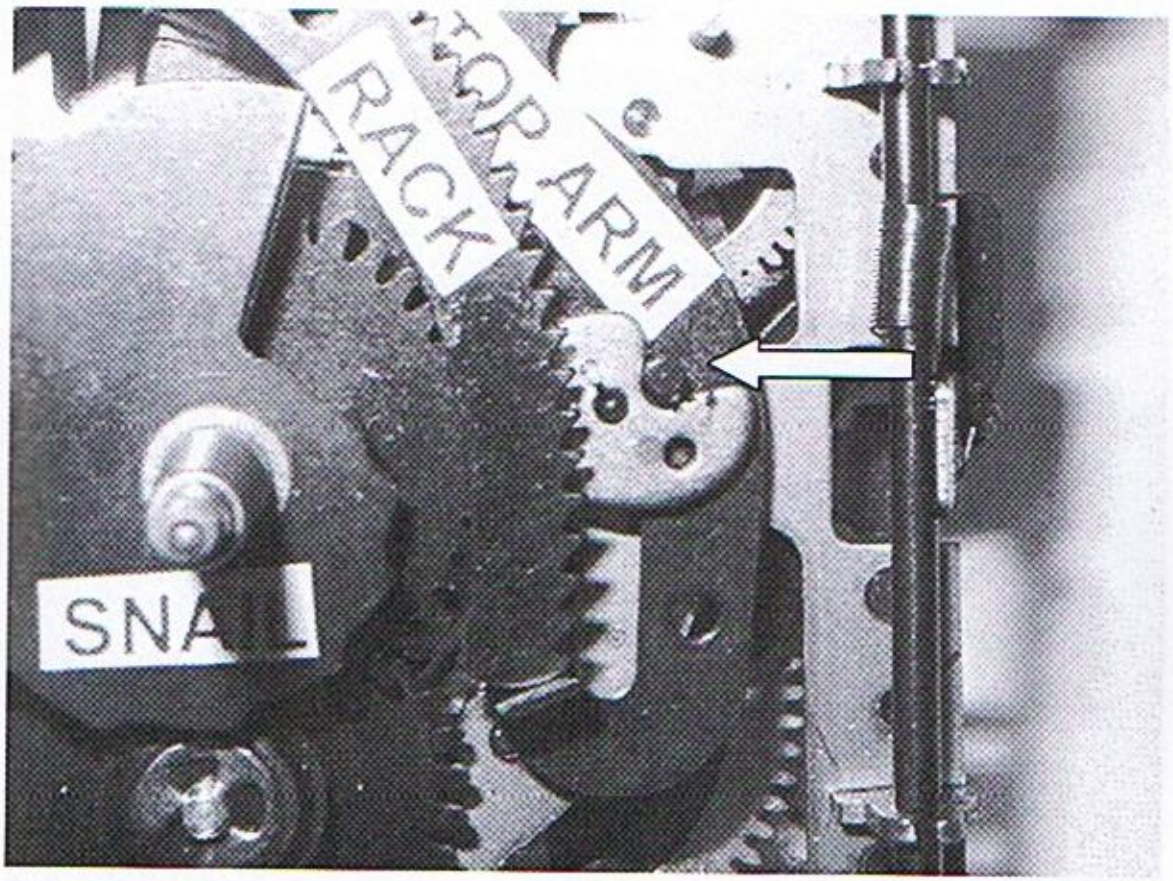


The picture that follows shows how the gathering pallet should be positioned. Only the pertinent parts are removed from the movement, and shown so you can see more clearly. Notice how the pin (pointed out by arrow) is positioned in relation to the bird cam (the black thing).



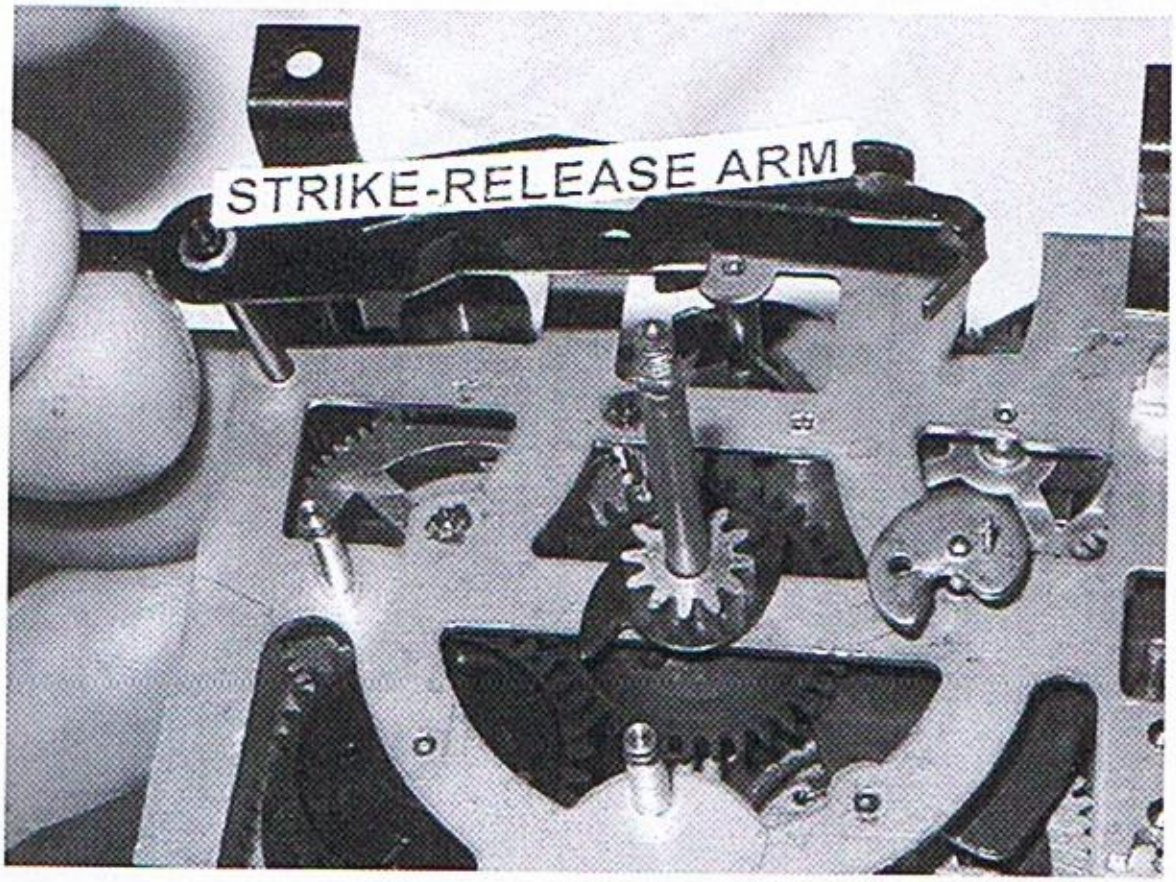
This position may need slight final rotation when your movement is on the test stand.

The front view should look like the picture below. The pin on the rack stop should nest nicely in the valley of the gathering pallet when the strike-stop arm arrests the striking action. You can test this by using pressure on the S1 wheel. For testing purposes, this will cause the strike train to advance as in normal running of the clock.



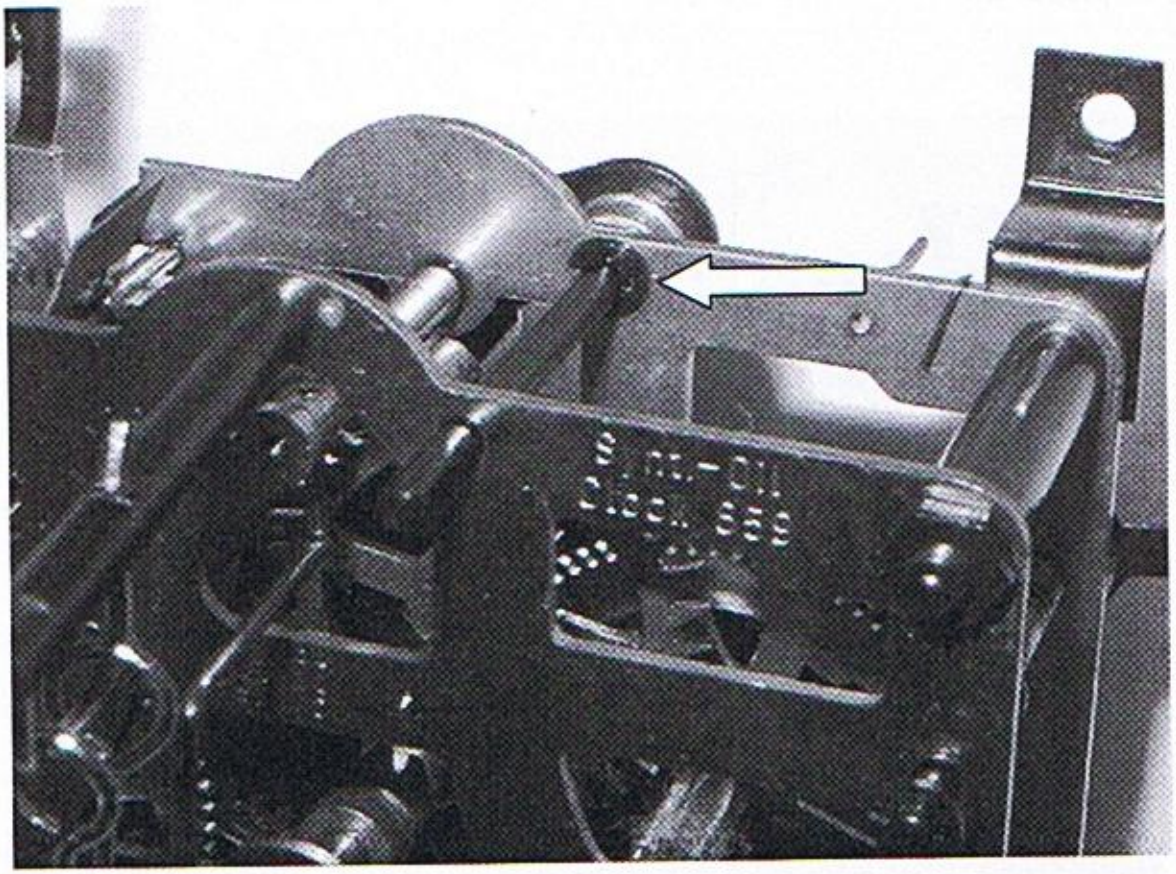
If the pallet needs repositioning, rotate the pallet with your needle-nose pliers as necessary. While repositioning the pallet with your needle-nose pliers, you will need to restrain the gear train from turning by resting a finger on the S3 wheel.

Replace all the arms and wheels to the front plate as follows: Insert the shaft of the strike-release arm into its' proper hole.

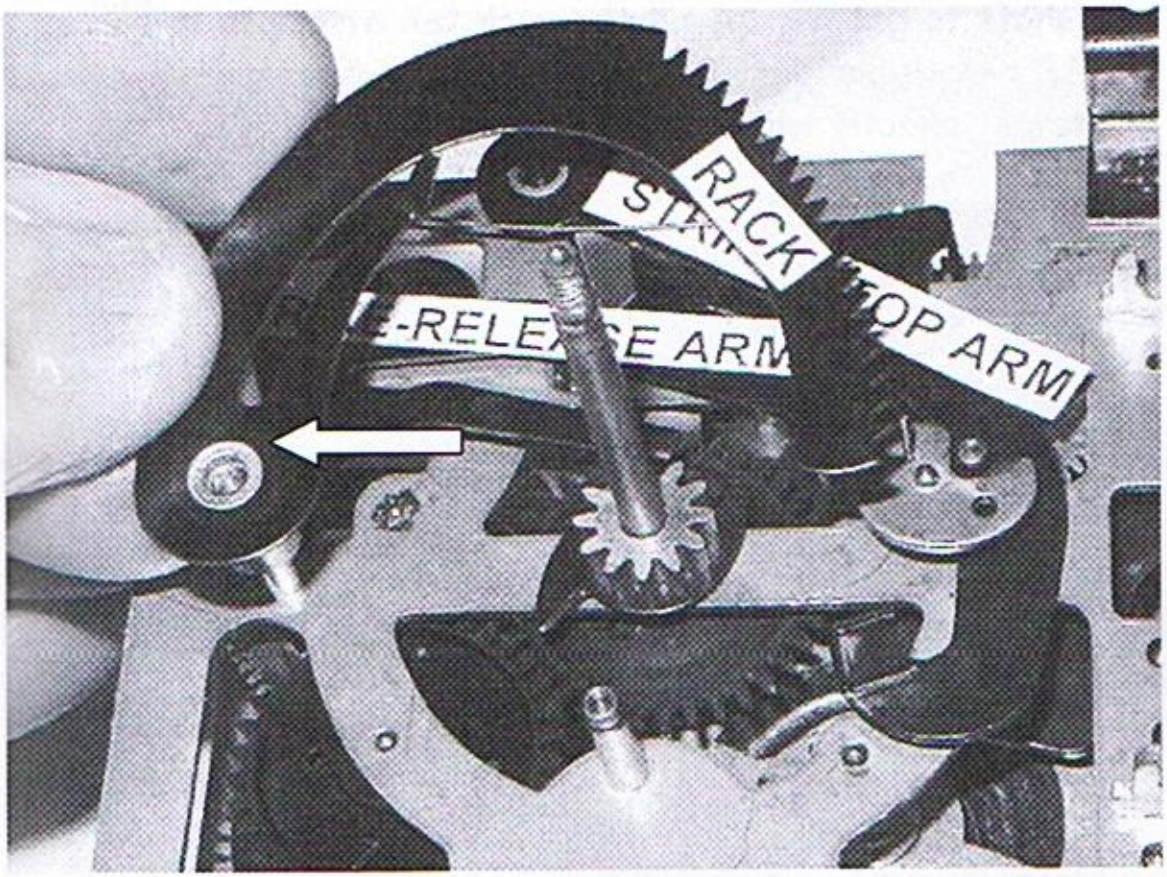


Now insert the shaft of the strike-stop arm into its' proper hole. Don't forget to attach the little steel wire spring seen in picture.

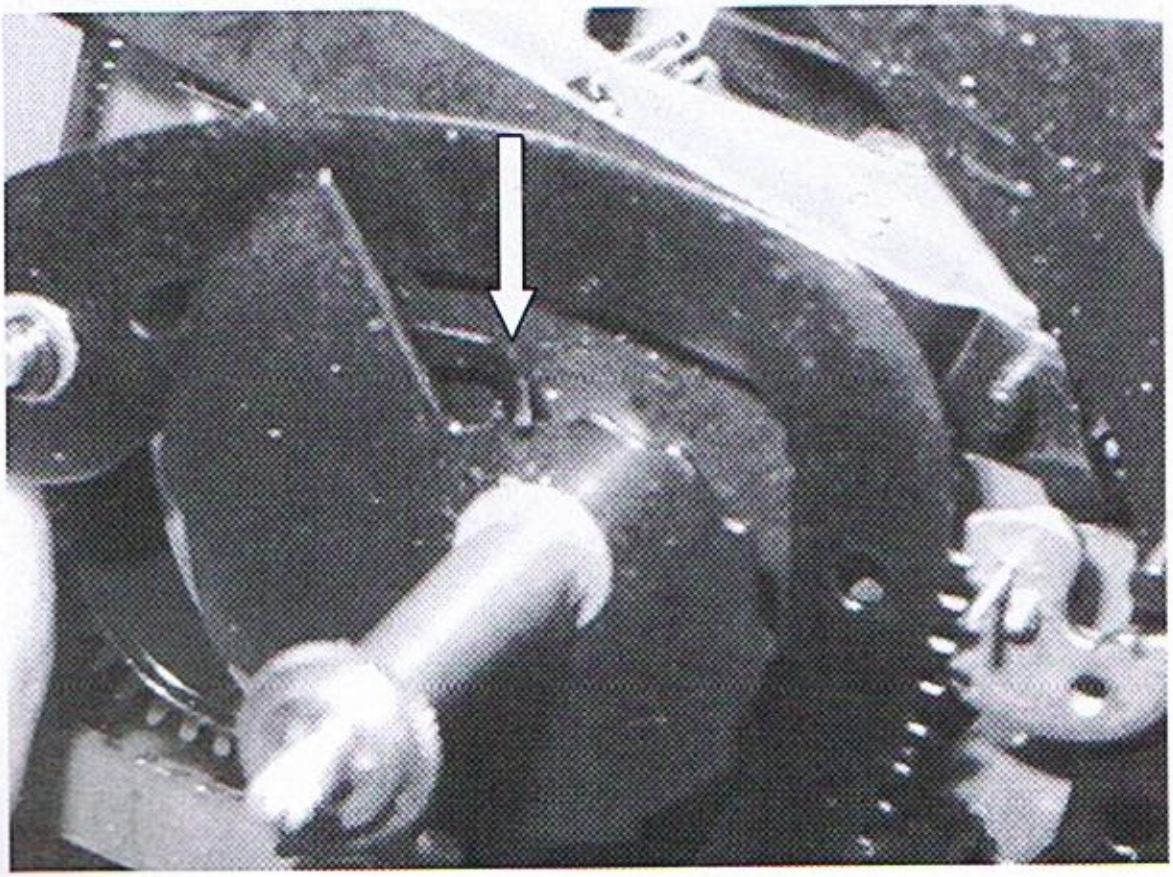
Snap retainer clip inside front plate.



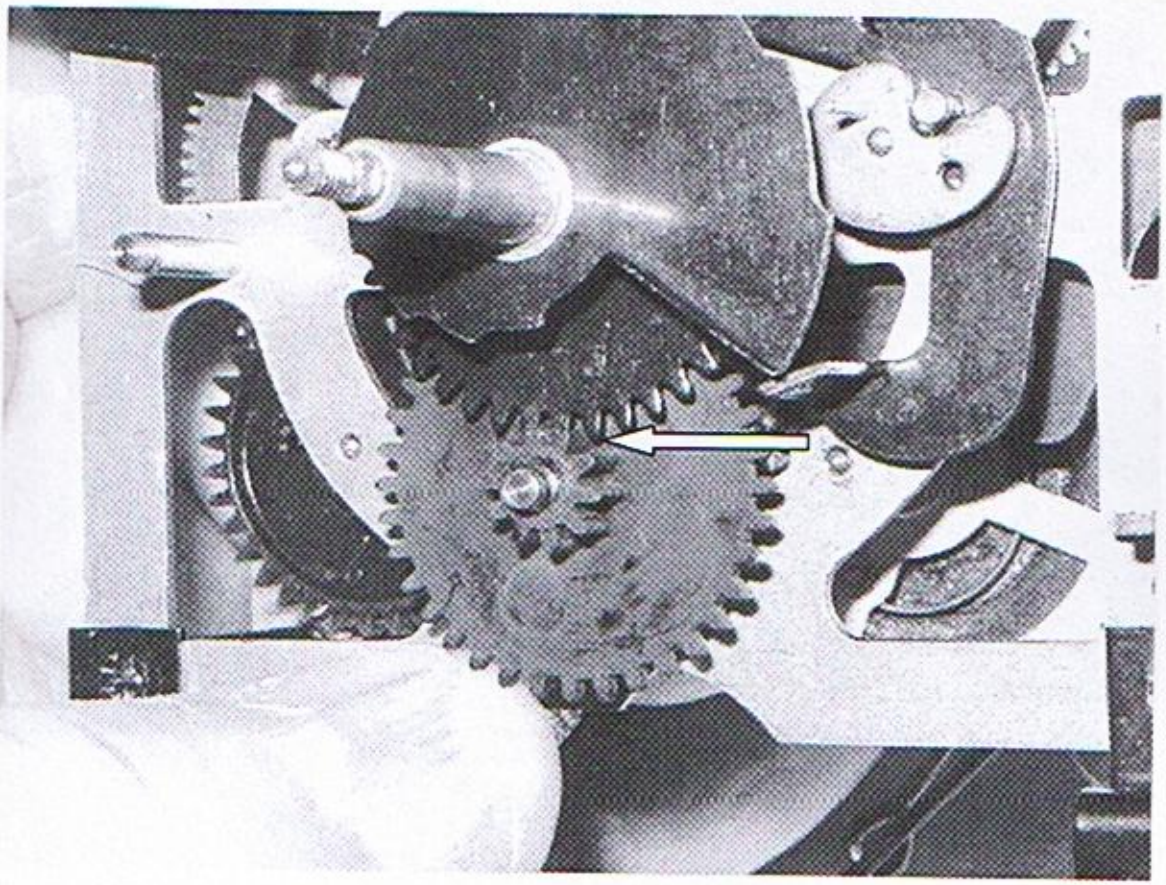
The rack can now be installed on its' post (arrow). Remember to install the retainer clip.



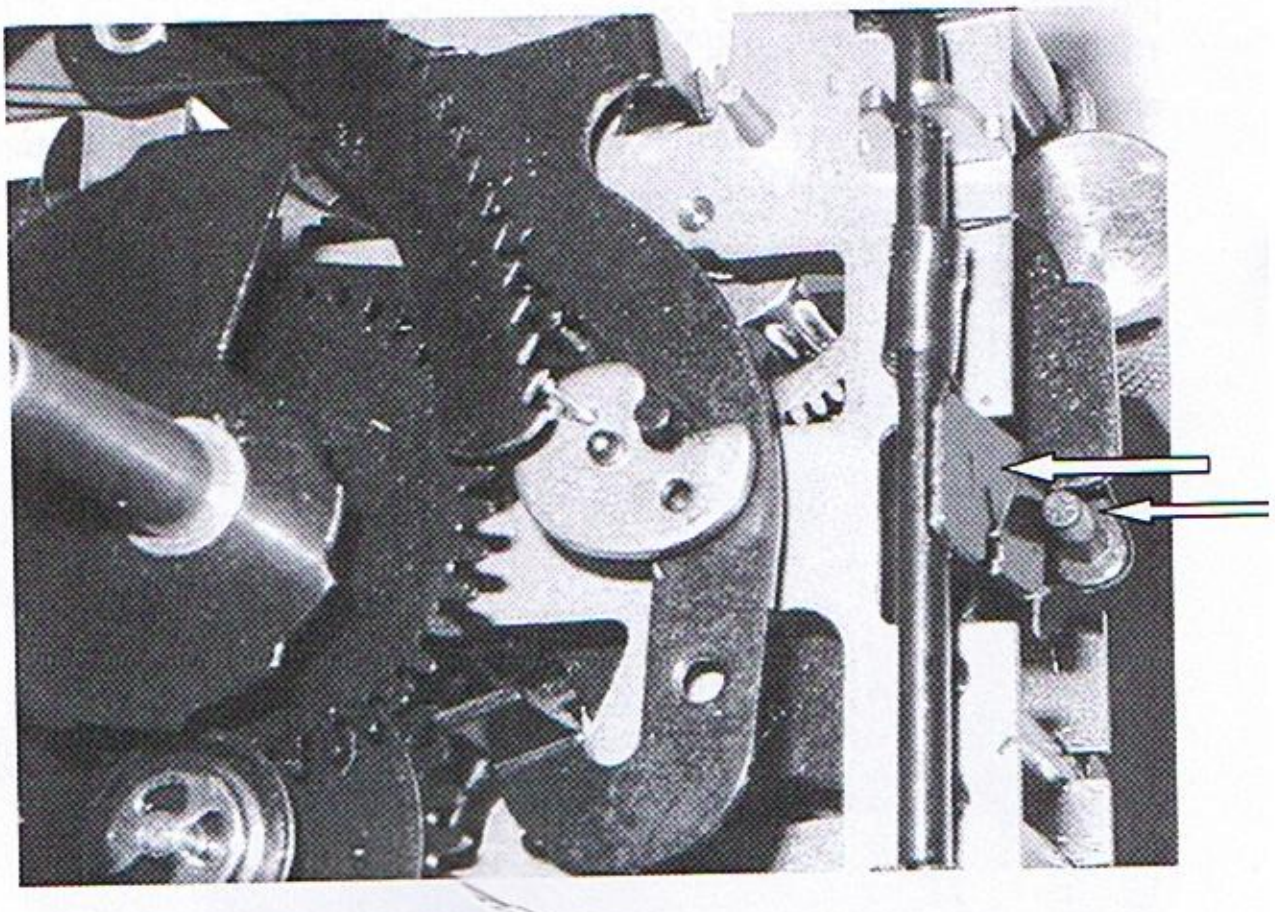
The motion wheels must be coordinated so that the rack tail will fall unimpeded onto the 12 o'clock plateau (arrow) or else the clock will not strike the full 12 times. Test this by turning the handshaft (screw the hand nut on the end of the handshaft to get a grip) till the rack tail attempts to fall on the 12 o'clock position. Be careful to stop turning the handshaft exactly when the rack falls.



