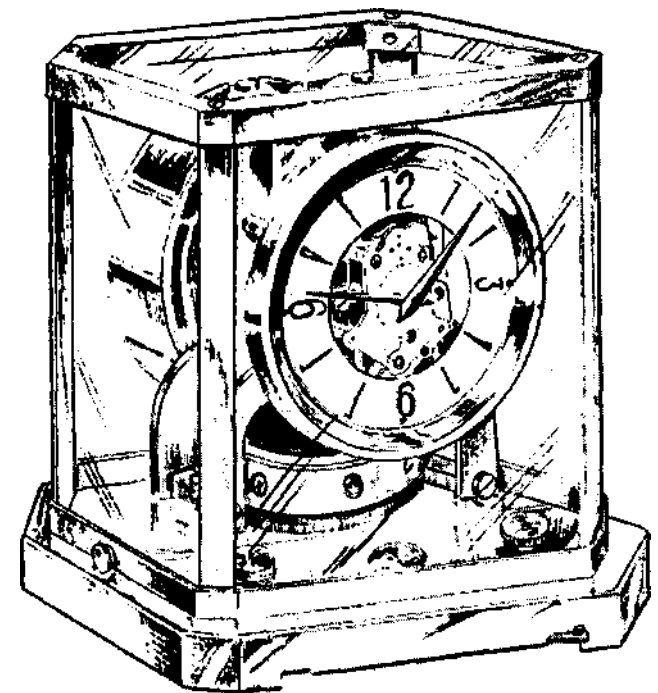


# ATMOS

## The Perpetual Motion Clock



Manufacturer's Instructions for the Care,  
Operation and Repair of the Atmos Clock.  
Revised Edition

# ATMOS

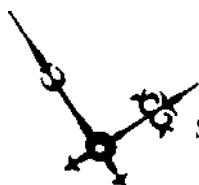
## The Perpetual Motion Clock

Manufacturer's Instructions for the Care,  
Operation and Repair of the Atmos Clock.

Clockworks Press International, Inc.  
Shingle Springs, California U.S.A.  
Millenium Reprint Edition

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**This pamphlet is a reprint of the booklet *How to Repair Atmos—The Perpetual Motion Clock*, first published by Vacheron and Constantin - Le Coultre Watches Inc. Minor edits have been made and illustrations revised and/or added to improve the usefulness of the original material.**

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## CARE AND OPERATION OF THE ATMOS CLOCK

*Never move or shift the Atmos Clock before stopping and locking the Balance Wheel with the Locking Lever on the base.*

### 1. How to Remove the Glass Case From the Clock.

Pull out the two pins (A - Figure 2) which hold the glass case to the base. Lift the glass carefully. (If the string, red tag, and wooden shipping block have not been removed, remove them from the clock mechanism.)

### 2. How to Level the Clock.

While the clock is uncovered, level the ATMOS by turning the two thumbscrews on the base (C - Figure 2) until the bubble in the round spirit level is in the exact center of the liquid.

### 3. How to Set the Clock.

Push the minute hand with your finger clockwise. NEVER PUSH THE HOUR HAND. Never turn the hands for setting while the impulse pin engages the horns of the clock.

### 4. Replace the Glass Case. (F - Figure 2)

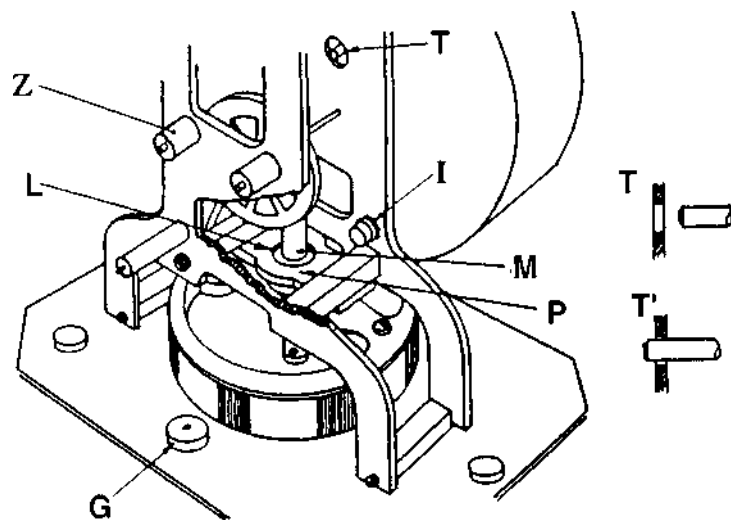
### 5. How to Start and Stop the Clock.

To start, push the locking lever on the front of the clock base (B - Figure 2) slowly from right to left. This starts the balance wheel to oscillate slowly. To stop and lock balance wheel, push locking lever on the base from left to right.