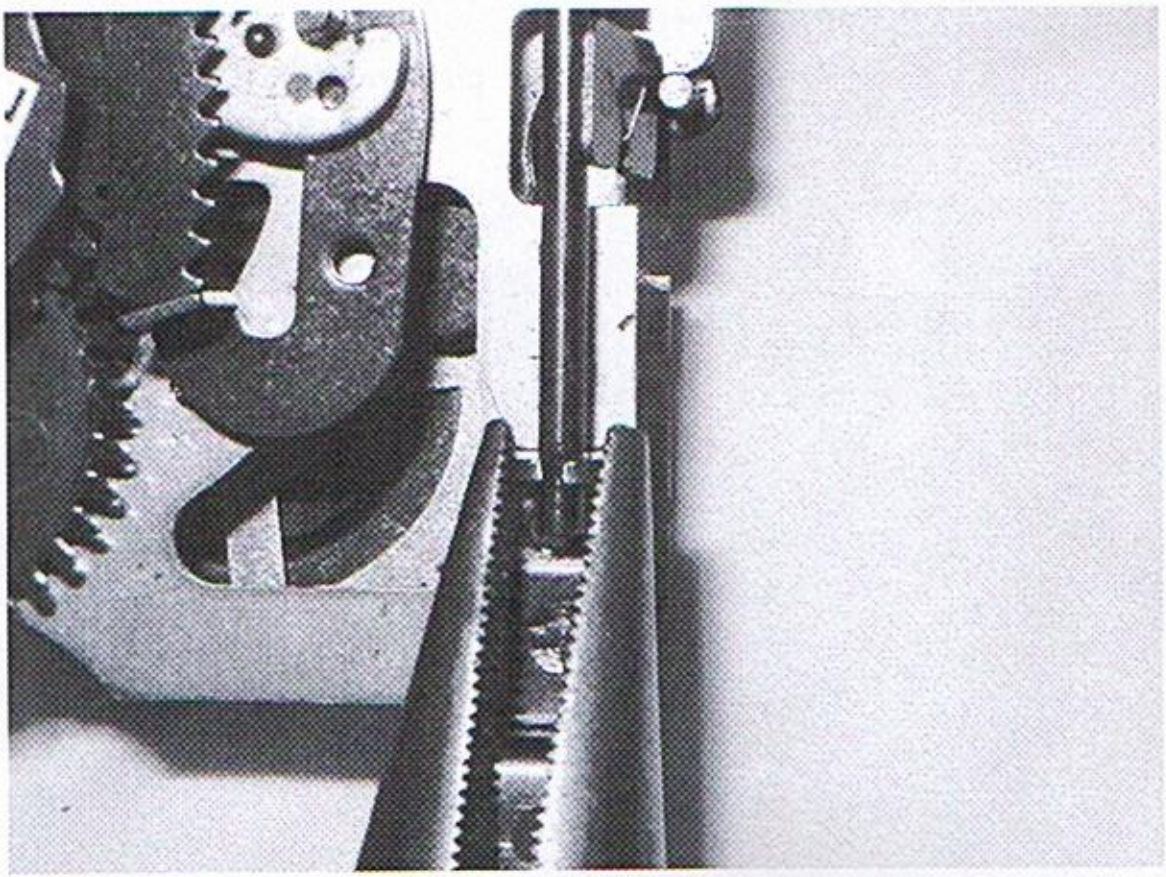
If the rack fails to drop all the way down to the 12 o'clock plateau, you will need to release the retainer clip and move the hour wheel one tooth in relation to the small gear it engages.



The bird arm must be installed so that the flap (top arrow) attached to the bird arm is to the left of the impulse pin (bottom arrow) on the trunnion.

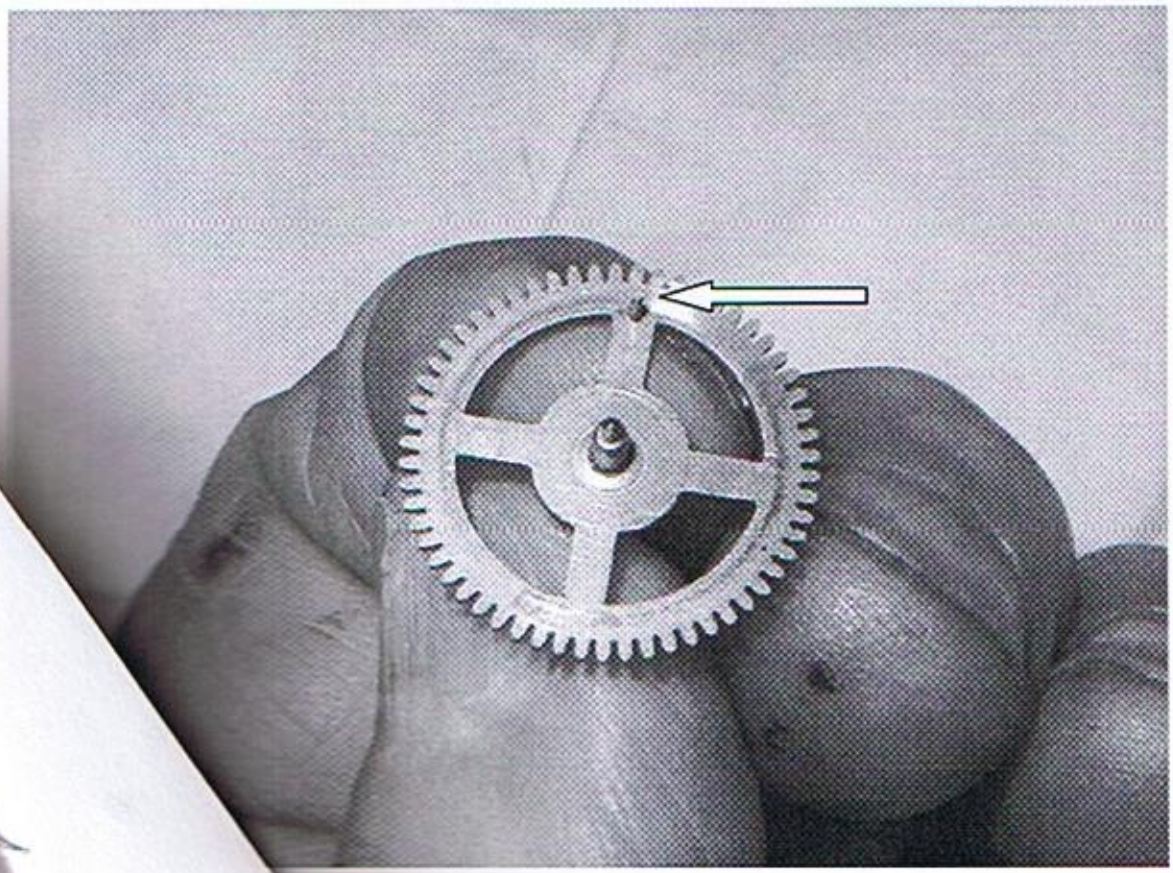


Then crimp the bird arm bearings just enough to retain the arm, but loose enough to allow the arm to freely move.

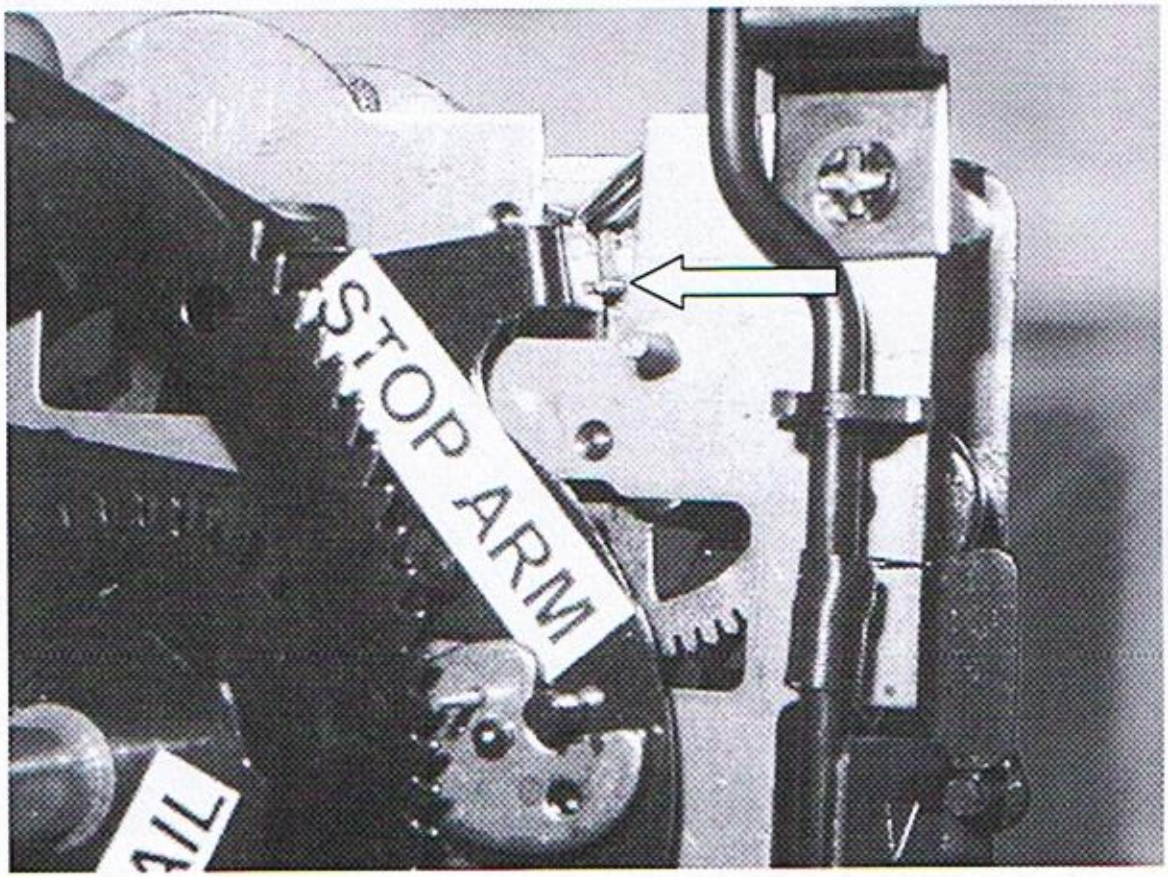


Now a word on the mechanics of the strike mechanism: All striking mechanisms have what is called "warning". This is like cocking the trigger on a gun, so that the strike can commence at precisely the correct instant. As the minute hand moves near the next hour (or half hour, if the movement is a half hour striker as most Cuckoos are), you will notice the gear train advances a very short run that ends in a "click" sound. This is the sound of the warning as the detent pin on the number 3 strike wheel (arrow),

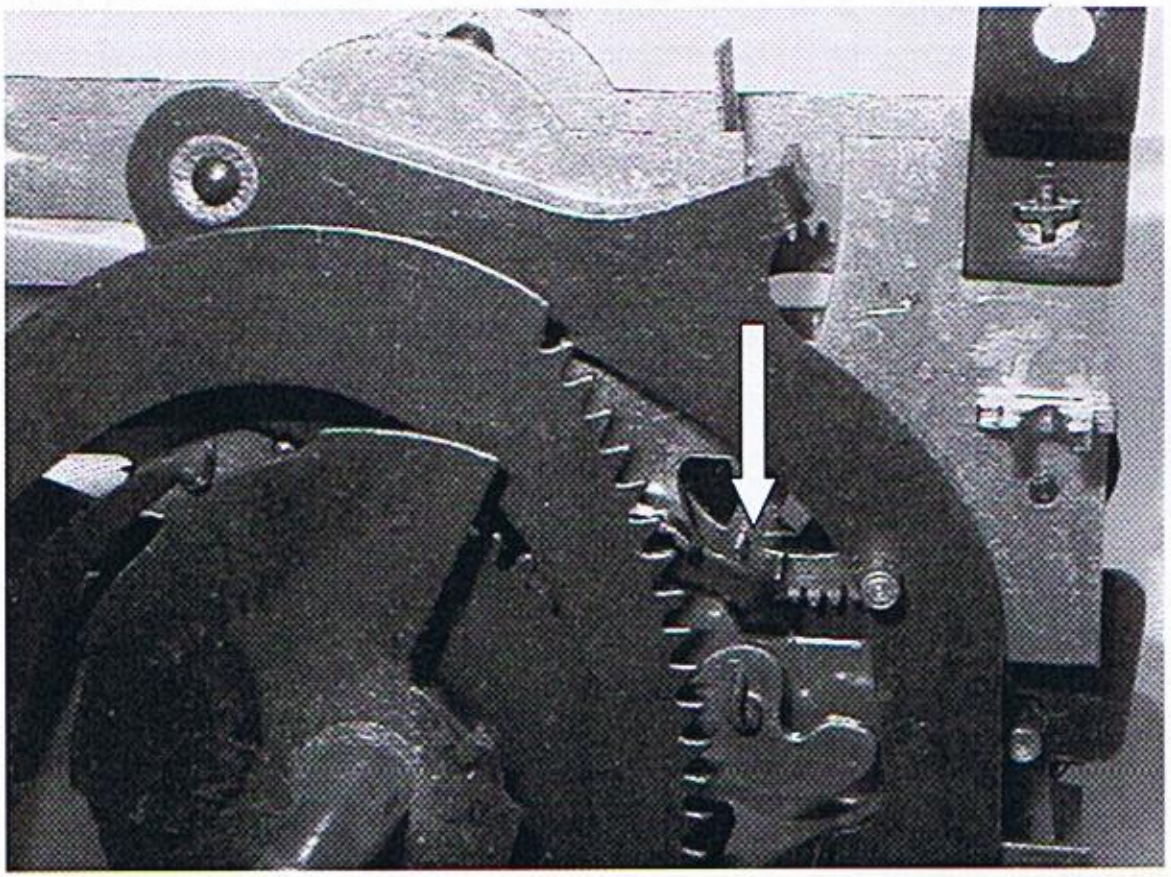
--- Continued after picture---



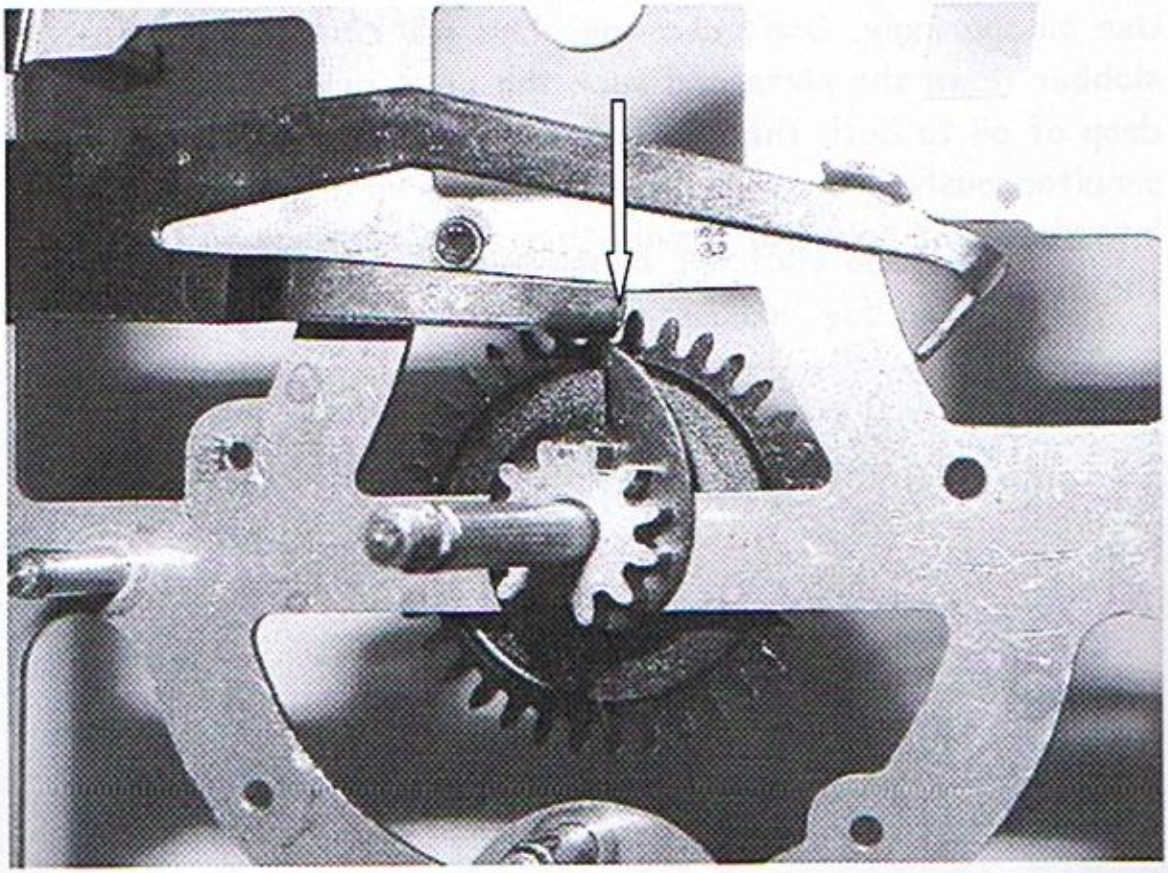
being released from the strike-stop arm,



and then contacting the strike-release arm, where the detent is detained, --



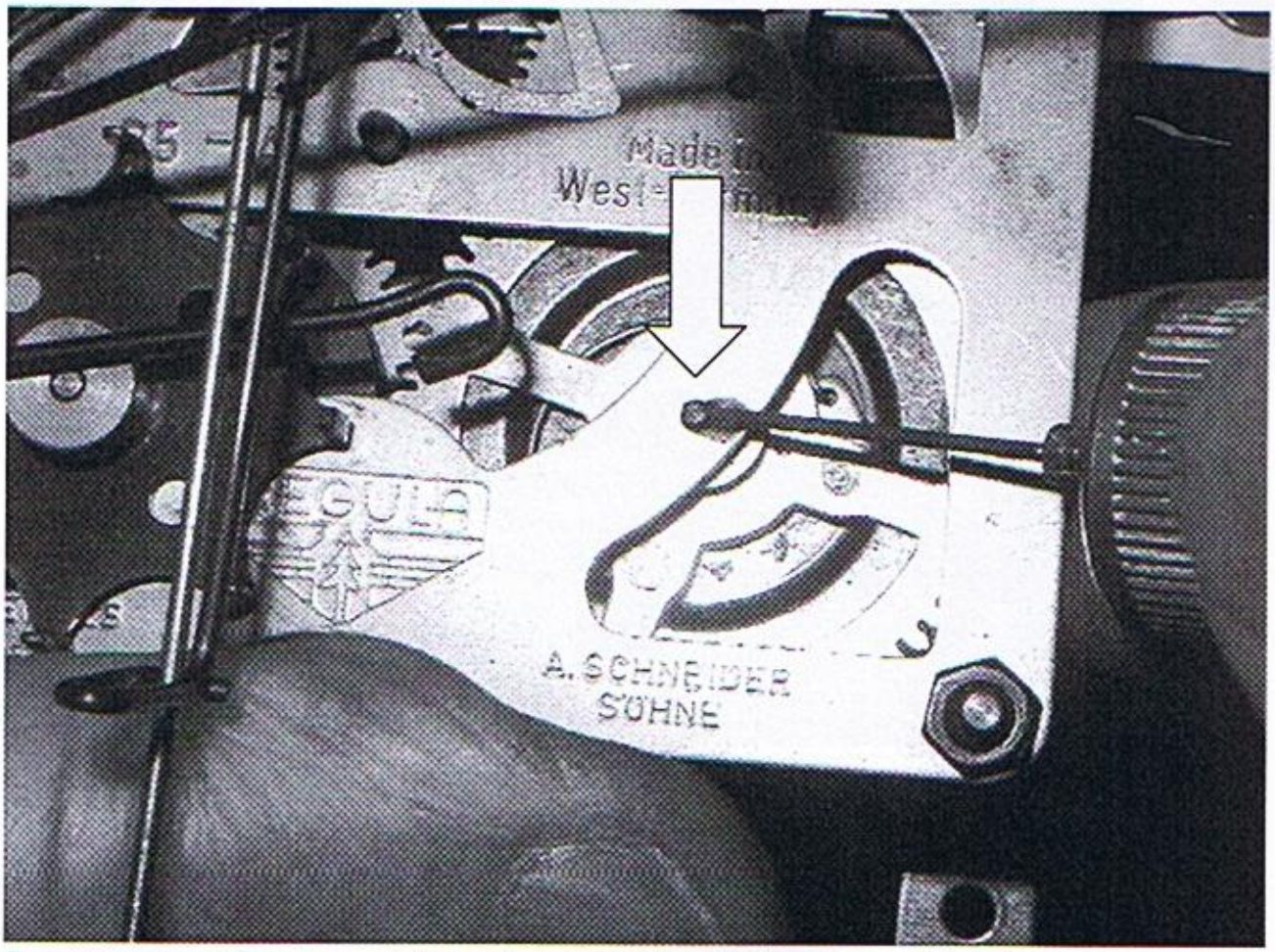
until it is released as the strike-release arm drops off the lifting cam lobe (arrow).



This happens at the exact point where the minute hand reaches the hour (or half hour).

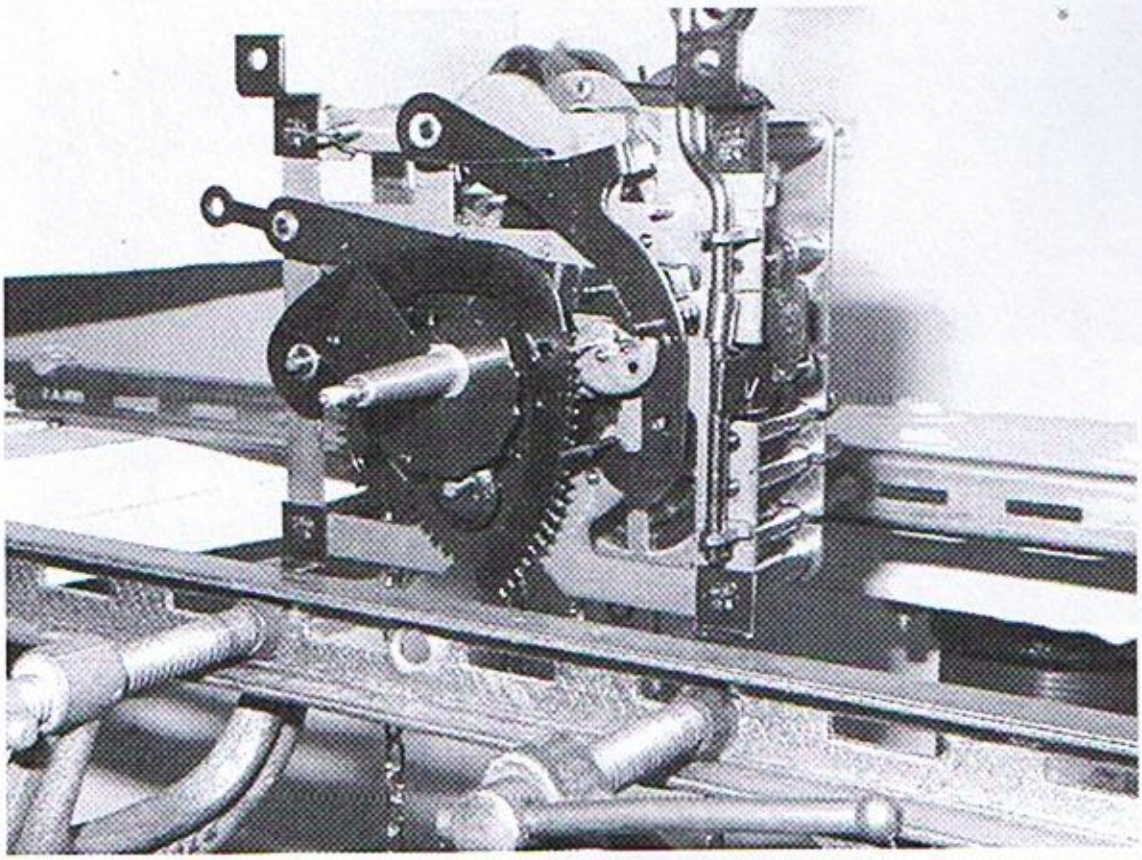
All this sounds intimidating, but you will be able to observe it in action when you have the movement on a test stand where you can peer between the plates and watch it all happen.

Oil the movement with a good clock oiler (*Ronell #OPO-05). Apply a very small drop of oil into <u>each</u> of the pivots. A typical pivot is pointed out being oiled in the picture below. Use oil sparingly. Don't over-oil. This will cause the oil to slobber down the plate and suck the pivot dry. Touch the drop of oil to both the steel pivot <u>and</u> the brass hole simultaneously. This will cause the oil to virtually disappear into the pivot hole and remain there and continue to lubricate the pivot.

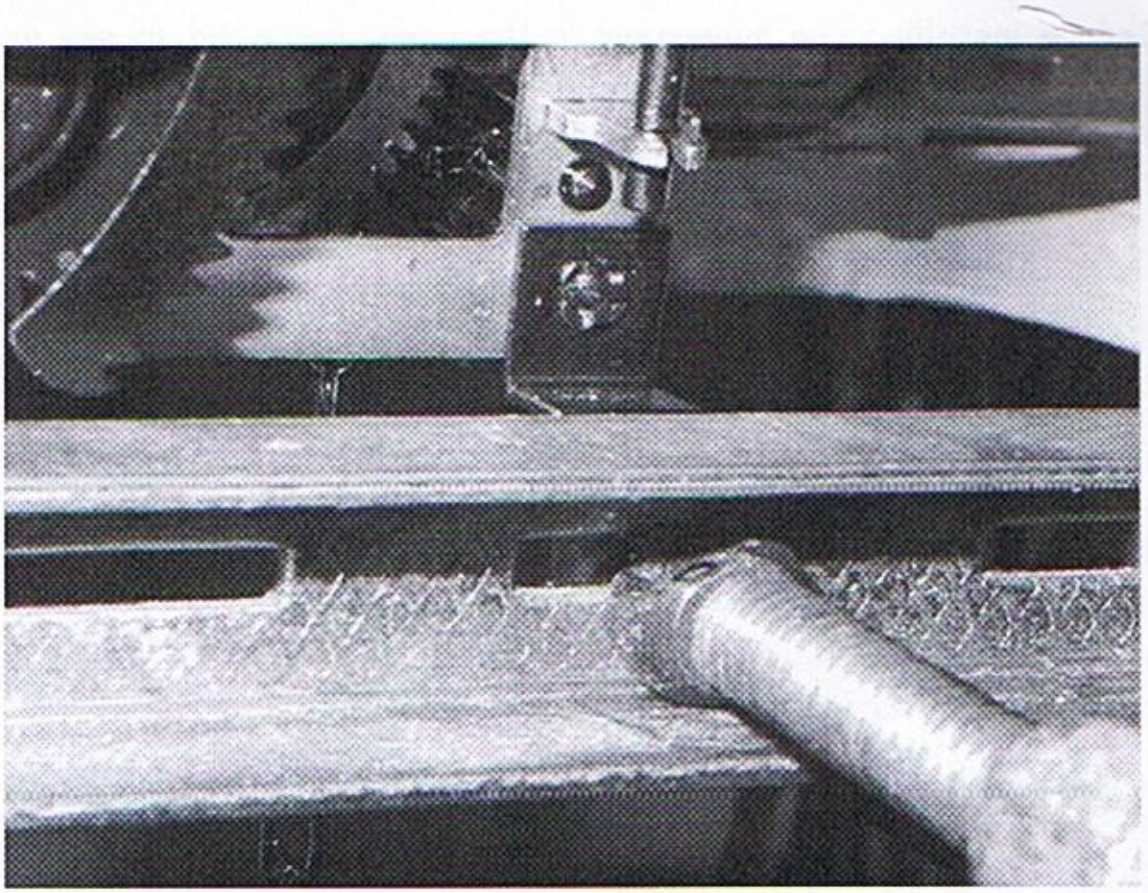


Be sure to oil every point where a steel shaft or pivot turns in both the front and back plates. Do not oil teeth.

Now the movement is reconditioned and fully assembled. Before installing the movement in the case, you need to set the movement up on a test stand. This will allow you to make final adjustments that are not easily done when the movement is inside the case.

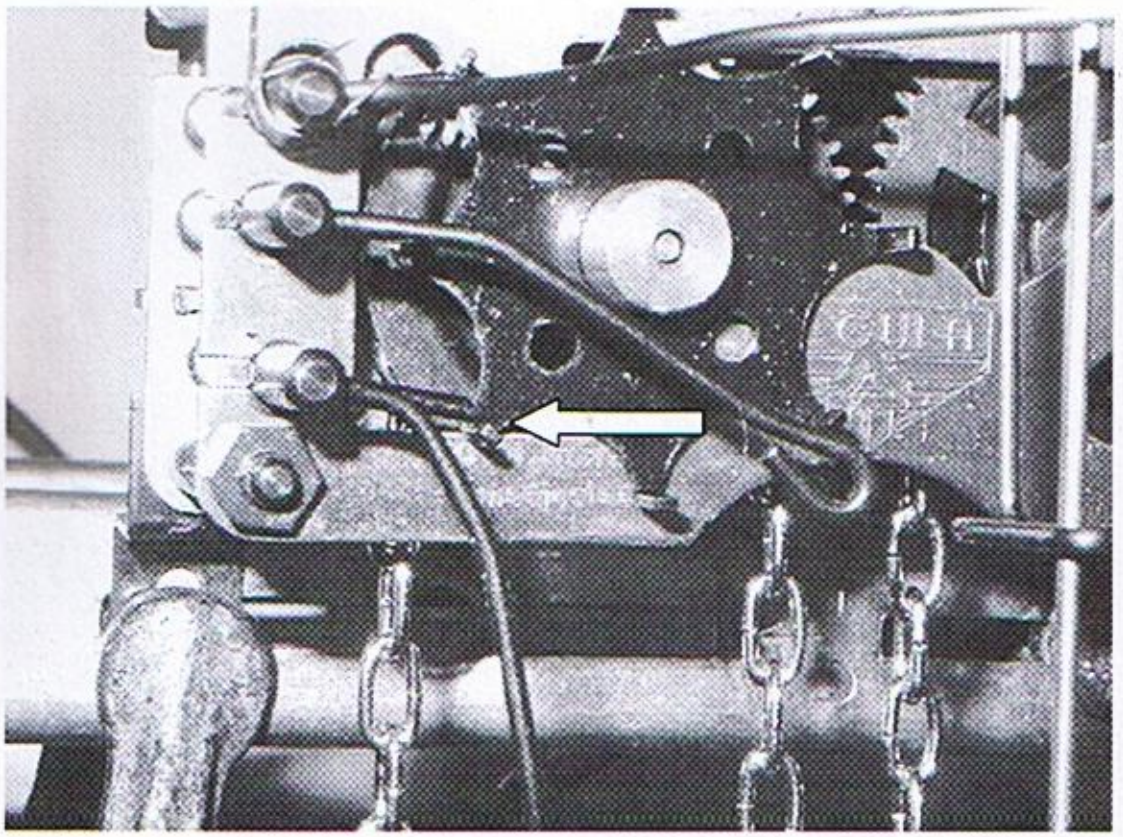


Attach the chains, hooks, weights and pendulum, and start the pendulum swinging. Test the time section now. You can put the movement into beat by tipping the movement up on one side or the other. Just loosen one "C" clamp, and elevate or lower that side till you hear an even measured beat (tick-tock sound).

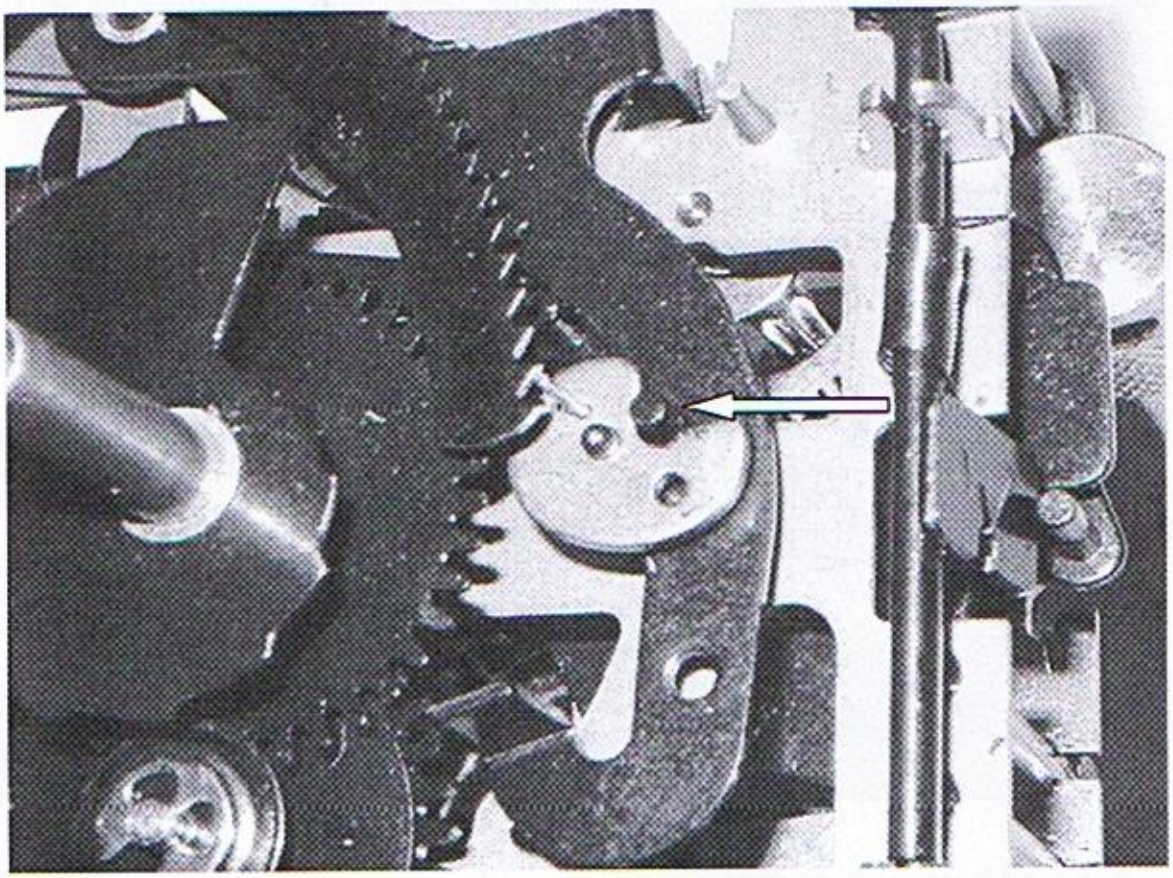


But do not try to adjust the beat by bending the crutch wire until the movement is back home in its' house.

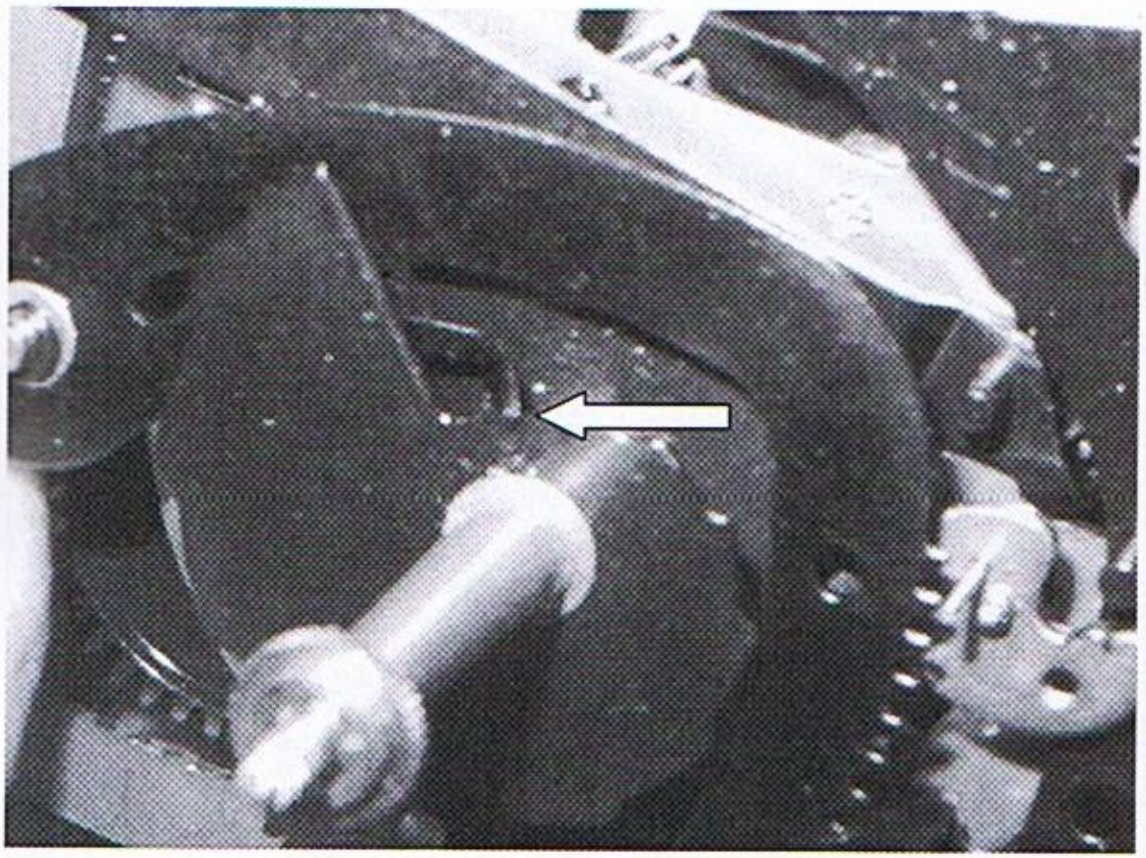
For purposes of this test, see that the bellows-lifting arms are free to move up and down. Sometimes, on the test stand, and without the bellows lifting wires attached, the arms fall down too far, and jamb the bellow-lifting wheel.



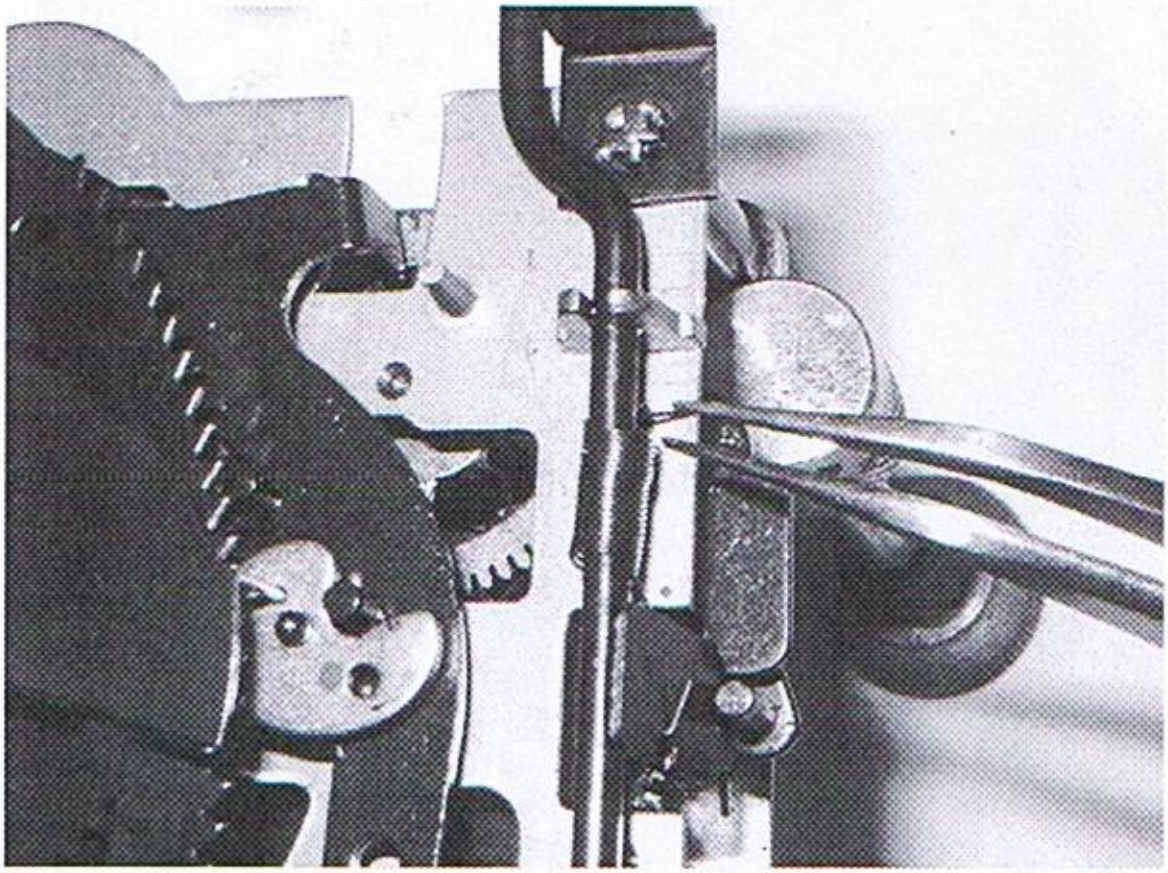
Rotate the handshaft to activate the strike mechanism so you can make sure the pin of the strike-stop arm is nested squarely in the valley of the gathering pallet when the strike has finished its' run. Otherwise the strike may not stop when it should.



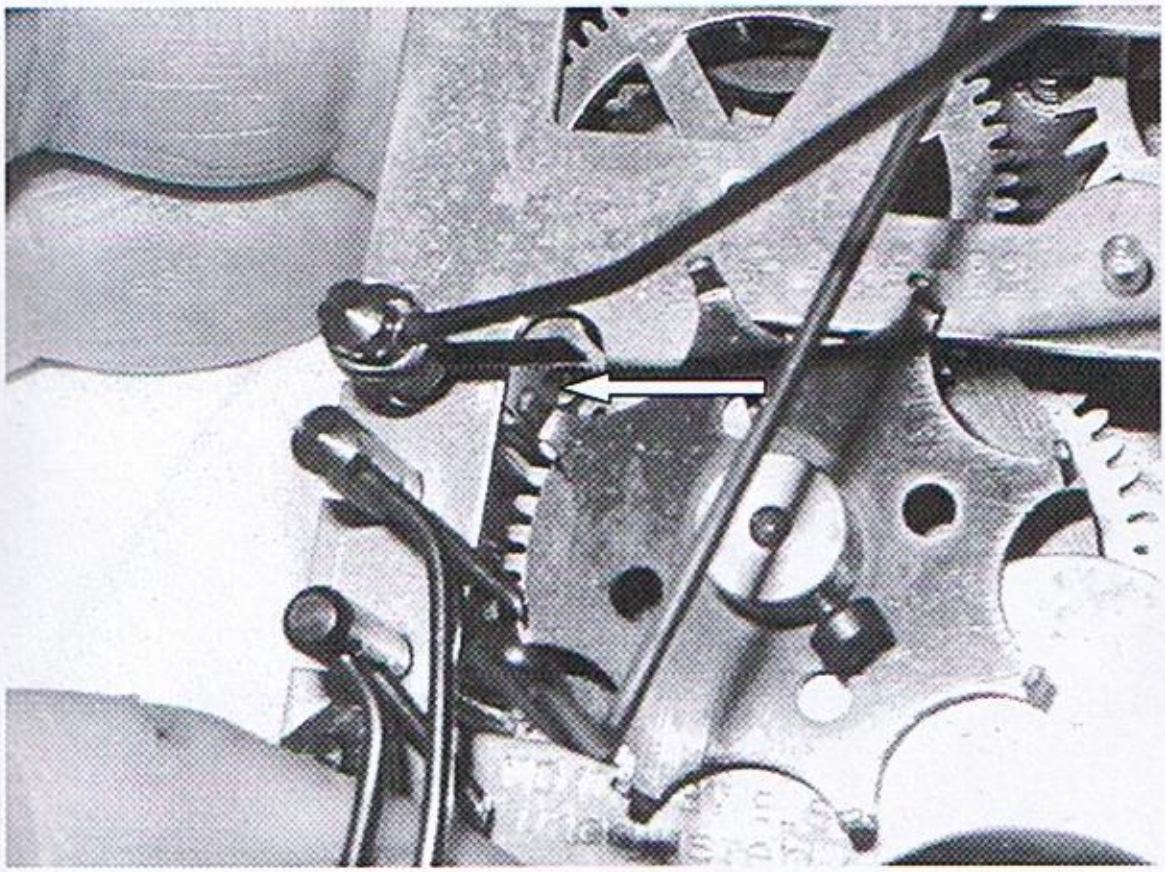
Double check that the rack tail falls cleanly on the 12 o'clock plateau of the snail as you turn the hands to the 12 o'clock position.