### 6. Never Touch the Balance Wheel.

## INSTRUCTIONS ON THE REPAIR OF ATMOS CLOCKS

To secure a good performance from the clock, it is essential that the ATMOS be placed on a stable support and in an absolutely horizontal position. The latter can be checked by the built-in spirit level G (Figure 1) located in the base at the front of the clock and also by the balance itself. It suffices if the banking stem M which is fixed on the balance staff, is



**Figure 1**

### Showing Front of Clock with Movement Removed.

centered over aperture L in the bridge through which it passes.

For repair work, follow these steps:

1. Check the horizontal position of the clock.
2. Check if power reaches the escapement by gently sliding the locking lever to the left and thereby releasing

balance from its locked position; the operation of the pallets can be observed through the small holes made for this purpose. The holes are located on the front plate of the movement at the top of the plate. Watch for a kicking action on the fork as each pallet drops off an escape wheel tooth. This shows whether there is power to the escape wheel.

3. Check if hands move quite freely.
4. Check condition of the motor. (See page 13)

Having made these four checks, lock balance wheel by depressing and sliding the locking lever (B - Figure 2) from left to right. Then remove hands by means of Tool 4 (Figure 5), also remove the dial and dial bezel. In the absence of the factory-made hand removing tool, a suitable tool can be made by converting a small hand removing tool for use on ATMOS. The key requirement is that the plunger must be no larger than 0.6 mm (.024"). The ATMOS minute hand must only be removed using a hand removing tool. The minute hand shaft is so small, that any other method will likely result in damage to the shaft.

After removing the hands, it is worthwhile to check the hands for balance. The hands must be perfectly counterbalanced. A poorly poised minute hand will stop the clock; a similarly faulty hour hand will cause variation of as much as a quarter turn in the amplitude of the balance.

The movement is removed by unscrewing the two mounting screws (one on each side of the movement) from the mounting studs (Z - Figure 1).

When removing the movement, care must be taken not to bend the fork, nor to let the gear-train run uncontrolled. Hold

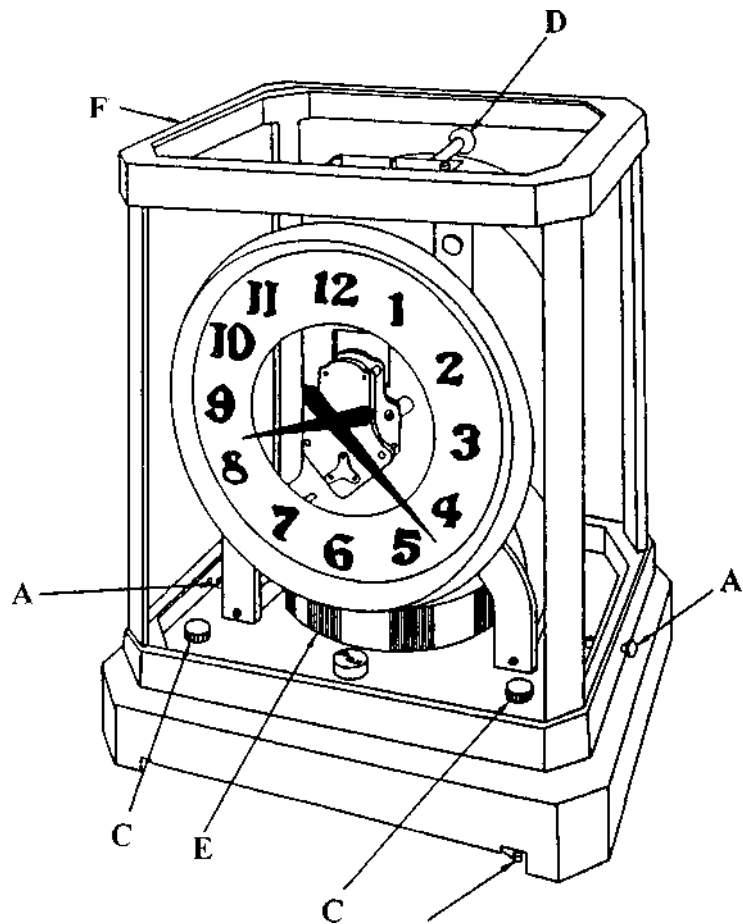
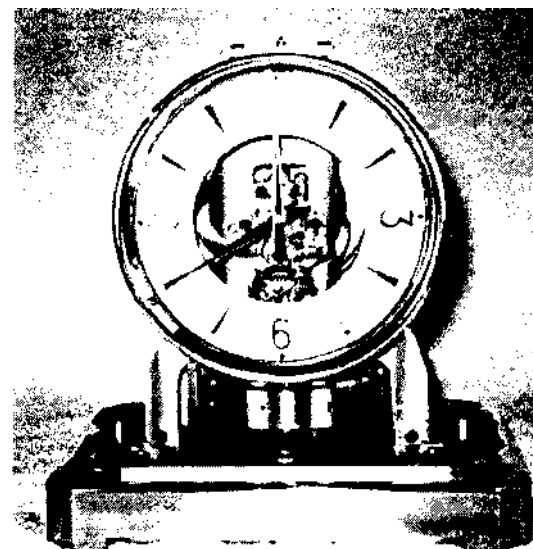