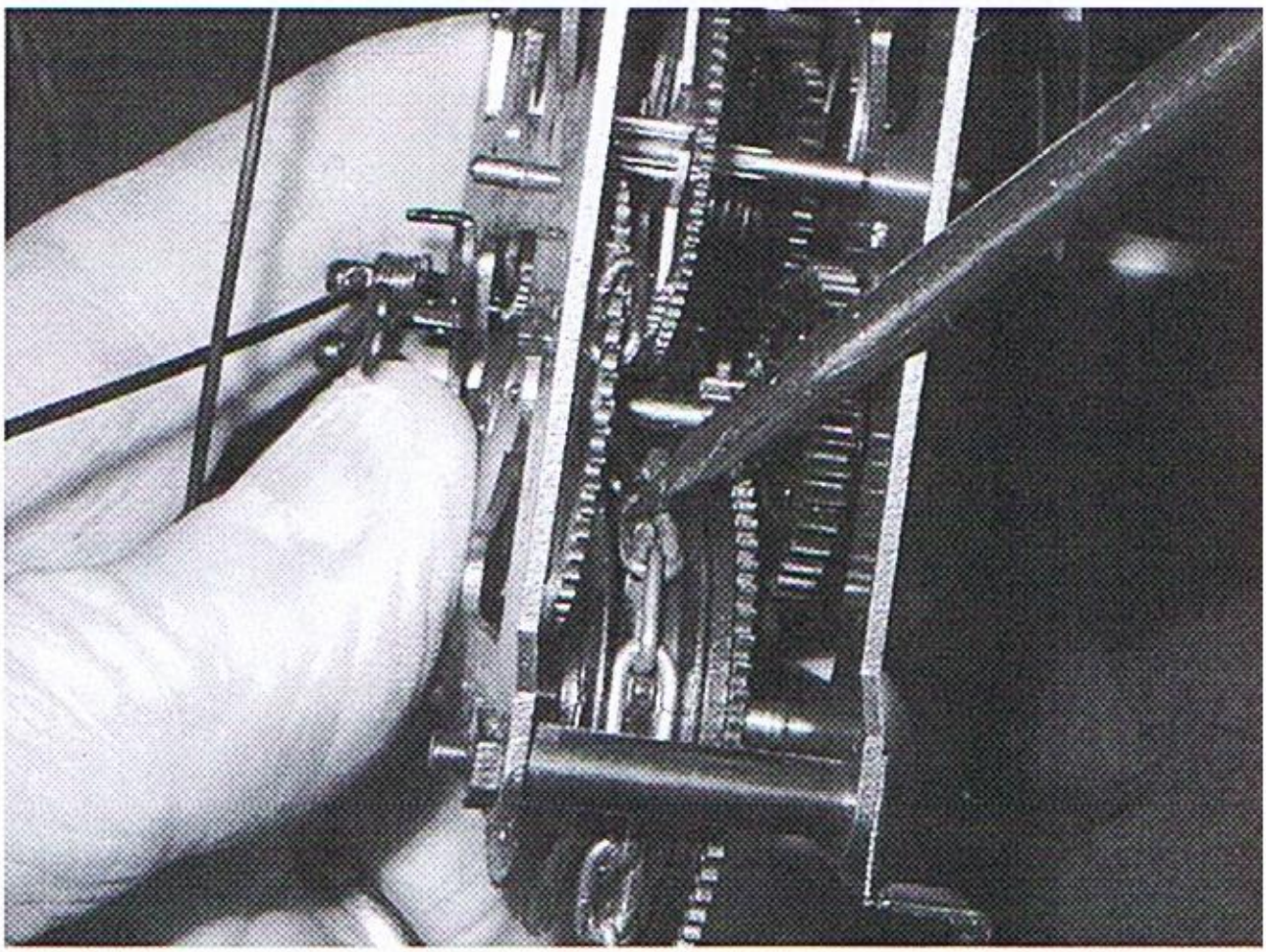
Ensure that the brass wire spring on the bird arm is exerting enough tension to make the arm swing out, but not too much tension, or the bird door may slam too hard and cause a reaction, such a repeated slapping and opening of the door.



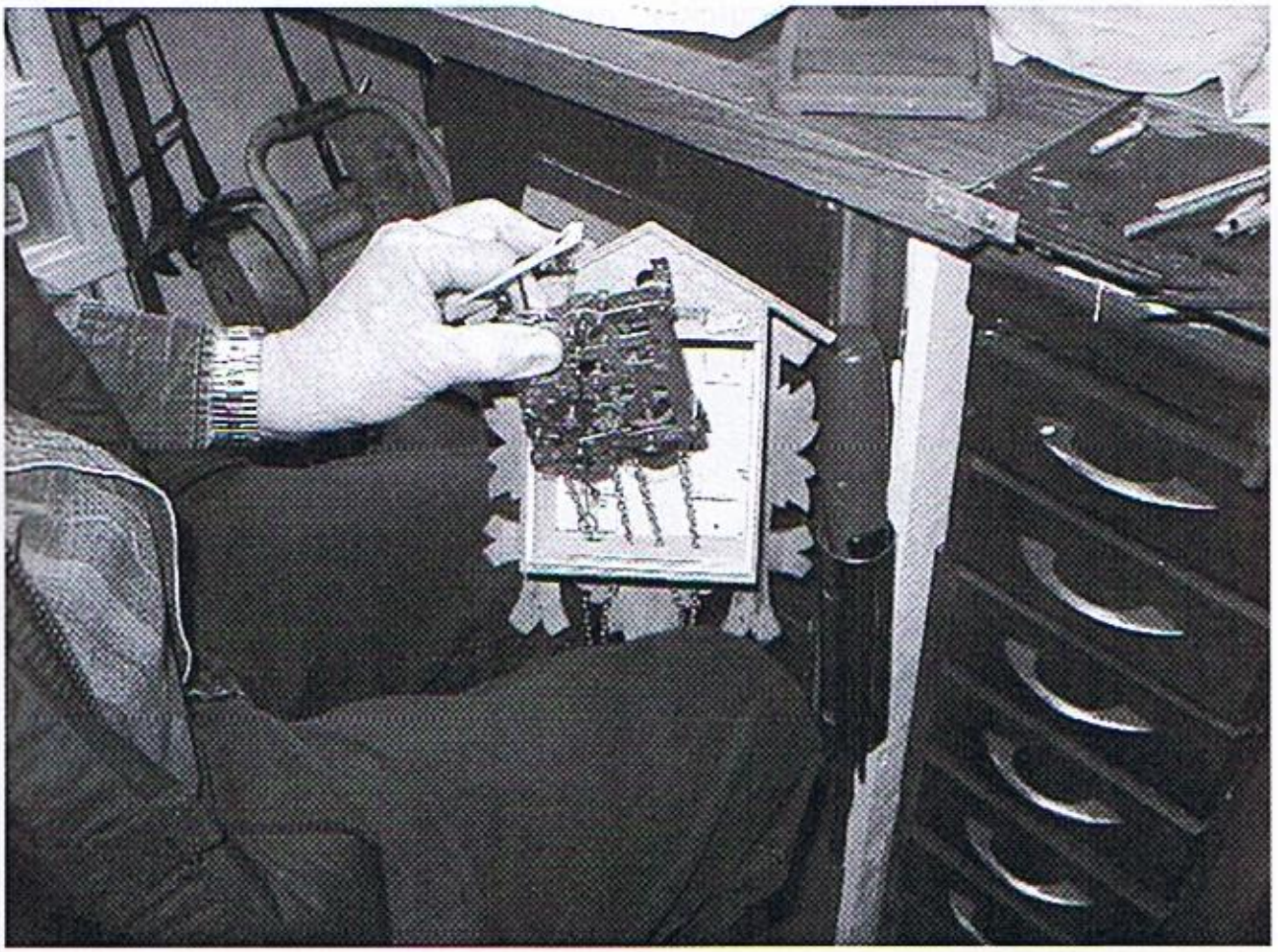
Set final positioning of bellows-lifting wheel so the gong will be the first thing to happen when the wheel starts up at its' next activity. Note the arrow showing one finger of the bellows-lifting wheel positioned just below the hammer arm lifting point. Rotate the bellows lifting wheel as needed for final adjustment, then tighten setscrew.



You are now ready to re-assemble the clock. Insert one chain around each sprocket. The sprockets will turn only one direction, so you must feed them into the side that will receive them. You may need to use a small screwdriver to impel the sprockets to rotate as they receive the chain.



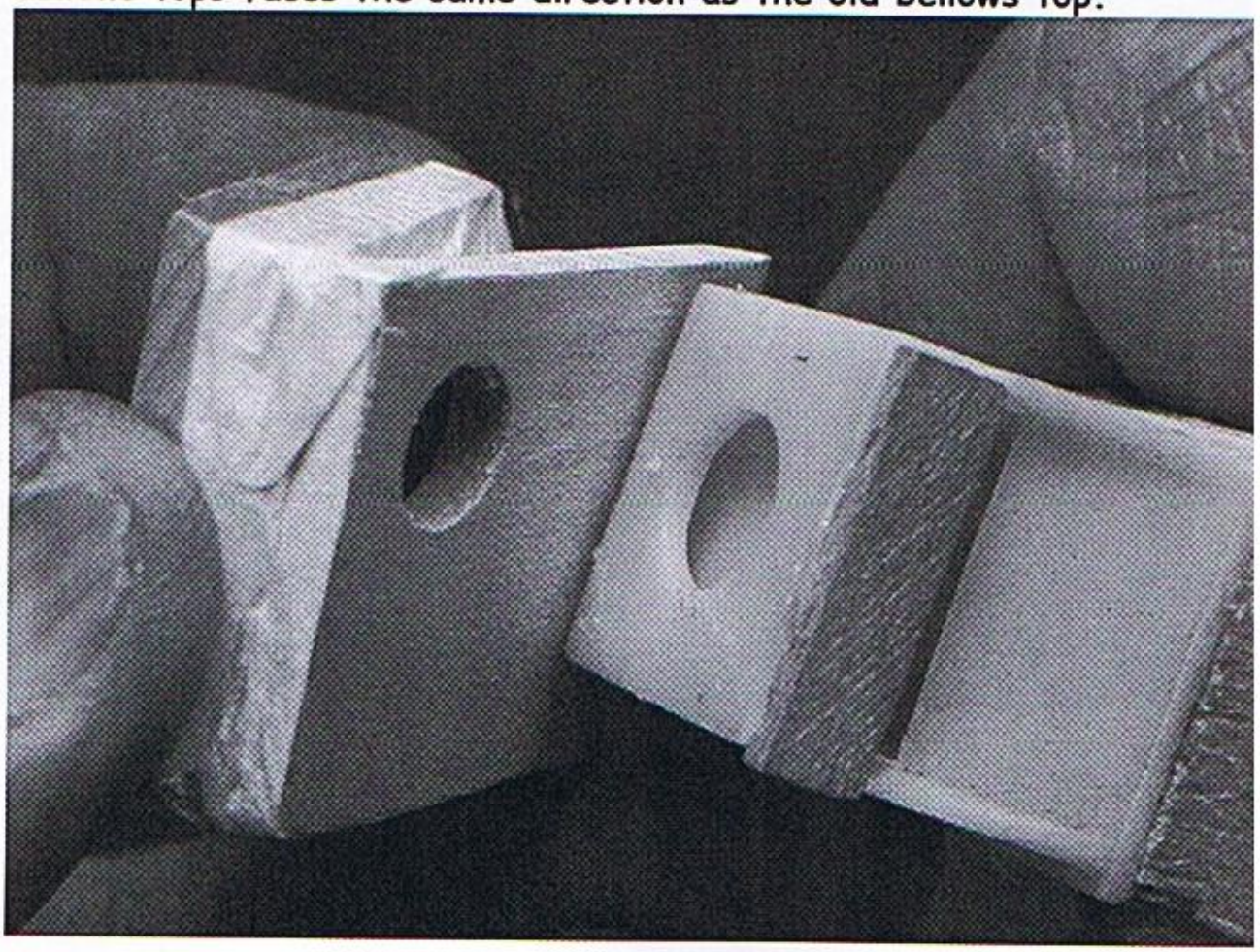
Pull each chain so the ends are nearly equal in length. When you have both chains installed in the movement, you are ready to re-insert the movement into the clock case. I like to hold the clock between my knees and feed the chains into their respective holes in the bottom of the inside of the clock case.



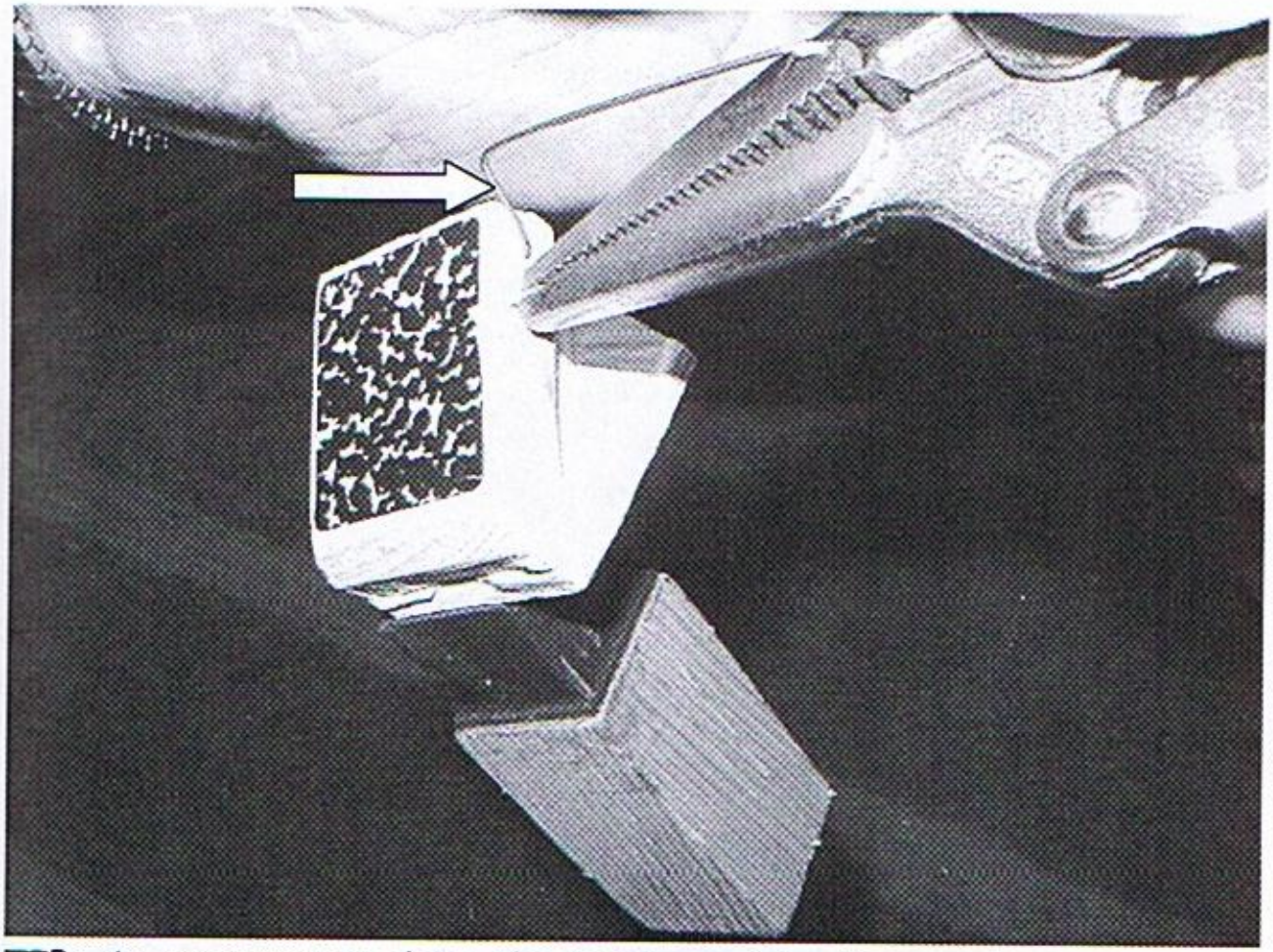
NEXT:
~Replace the screws that hold the movement in place.
~Re-attach the bird-to-door wire, and reshape the loop at

the end of the wire after fitting it back into the staple.
~Repair bellows as necessary:

Measure the size of the bellows tops and obtain a new pair * near the size of the old ones. Exact size is not at all critical. Remove the old bellows tops by breaking the glue. Scrape off the old glue residue, and glue on the new tops. I like to use hot glue. It sets up quickly, and can be separated if you make a mistake. But be sure to position the new bellows tops exactly as the old ones were positioned. Be sure the air passage holes line up, and be sure the "yawning" end of the bellows tops faces the same direction as the old bellows top.



The wire hardware imbedded in the old bellows tops needs to be removed and installed in the new bellows tops in the same position. This imbedded hardware consists of: Two staples (or eyelets). One in each bellows top where the lift wire slips in. One longer wire (in only one bellows top. See arrow) that lifts the tail of the bird during the cuckoo sound. Be sure, when reassembling, that the tail-lifting wire is UNDER the tail of the bird.



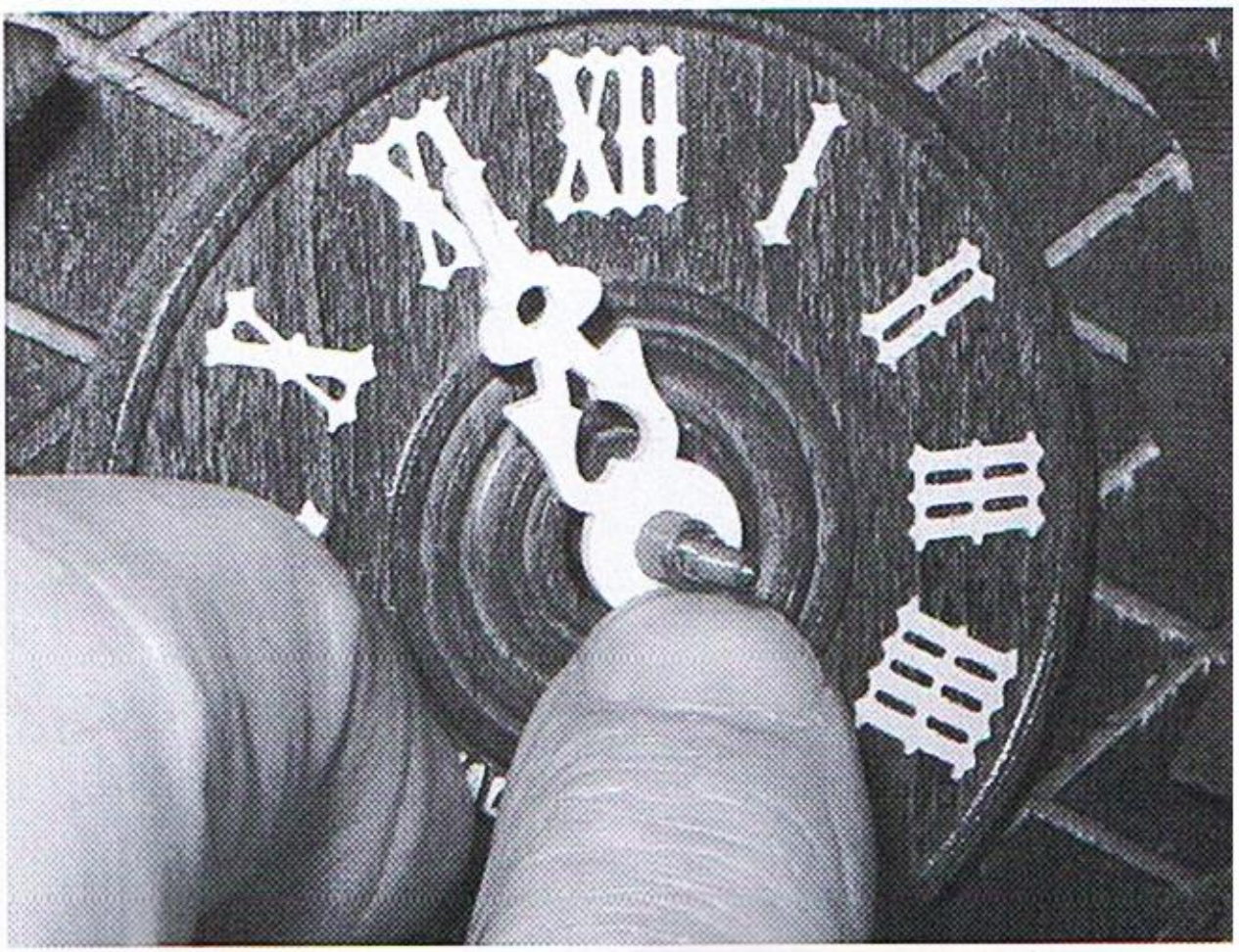
TIP: An easy way to drive the hardware into the new tops without bending the wires ~~ Use a small pair of vise grips to

firmly hold the wires and press or tap the pliers to imbed the hardware. Apply the vise grips so that very little of the wire shows. This will help prevent bending the wire.

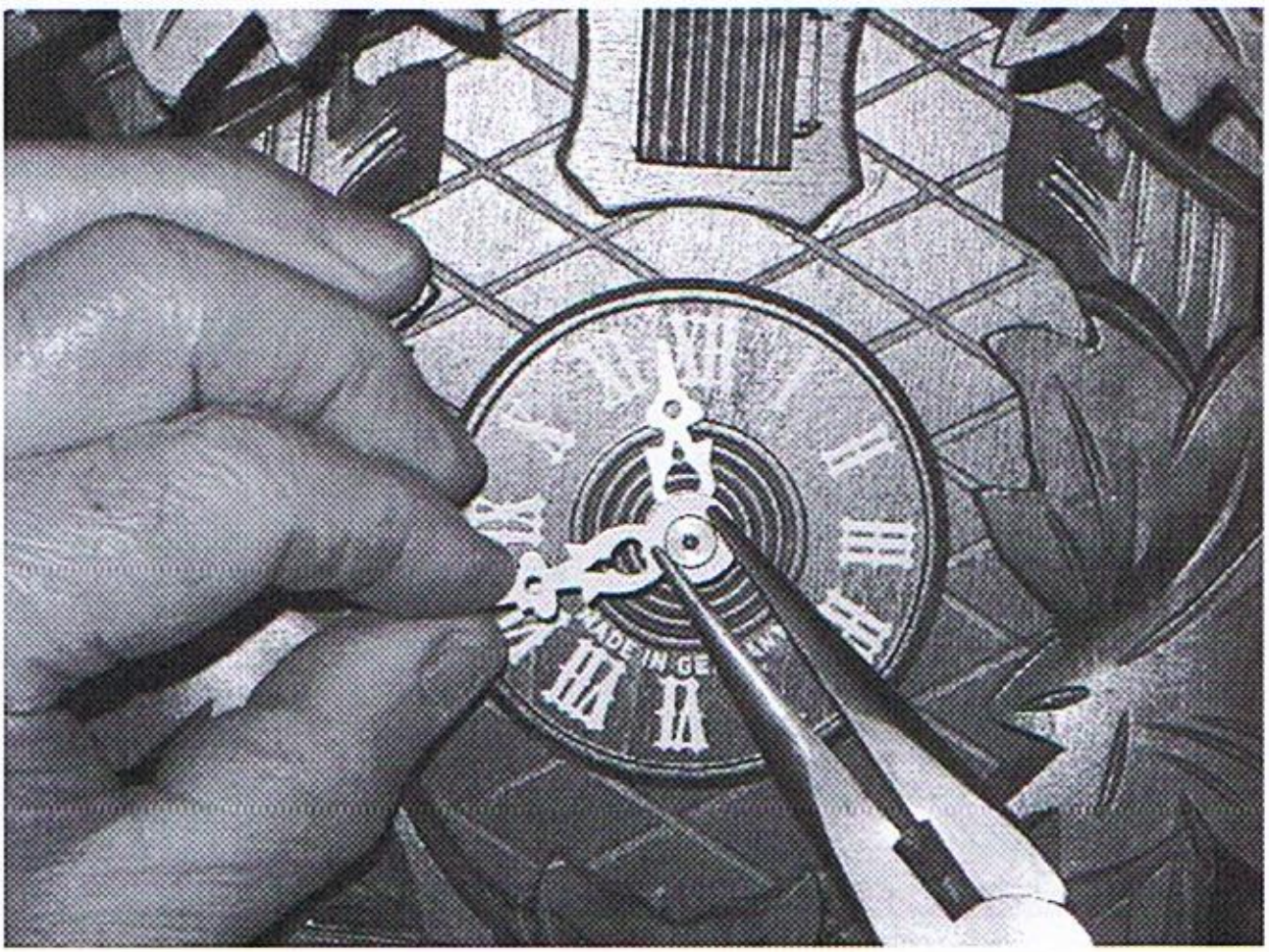
~Install bellows and lifting wires.

~Re-attach the chain ends by using the needle nose pliers to reshape the open chain link.

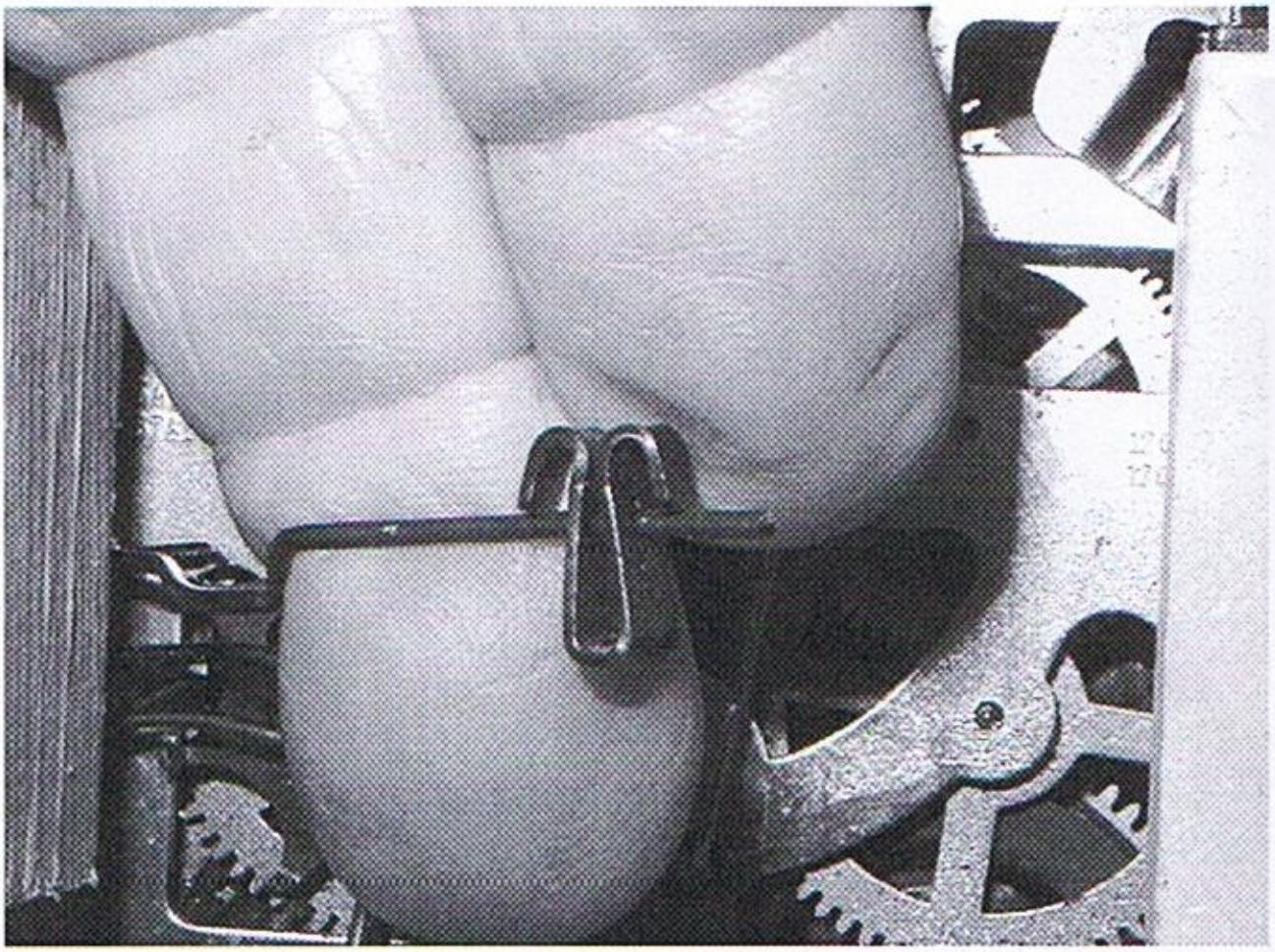
~Replace the short hand by pressing it in toward the dial. You can slip it to the correct hour later.



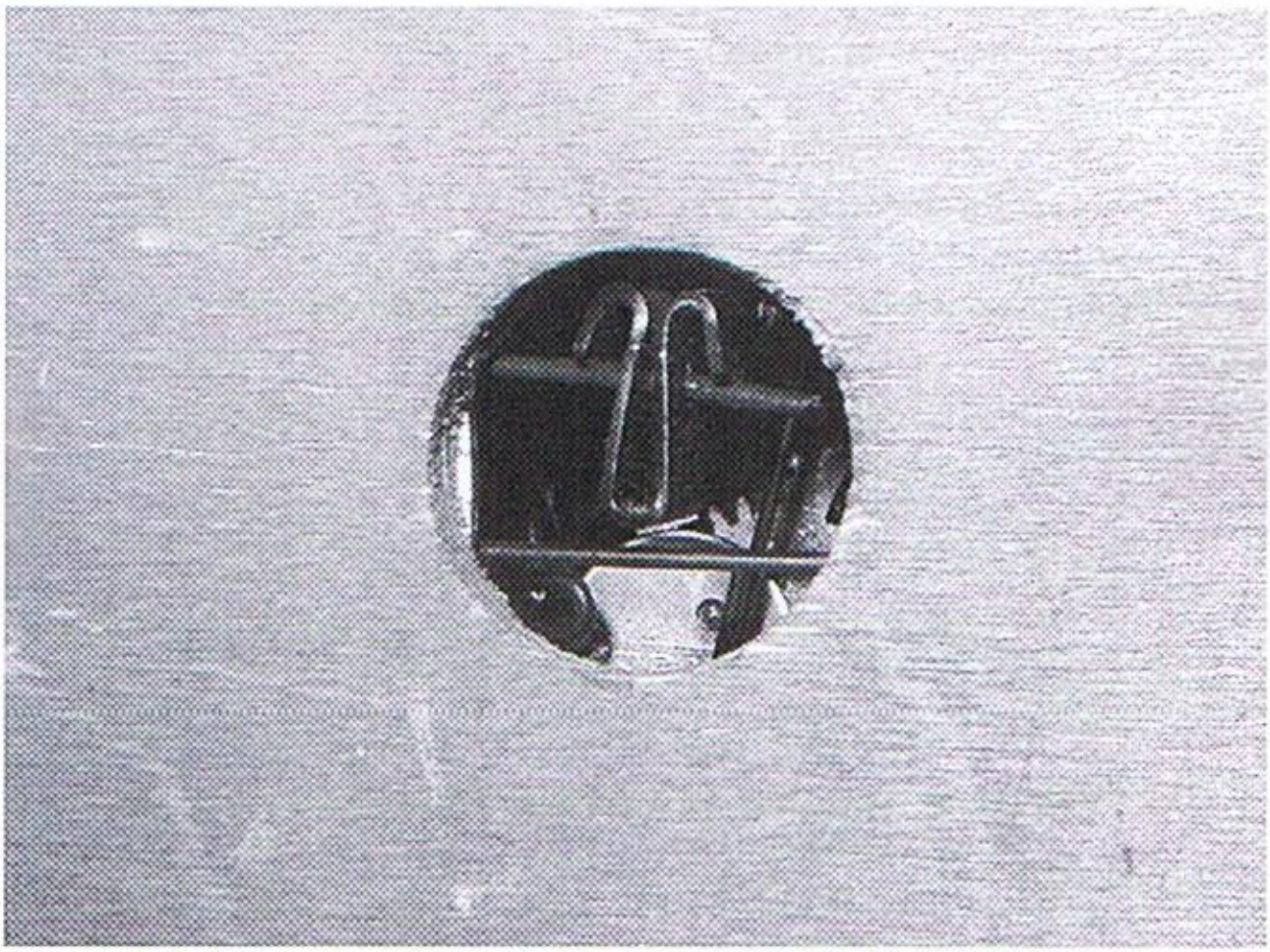
~Replace the minute hand, installing the bushing and nut in the reverse order of their removal. Tighten the nut (after you have determined the correct minute).



Adjust the gong hammer so it is about 1/16 inch above the horizontal portion of the gong wire (see 2 following pictures). The gong is supposed to sound first before the cuckoo call.



The horizontal wire is part of the spiral gong which is fastened inside the back door.

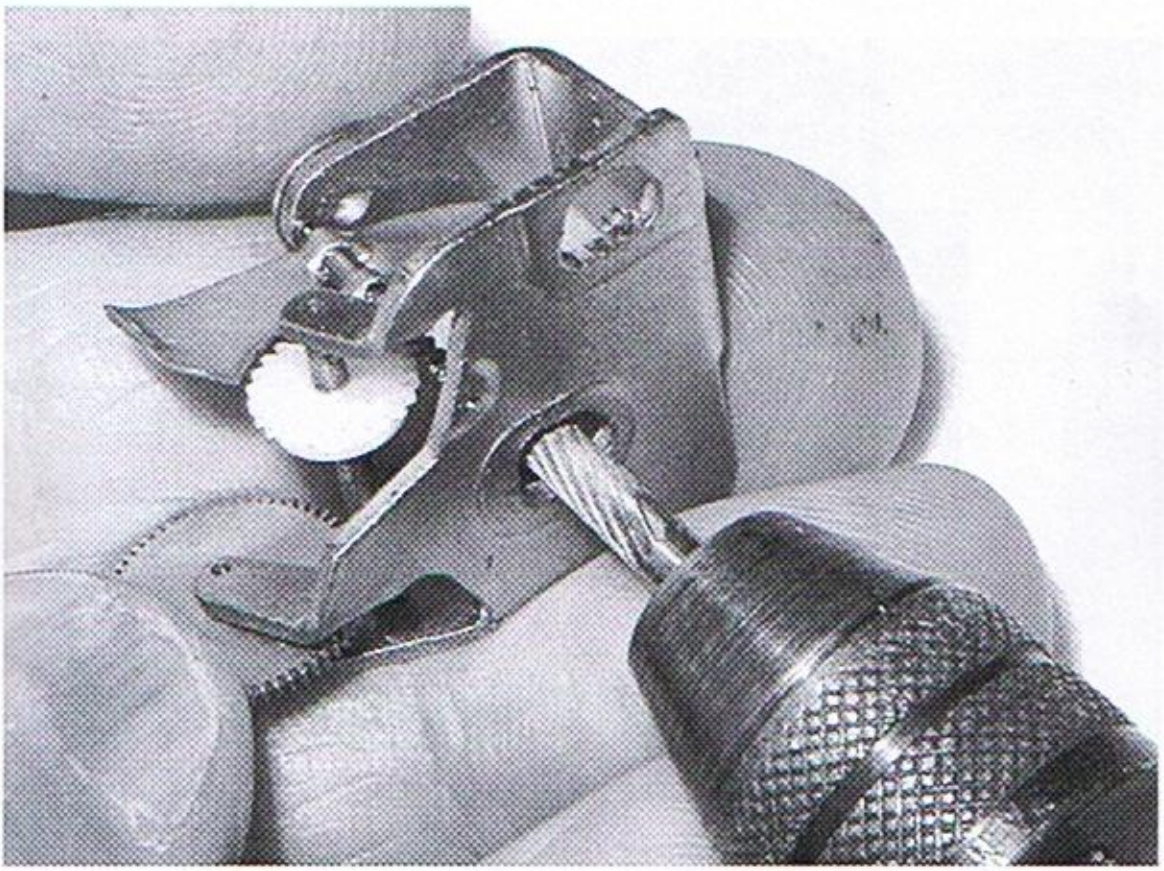


TIPS ON MUSICAL CUCKOO CLOCKS

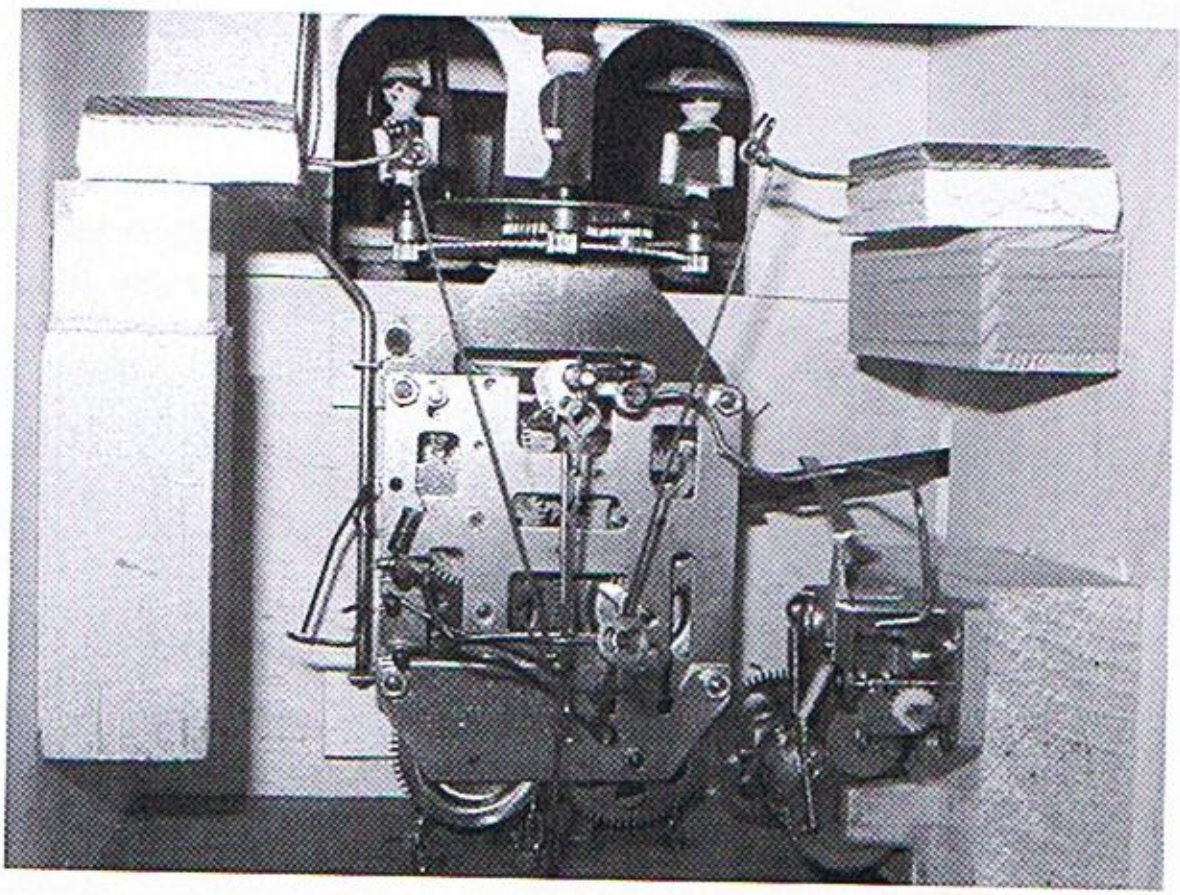
Musical cuckoo clocks come in a variety of configurations, so I will not attempt to cover them all. Rather I will give you some general guidelines. This will leave you to exercise your mechanical genius a little, but it should serve you well.

The repair most often needed is replacement of the governor mechanism. They come in 2 sizes. One is for 18 tooth music movements (*Timesavers #14496) and a size for 22 tooth music movements (*Timesavers #14495). There are some other models available, but these 2 sizes will supply most of what you will need.

Modification of the mounting holes is almost always required to get the gears to line up correctly. The holes can be filed or enlarged with Dremel type grinder.

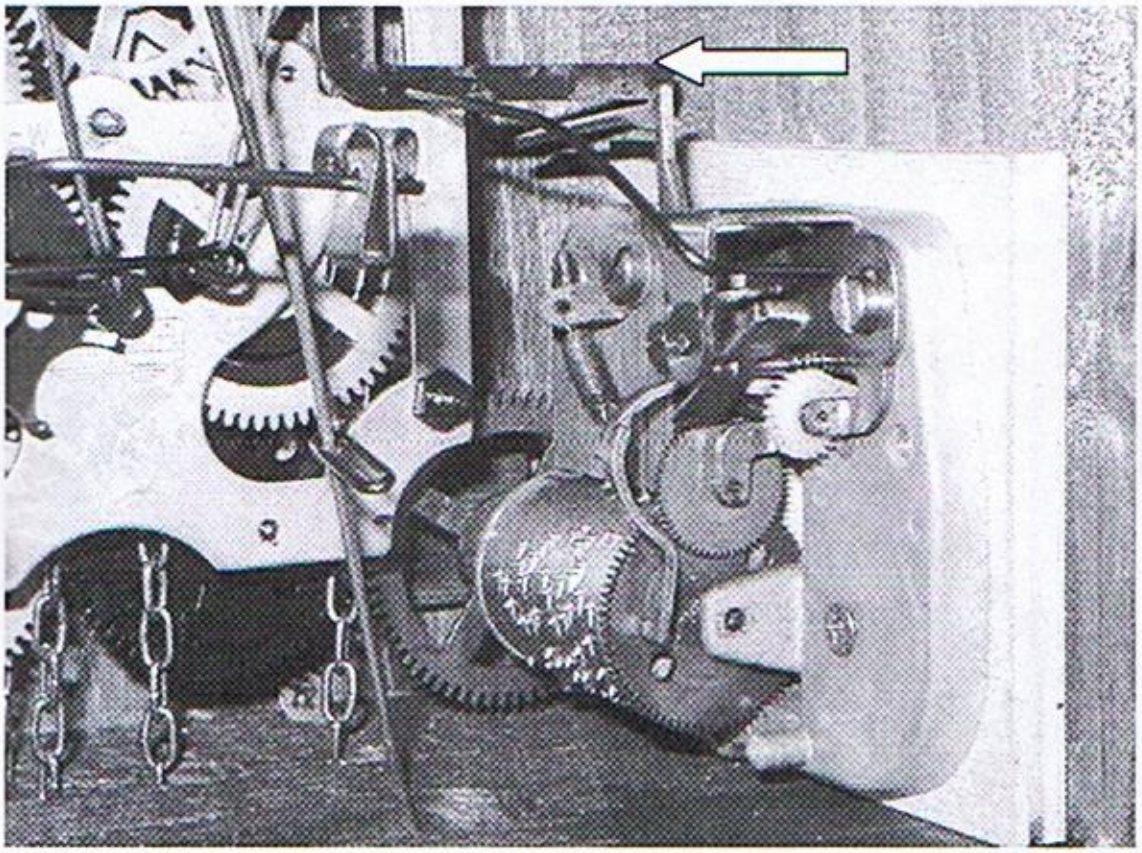


Here is a picture of one of the more common configurations of musical Cuckoo clocks.



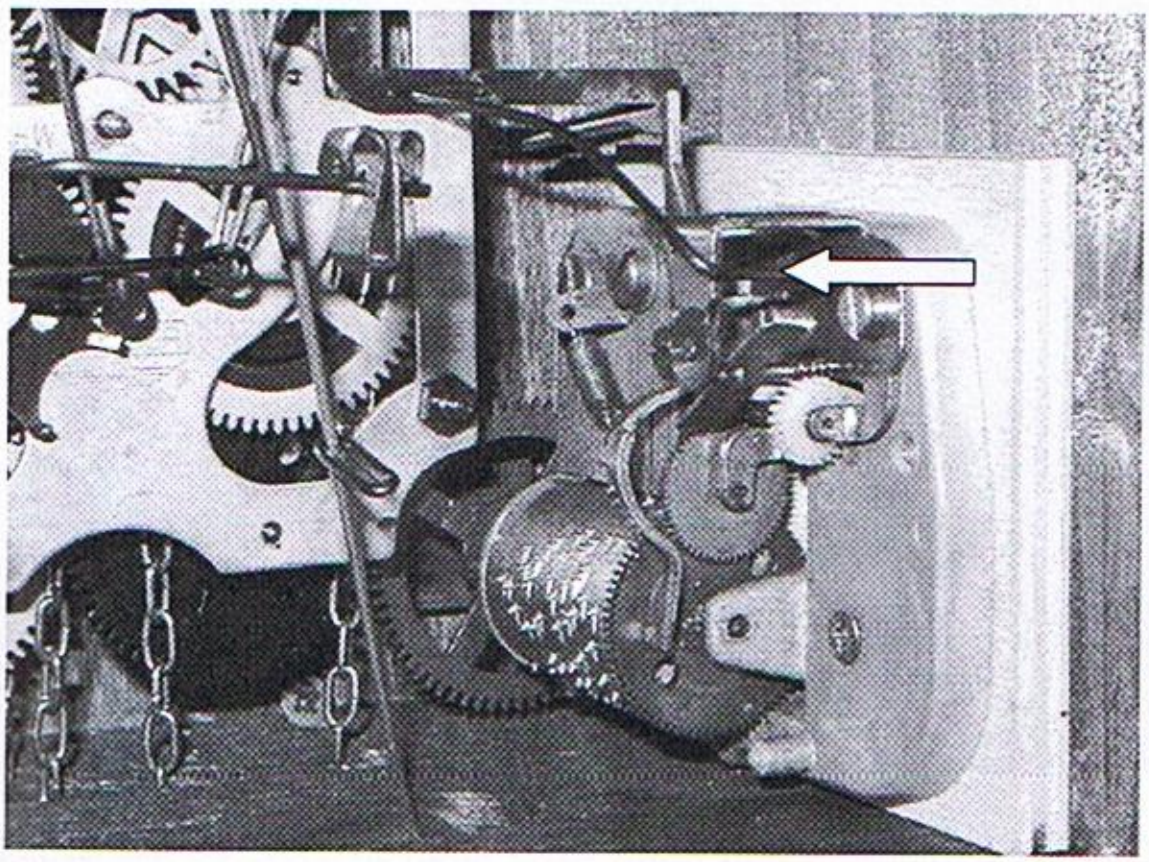
Musical Cuckoo clocks have some things in common: They all have to have a means of triggering, and a means of terminating the music session.

The clock in the picture has an arm connected to the shaft of the rack-stop arm of the cuckoo movement. Let's call this the "music-trigger arm". This moves down to trigger the music. This downward motion begins as the clock approaches the release of the Cuckoo sound.

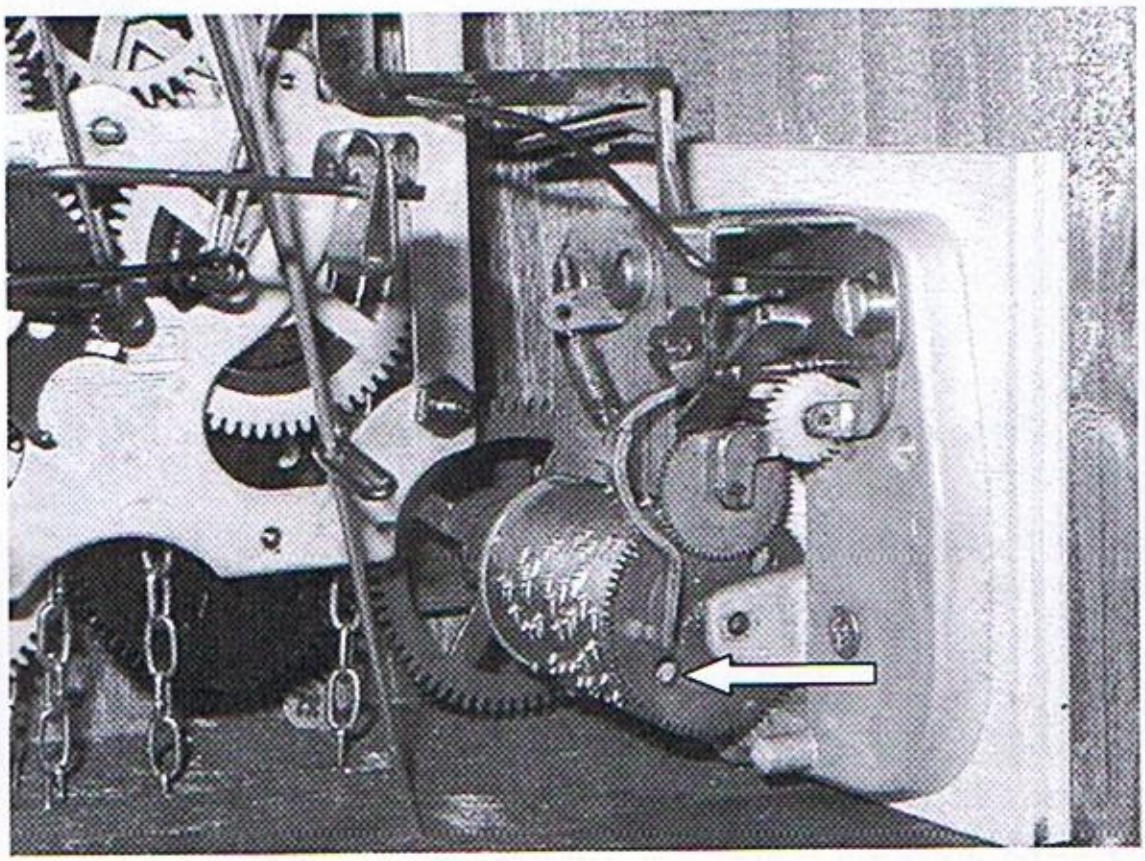


The music-trigger arm pushes down and releases the music. However, we want to prevent the music from starting till the Cuckoo has finished his call. Here is how that is accomplished:

Notice that there is a wire attached to the music-trigger arm that moves with it. This wire moves into position in the area of the governor fan to stop the fan from turning while the cuckoo finishes his call, and then moves up out of the way so as to allow the music to begin playing when the Cuckoo is finished.



So far we have dealt with commencement of the music. Now let's deal with the termination of the tune. Our current model has it's own built-in stop feature. See the little hole in the end of the music drum?

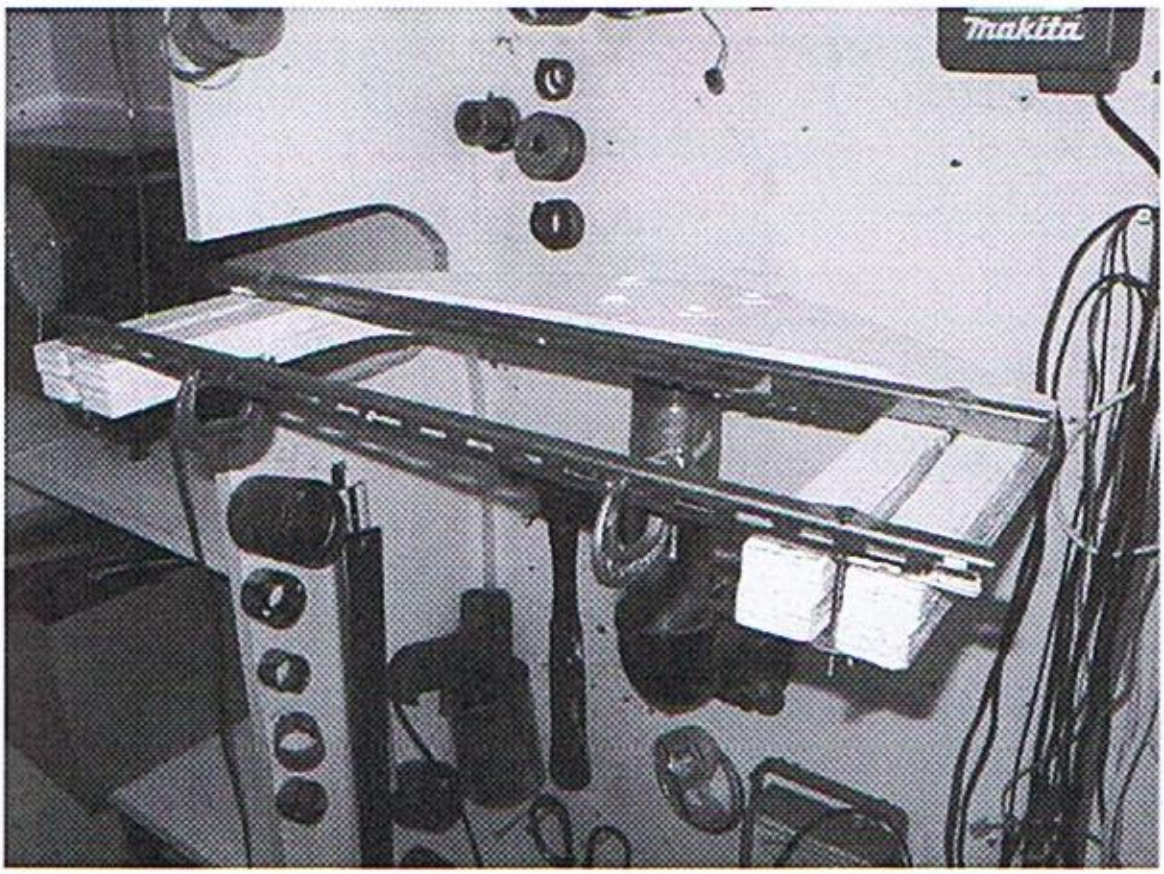


Note the curved arm above it. That curved arm has a little tip that drops into the indicated hole just as the music finishes. The music drum continues to turn just a little. The curved arm is dragged a short distance before a finger on the other end of the curved arm engages the fan to stop the music. There is a small spring that pulls against this action. This is all designed so that when the curved arm is released at the next music, the curved arm will not drop back into the hole and prevent the music from commencing.

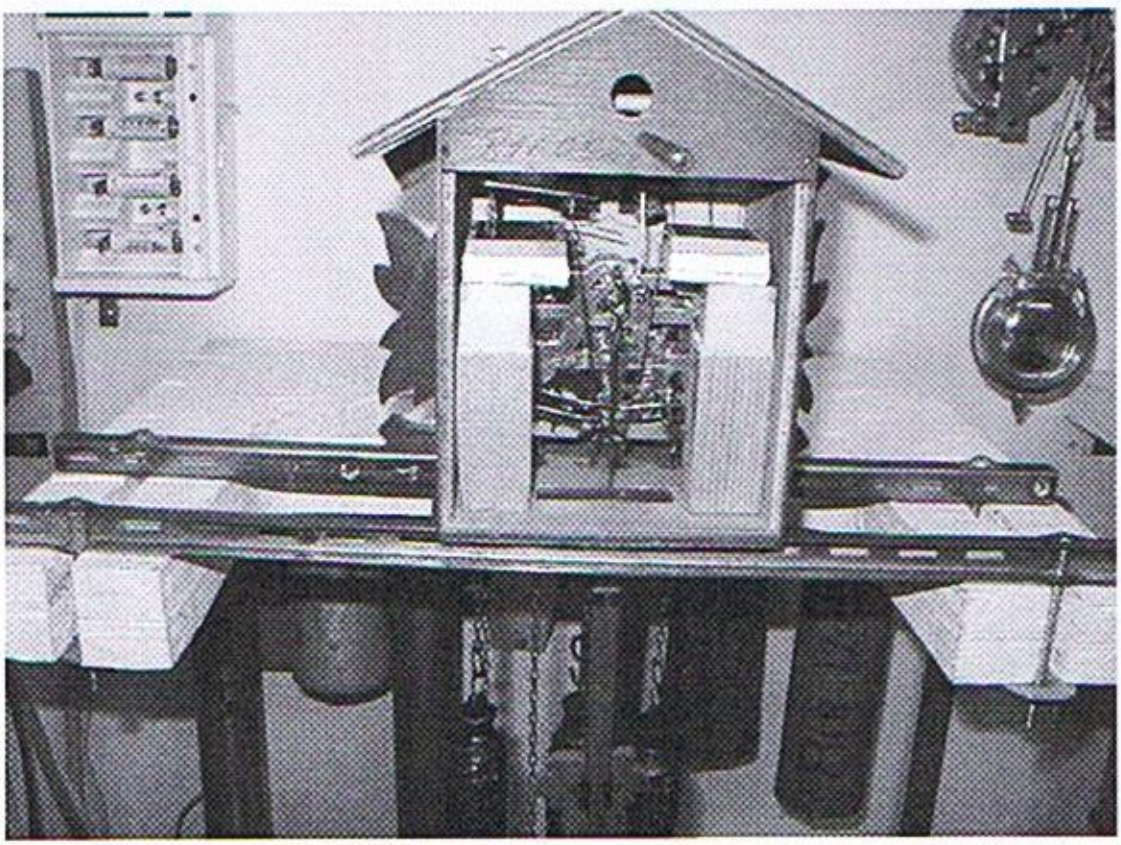
Some clocks are designed to play music just on the hour. If the clock is designed to play music on only the hour, the music-trigger arm must not descend so far as to release the music on the half hour.
Other types of music Cuckoos have different mechanisms for releasing and stopping the music. The basics learned here will help you detect how these other models work.

Let me emphasize the absolute necessity of a good test stand that will allow you to peer into the clock with the back removed. It is impossible to successfully adjust a cuckoo clock any other way!

Here is a picture of the stand I use:



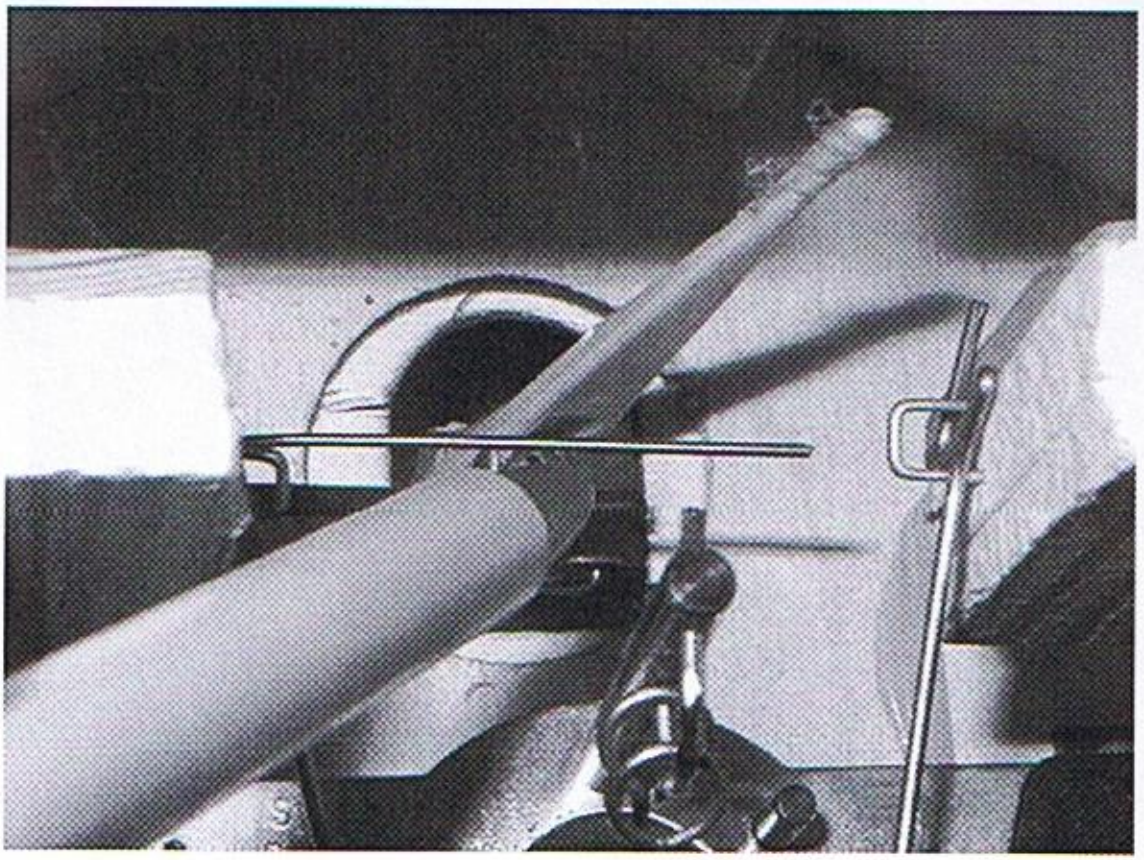
It has a heavy swiveling base made of steel plumbing fittings. This allows the table to swing right or left for better viewing. You do not need a stand this heavy for Cuckoo work.



The metal cross supports, available from your local hardware store, can be slid forward or back to accommodate any size Cuckoo clock (as well as clock movements). I have used 10/24 screws and thumbscrews to secure them in place. You could use "C" clamps. The beauty of this type stand is; these metal supports are so narrow, yet strong, they fit between the chains and the front carving without fouling the chains.

CHAPTER 3
TROUBLE SHOOTING

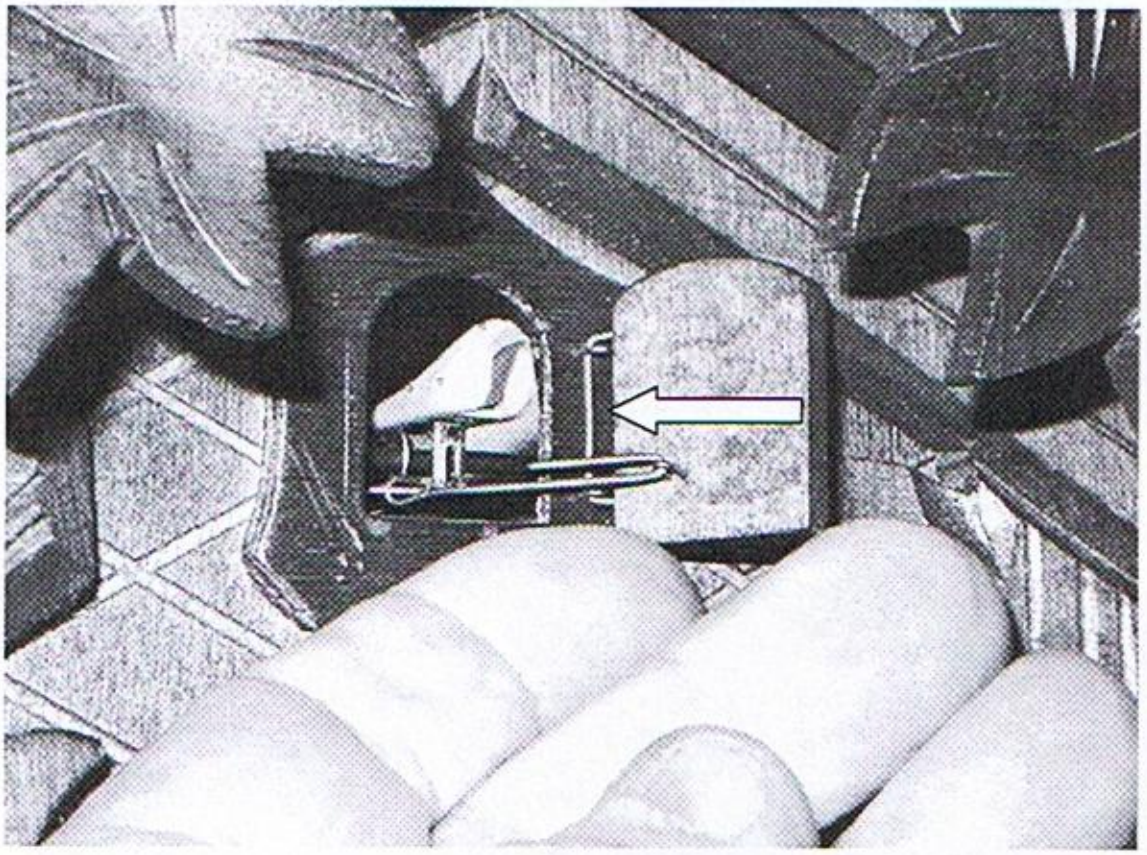
1--Cuckoo bird stays out. Door won't shut:
~Make sure the lifting wire is under bird's tail.



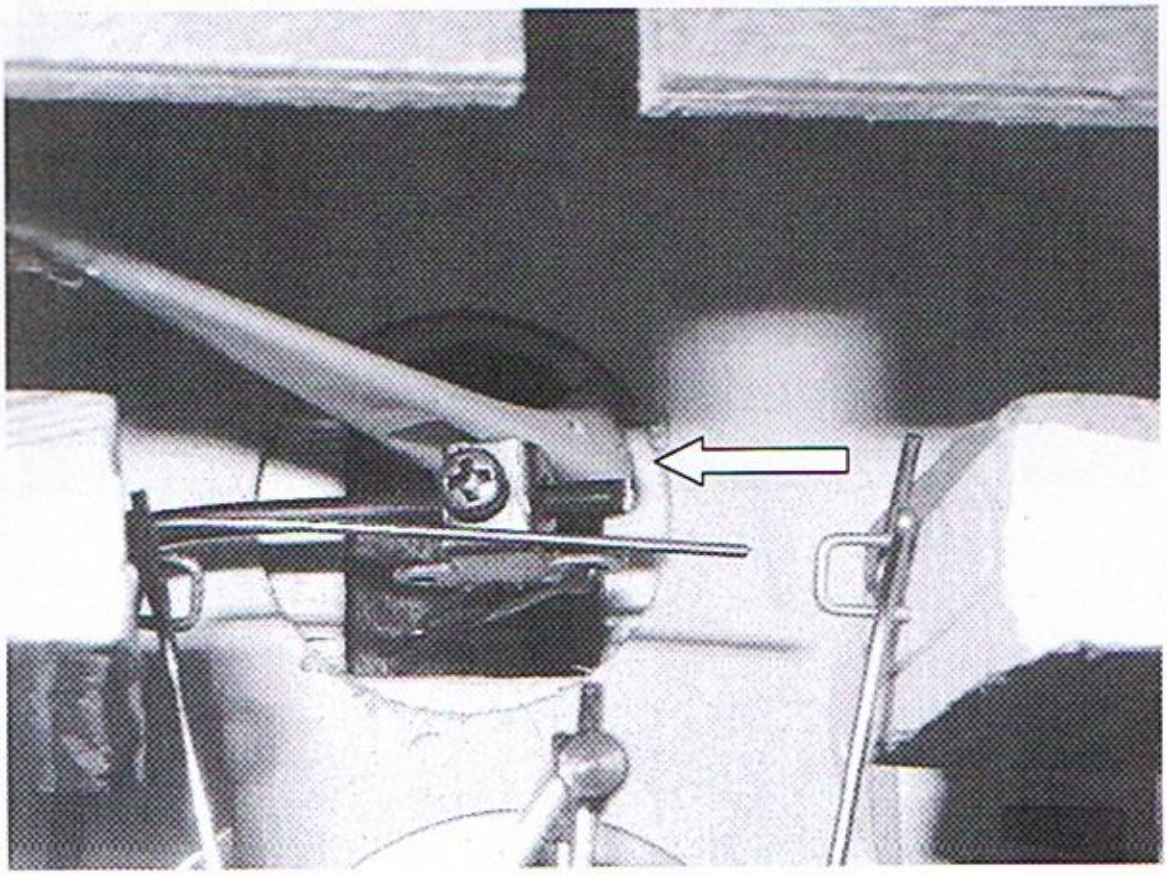
2 -- Cuckoo bird door continually opens and shuts when Cuckoo is calling:

~ Gathering pallet may not be positioned correctly.

~ Ensure the Bird-to-door wire and hinges are working freely.

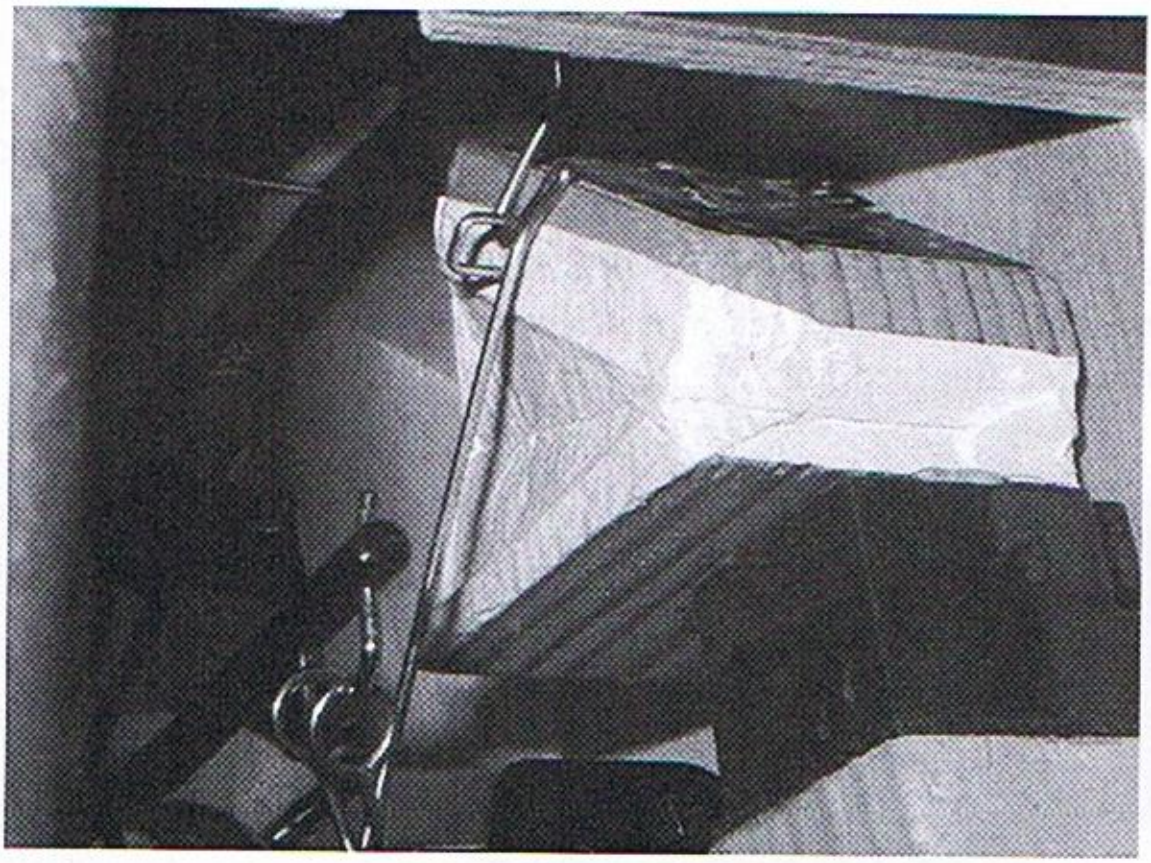


3 - Cuckoo bird does not come out, and there is no Cuckoo sound. ~~ Check to see if the bird's nose is hanging up on the edge of the bird hole.



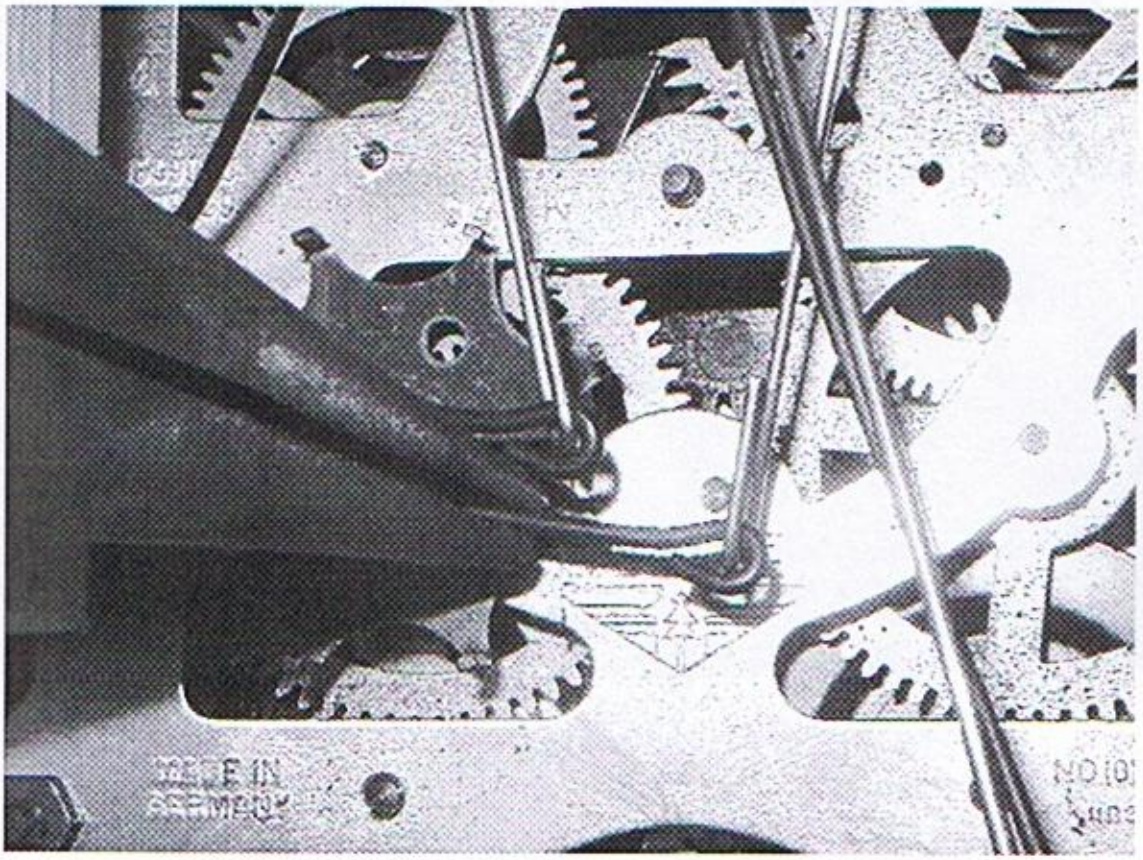
Or:

~Bellows may be lifting too high.



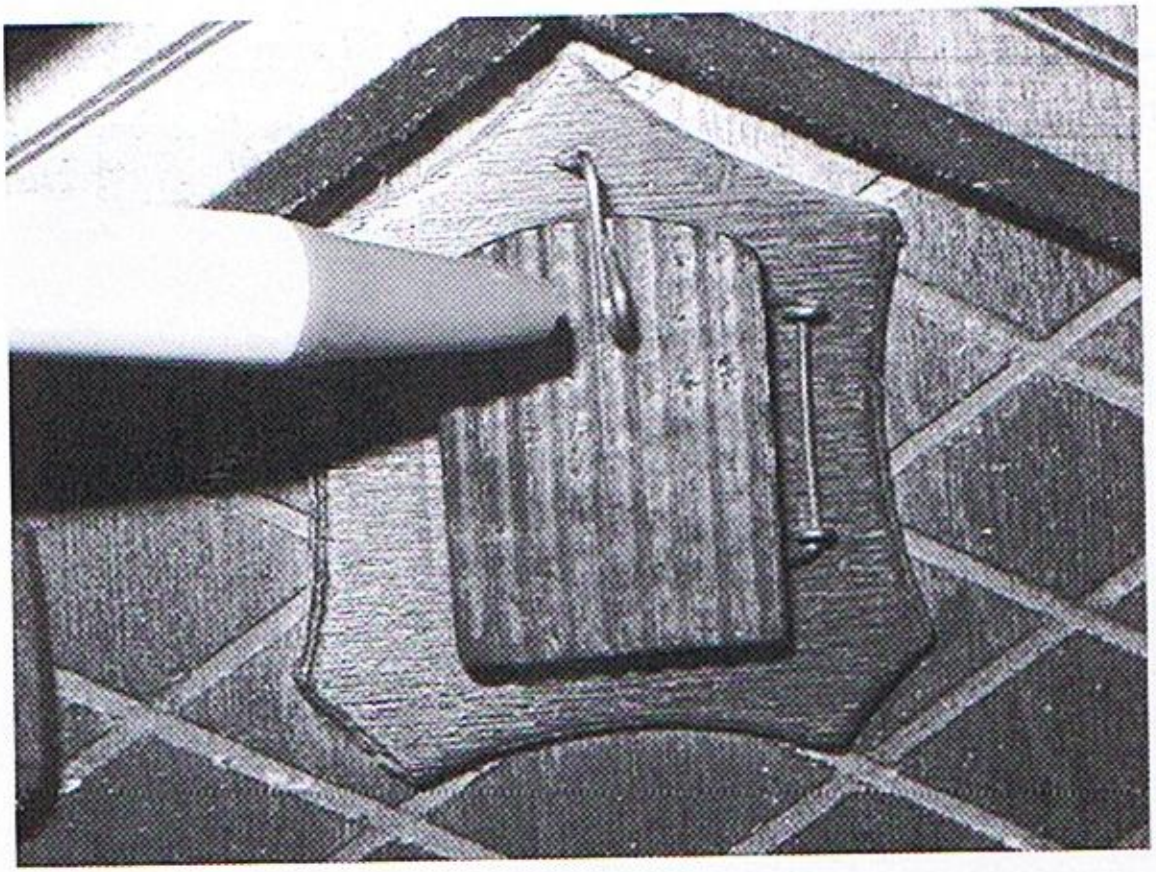
In which case:

~Lifting arms on back of movement may need bending to reduce lift.



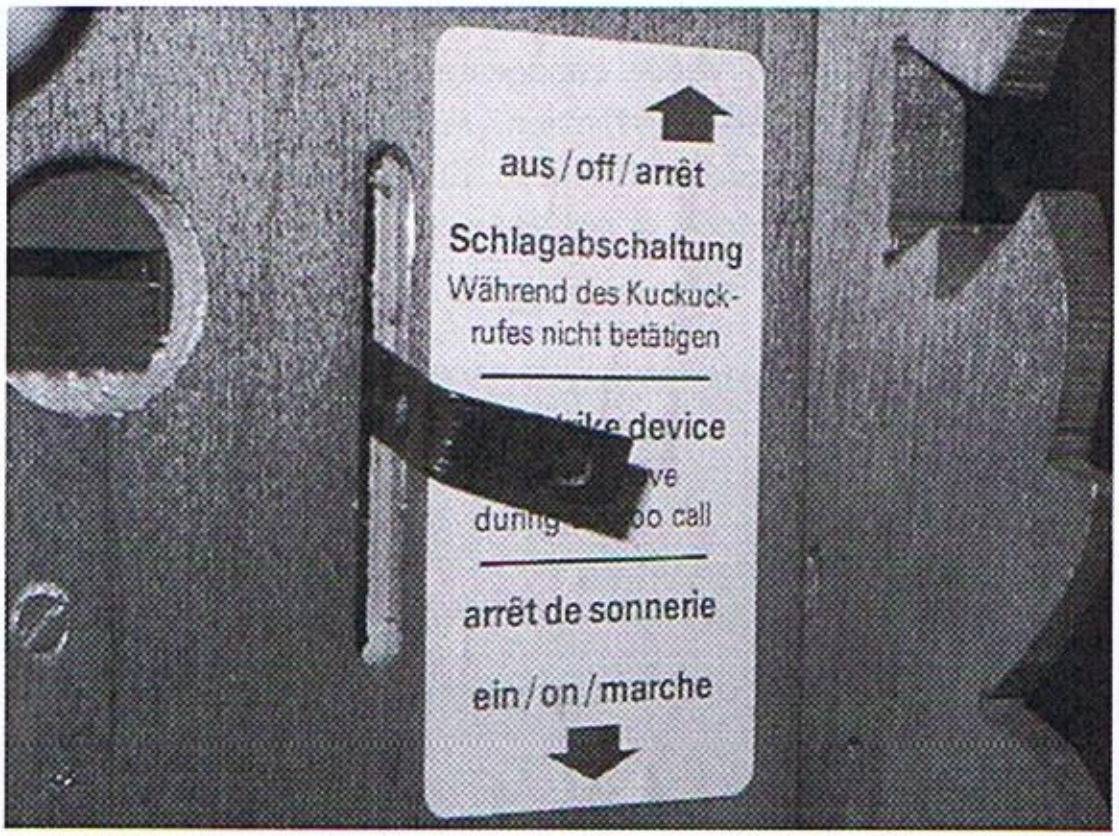
~OR~

~Bird door latch may be closed



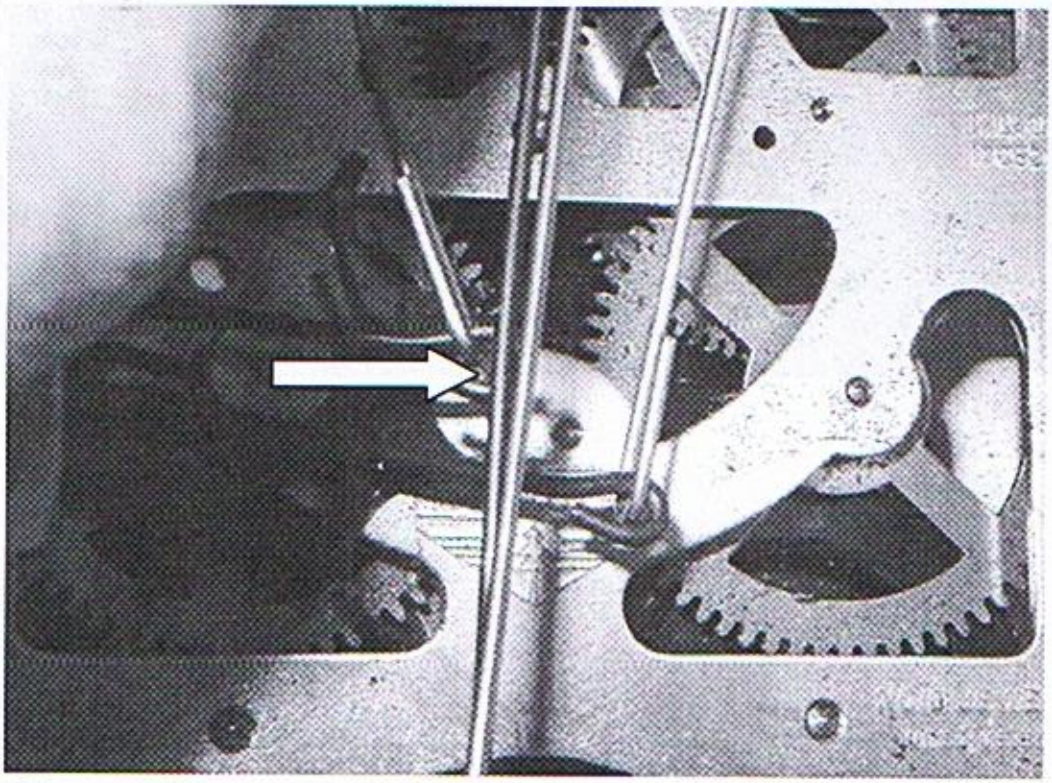
~OR~

~On/off switch (if any) may be in off position.



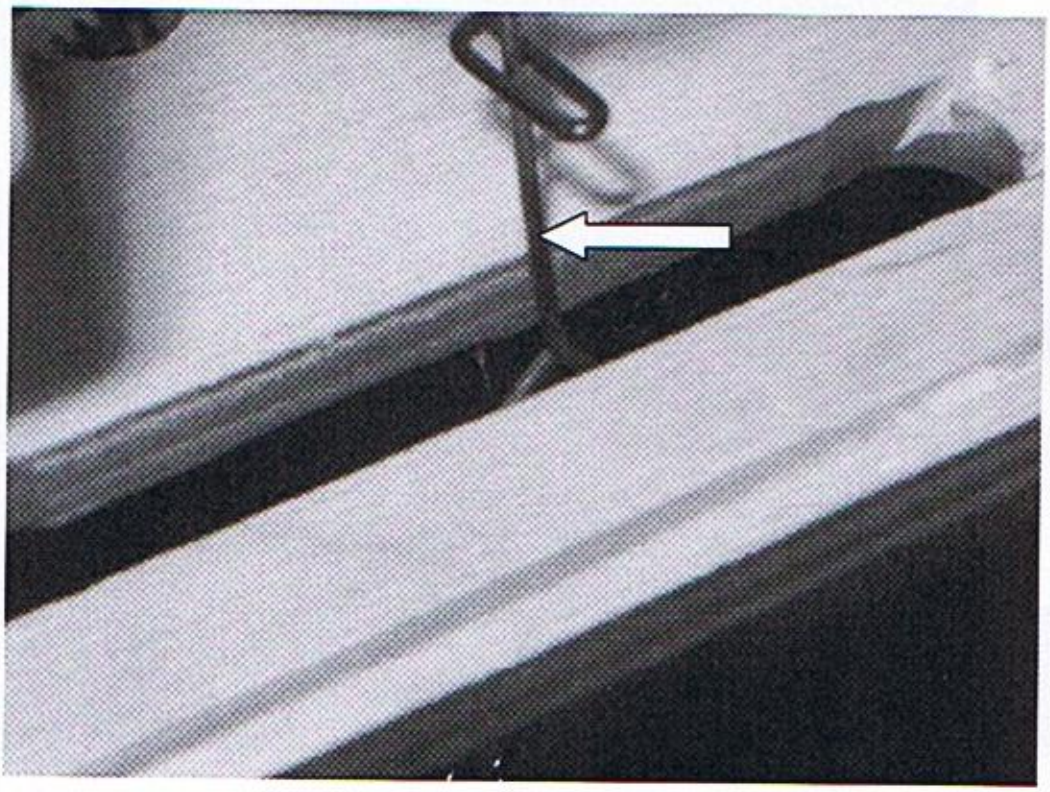
4 -- Clock won't continue to run: Escapements on modern Cuckoo clocks seldom need any adjustment or repair. Attempts to adjust the depth of verge engagement usually result in broken parts and added frustration. My advice is don't try this type repair till you have done a thorough study of escapements. If the clock is not running, look for other reasons such as:

~Pendulum hanger may be dragging on bellows lift wires.



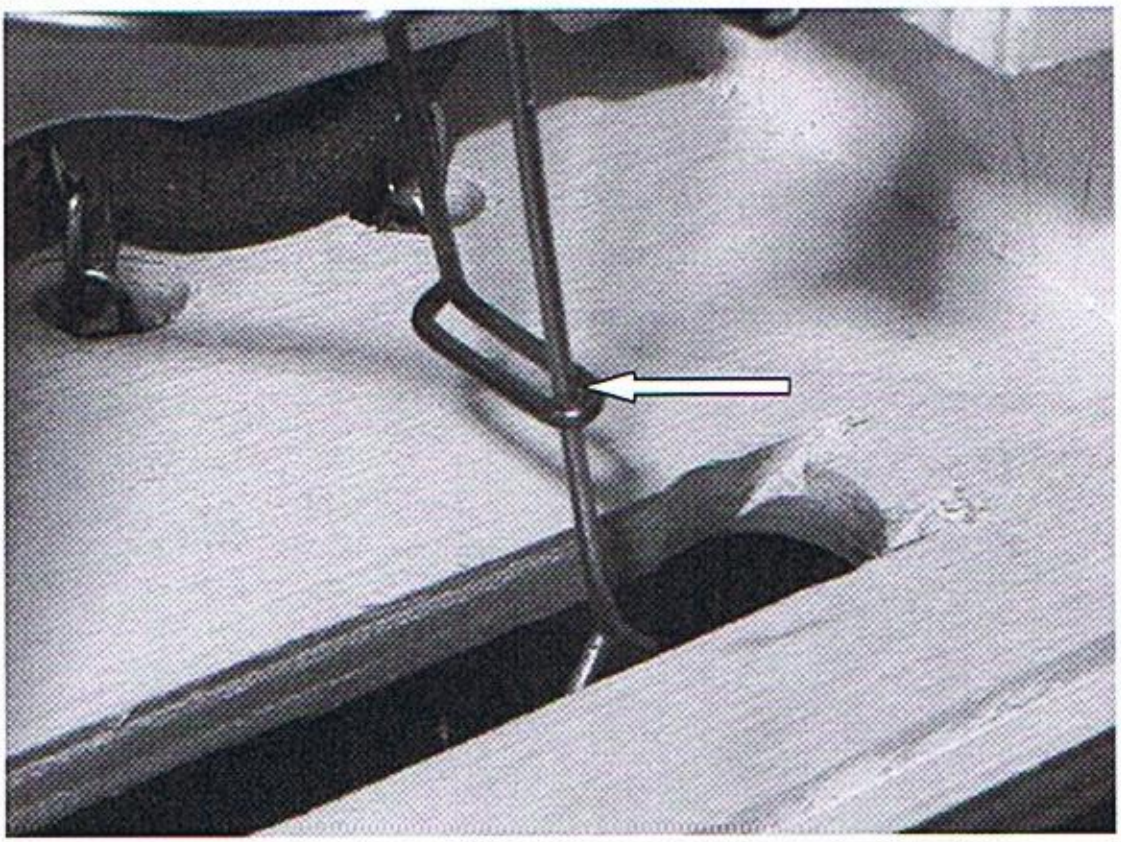
OR~

~Pendulum may be dragging on slot



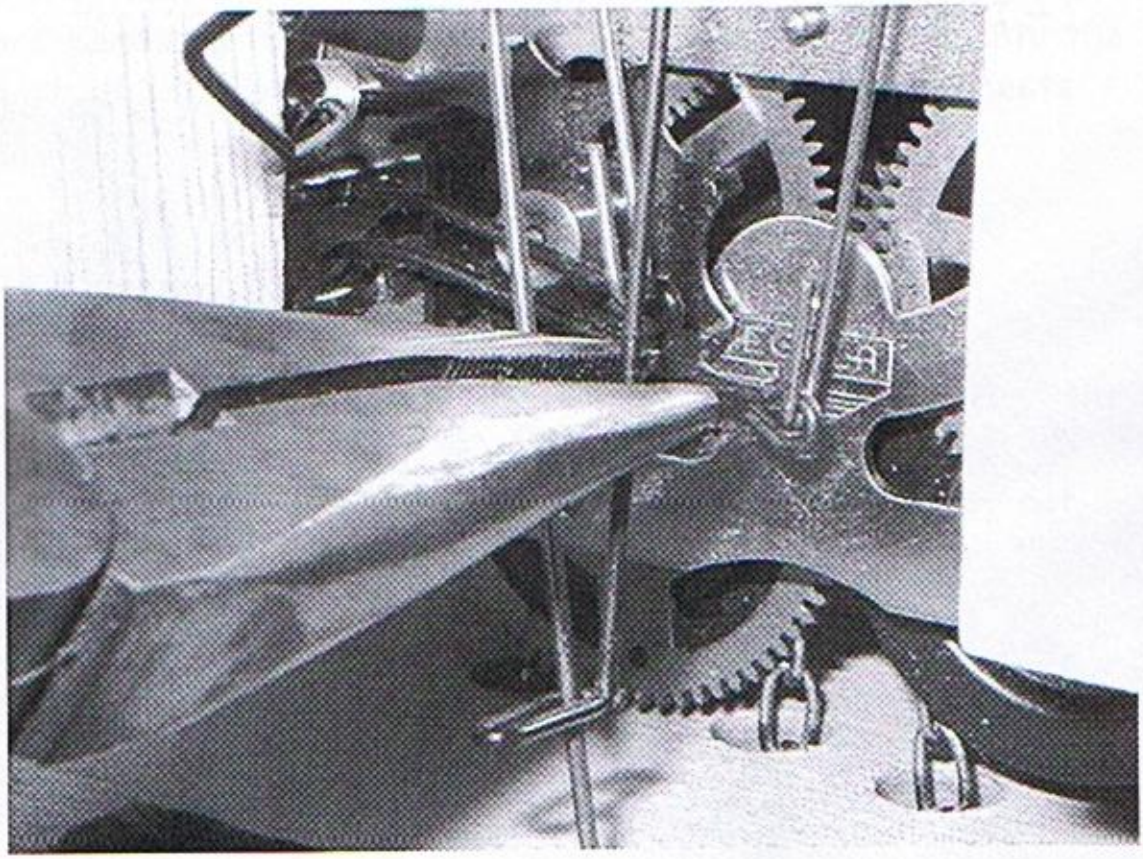
Or:

Pendulum hanger may be hanging at end of crutch loop



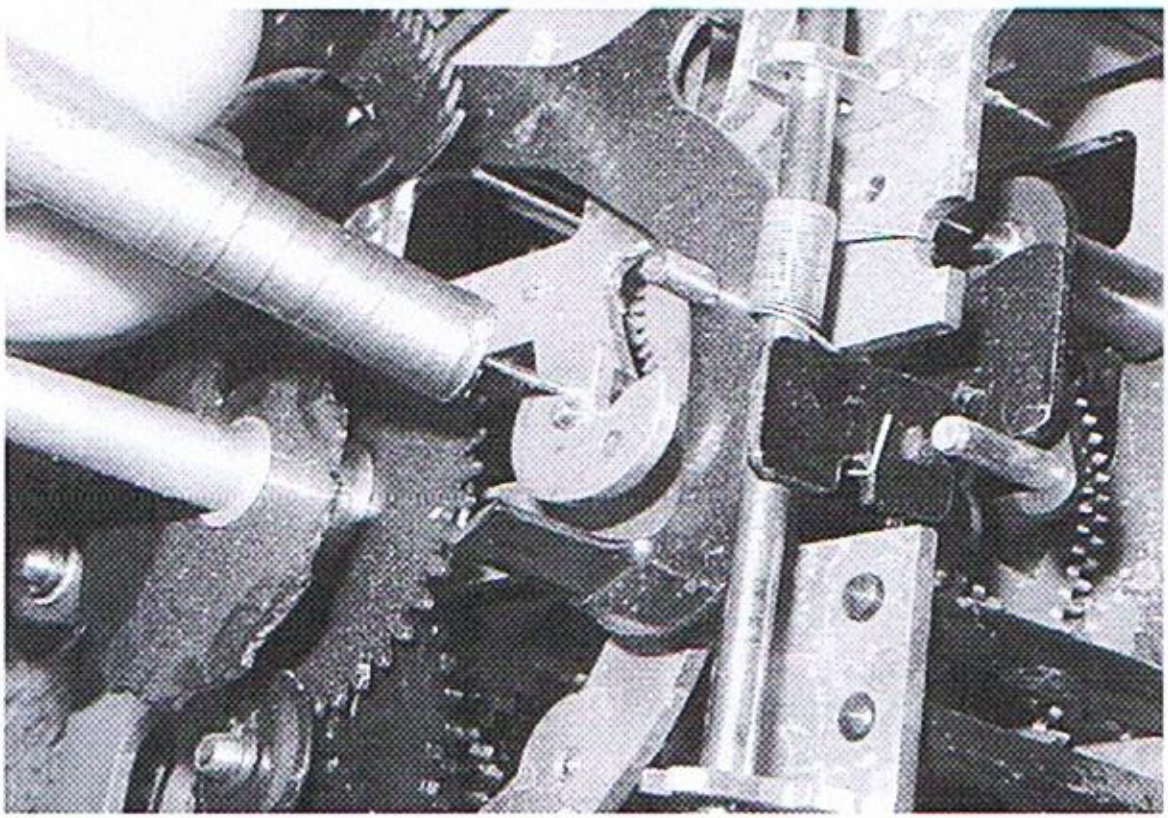
~OR~

Crutch needs bending to correct uneven beat.
The beat is set by bending the "crutch". Bend the crutch to the left if the tick-tock sound is emphasized to the right of center of the pendulum swing. Bend the crutch to the right if the sound is emphasized to the left of center.



~ See if movement needs cleaning/re-bushing.
~ Look for a chain link that has gotten crosswise.
~ Look for chain hanging up on external objects.
~ Double check Addendum page for clock set up.

5 -- Cuckoo sometimes counts too many times:
~Bird door hinge or door wire may be fouling.
~Gathering pallet may be defective or loose (See picture below).
~Tighten pallet (if loose) by tapping with hammer and hollow punch.
~ If all this fails, see Addendum.



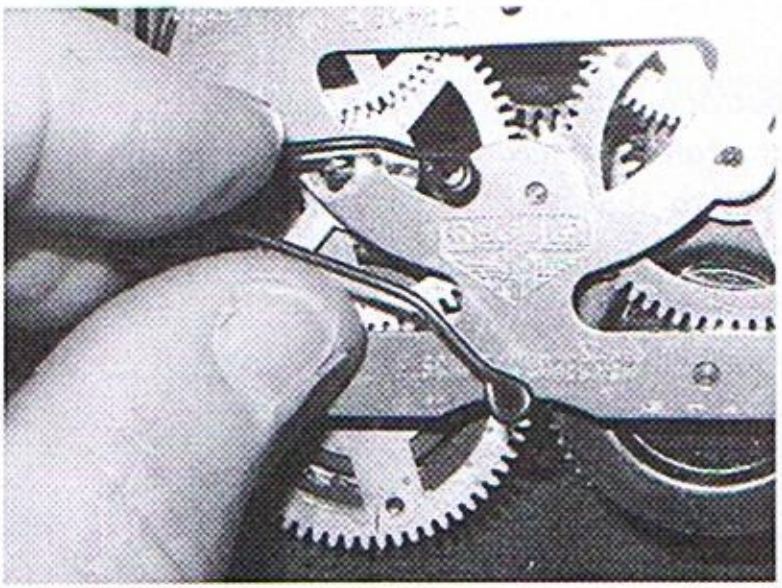
Trouble-shooting will be greatly enhanced by using a good sturdy test stand* which will enable you to attach the weights and pendulum to the clock. This will allow you to look into the back of the clock while it is functioning, make adjustments and then re-test to see if all is well.

"Leveling" a Cuckoo clock is a nebulous issue. In adjusting the beat, while the clock is on the test stand, you may get a false setting because the bottom of the clock box may not coincide with a pleasingly plumb look when viewed from the front while on the wall. Therefore the beat should be set to agree with the way the clock looks on the wall.

~NOMENCLATURE~

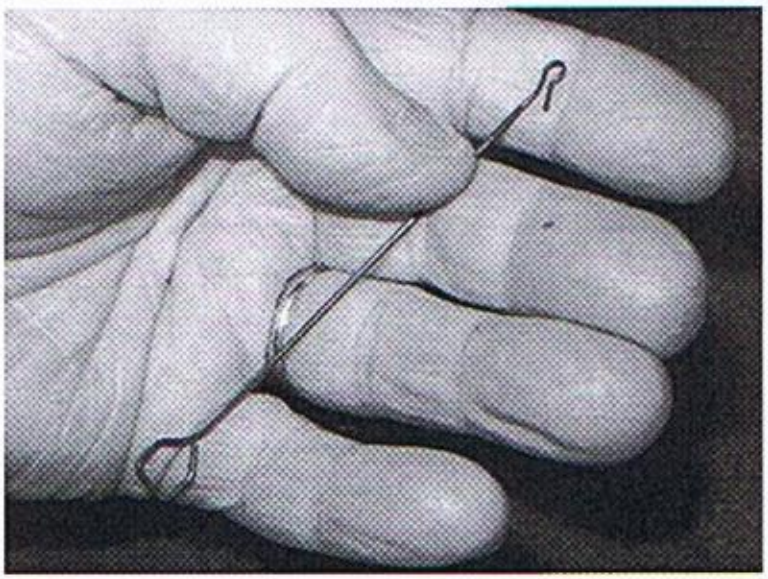
The following pictures identify:

Bellows Lifting Arms:

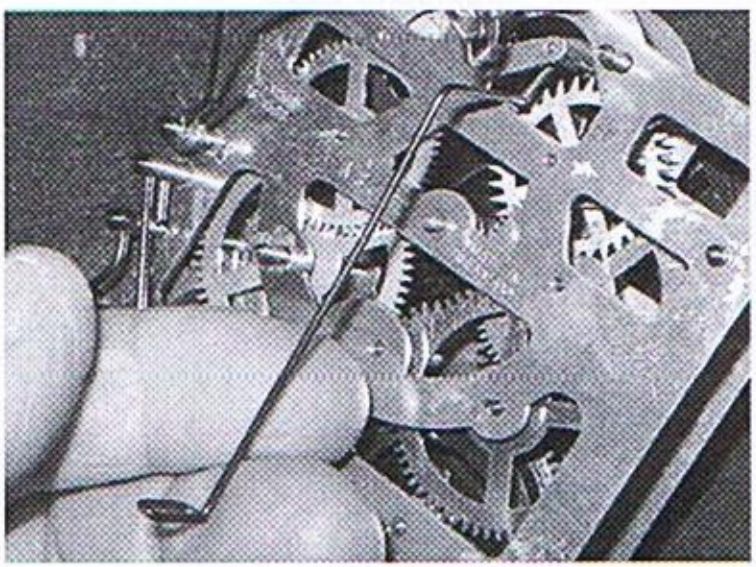


Bellows Lift Wire

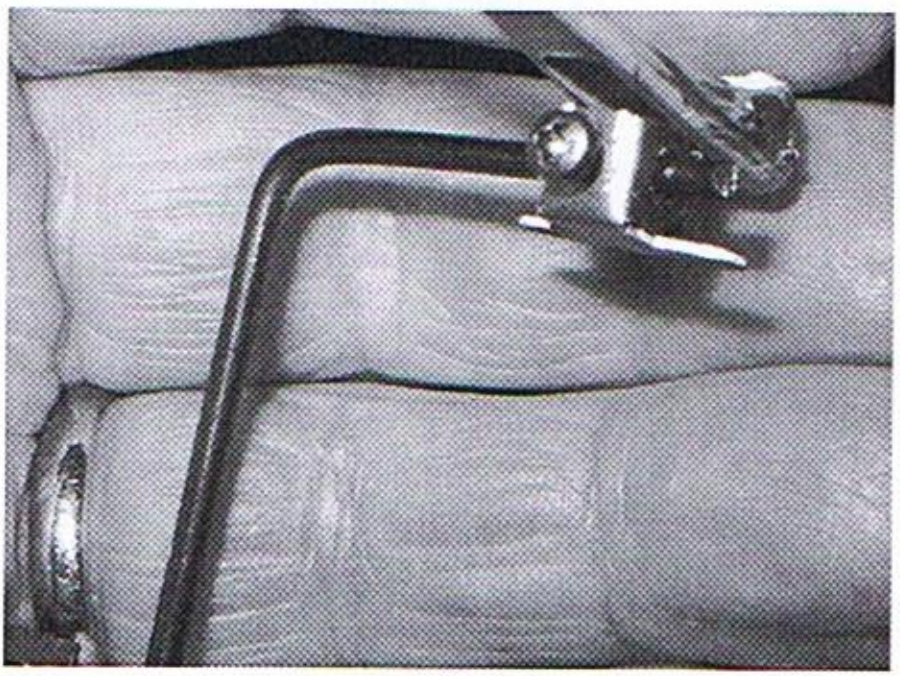
Pendulum Hanger



Pendulum Crutch

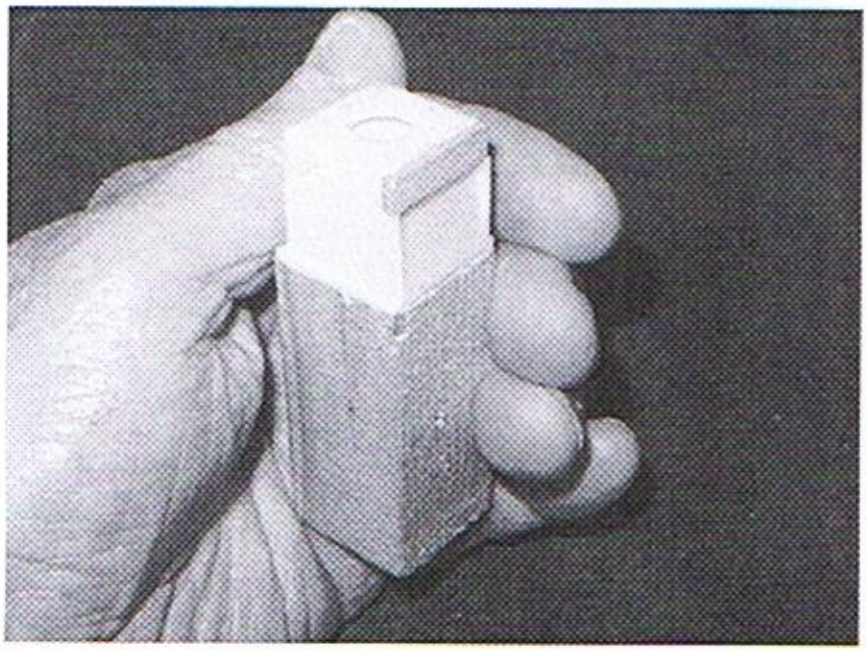


Bird Arm



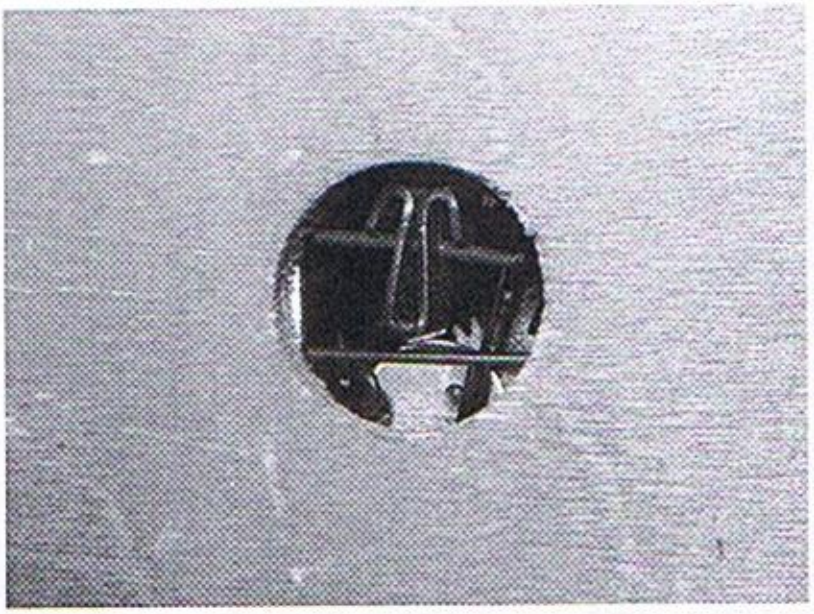
Bellows Tops

Bellows Body

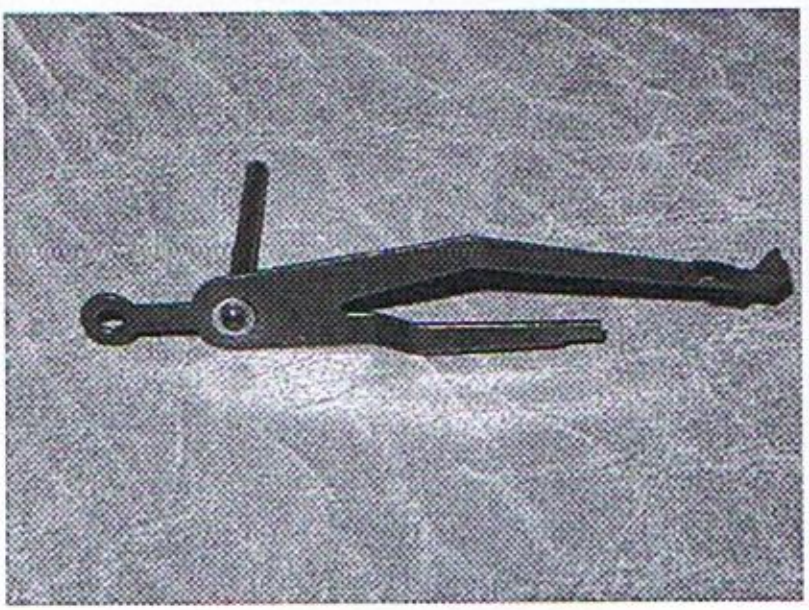


Gong Hammer

Gong Hammer Inspection Hole



Strike-Release Arm



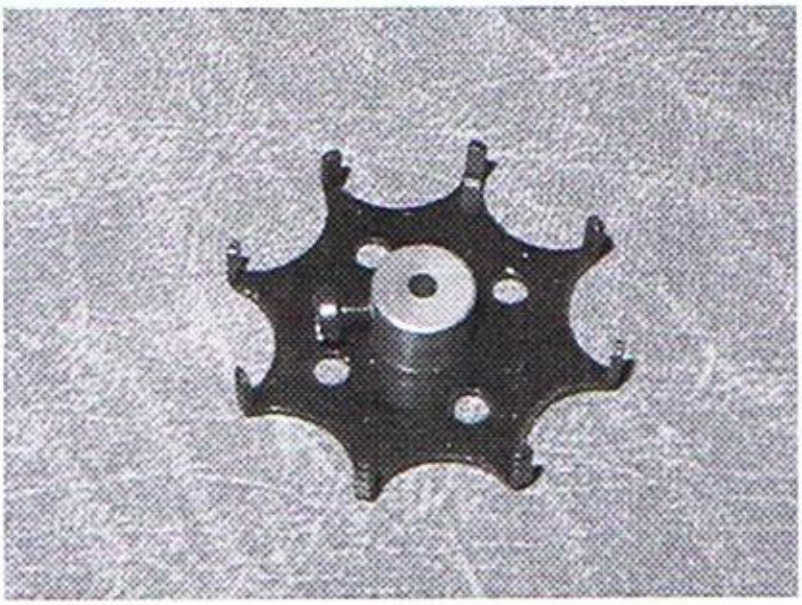
Rack

Snail (as part of the canon tube assembly)

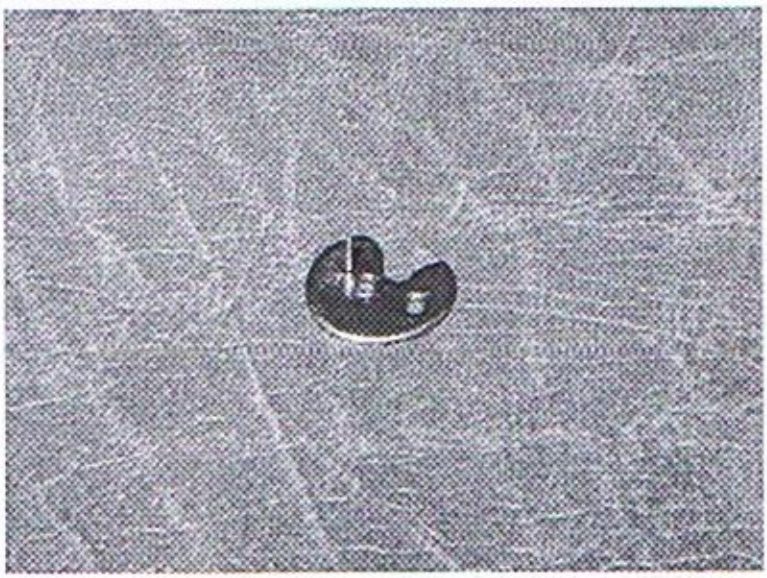
Strike-Stop Arm

Bird-Arm Lock

Bellows-Lifting Wheel



Gathering Pallet



~General instructions for hanging a Cuckoo clock~

- Hang clock high enough so the loose ends of the chains never touch the floor.
- Use strong nail or screw with large head in wall stud, or else use a sturdy screw anchor. Make sure the screw or nail extends far enough from the wall to ensure the screw head locks into the clock.
- Unlatch the wire latch (if any) on the small bird door.
- Hang weights on the hooks attached to the end of the chains.
- Hang pendulum on the trapeze-like wire that protrudes through the slot in the bottom of the clock.
- Gently give the pendulum a sideways swing.
- Tip the clock slightly to the right or left till you hear a good even tick-tock sound. Then make a pencil mark on the wall right next to the clock for reference.
- Wind the clock by pulling down on the loose ends of the chains till the weights are almost up against the bottom of the clock. Do this daily for one-day clocks, or once a week for 8 day clocks.
- Set the hands by moving the long hand only. Some clocks require you to stop just past each hour and half hour in order to keep the cuckoo sounding the same hour the hands indicate.
- If the clock runs too slow, slide the wooden leaf up on the pendulum. Slide it down to make it slower. DO NOT CRIMP THE METAL CLIP ON THE PENDULUM. Sliding the leaf will be necessary in the future.
- Have clock professionally oiled every 3-4 years (sooner in hot or dusty conditions). Mechanical clocks, such as Cuckoo

Clocks may need overhauling every 7-10 years. Serviceable life will be extended if regular maintenance is performed.

*Some Replacement parts are available from:
Tom seaman
eBay username- alugal
eBay store name- Clock repair Parts

I Love clocks
108 Coronado Shores
Lincoln City OR 97367
TSEAMAN@CENTURYTEL.NET
541 764 4004
ENJOY!

I have used the Regula one-day movement in these illustrations/photos. You will encounter variations of the Regula movement such as eight-day movements and turntable movements for musical Cuckoos as well as other brands of movements, but this volume is pretty comprehensive for most of what you will encounter. Have a BLAST!

*CONTACT INFORMATION

Ronnell Clock Co. Information ~ 541 471 0099
Orders ~ 1 800 334 0135

Timesavers www.timesavers.com
1 800 552 1520

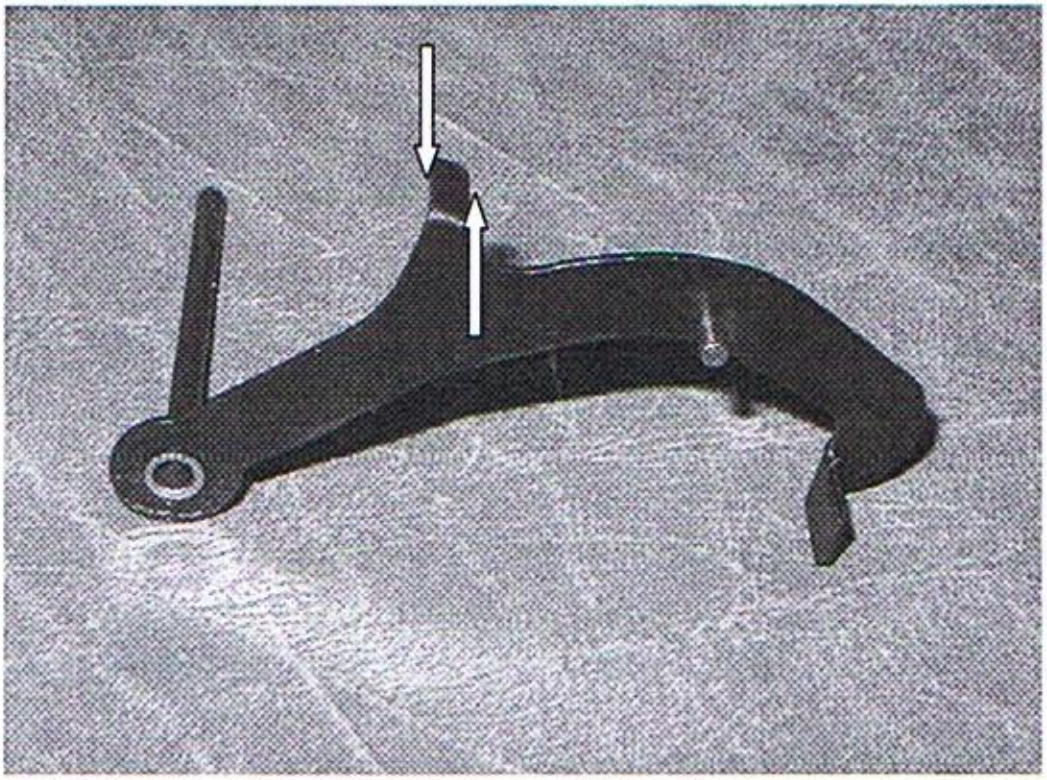
Tom Seaman ~See eBay username alugal or eBay store "Clock Repair Parts"

~ADDENDUM~

Here is what to do if the Cuckoo will not stop calling.
First eliminate all other possible causes, such as:

- Bird-to-door linkage friction
- Faulty hinge
- Missing spring on strike-stop arm
- Mis-alignment of (or loose) gathering pallet

If all this does not solve the issue, do this:
Re-shape the top tab on the Strike-Stop arm



so that when the detent pin strikes the tab, the action is a "scooping" action rather than a glancing impact forcing the arm upward. Such re-shaping is done by twisting the tab slightly in the direction of the arrows as seen in the photo above. This procedure can be done while the movement is assembled if you are adept with needle-nose pliers.