Figure 2

the first wheel (The large wheel that engages the barrel gear.) so as to be able to control the speed of the Barrel as it runs down. Count the turns of the Barrel while releasing the train. Normally this will require 5 to 7 revolutions or turns of the spring barrel. Less than this may indicate that the clock was not winding properly possibly indicating a problem with the bellows or motor. (Note: Regulator knob D above only in models prior to 1951.)

After completely unwinding the mainspring, remove the motor by unscrewing the four motor mounting nuts (I - Figure 1), using Key No. 5 (Figure 5). In the absence of the factory-made tool, an 8 mm (5/16 inch) spanner or open-end wrench can be used. For Caliber 540 models, the motor is removed by rotating the motor unit in a counter-clockwise direction. It is on a bayonet-type mount.

When the motor and movement have been removed, see if the balance is well poised. If it is, the small roller at the top of the balance staff will be constantly centered on the regulating clamp as the balance revolves; this is to prevent the roller from ever touching the clamp while the clock is running, despite the slight, inevitable to-and-fro movements which occur. If this condition is not fulfilled, re-adjust the balance tube by bending it very gently as little as possible.



1953 Atmos  
With Cover Removed

Next, unscrew the 6 screws of the stand and base plate to free the framework from the base.

To free the balance, unscrew regulating clamp screw J and wire sleeve screw K (Figure 3). Gently, pull out pin N while holding up the balance; then gently disengage the balance by raising up the framework. See that the regulating clamp does not remain locked in the regulating sleeve. (There must be no danger of the wire coming into contact with the aperture in the small roller, but must be protected by the clamp.)

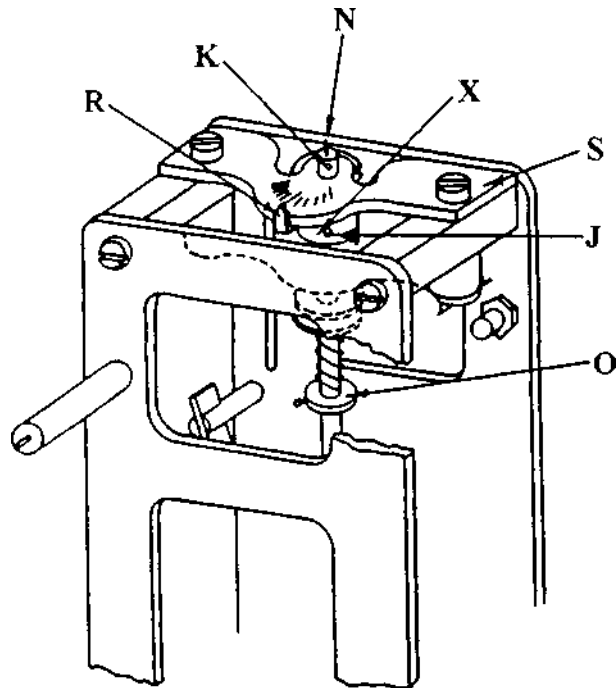


Figure 3

When balance has been removed, check winding mechanism as follows:

To wind the mainspring, compress the back spring H (Figure 4) in the hand. (Stop movement of gear-train and allow

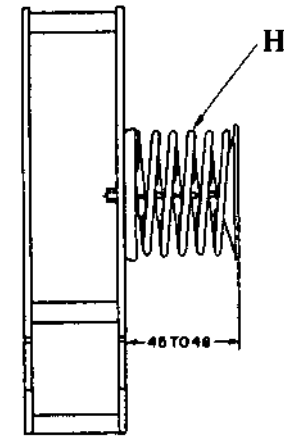


Figure 4  
Back Spring

back spring to release itself as many times as necessary.) When back spring is completely expanded, it is equilibrated with mainspring. The latter must never be wound more than the back spring can wind it. If the mainspring is overwound, the movement will bank. During this operation, count the number of revolutions of the barrel required to wind mainspring. When the springs are equilibrated, to secure the best working conditions, the mainspring should be wound to a minimum of 5 revolutions and a maximum of 7 revolutions. The winding of the mainspring ceases abruptly. If it does not, that is to say, if the back spring continues to wind the mainspring with a small momentum (by 2, 1, or even 1/2 of a ratchet cog at a time), it signifies that winding is not being operated under

good conditions. The causes for this are the following:

1. The back spring may be warped, even slightly (1 or 2 spirals).
2. Length of the small chain may not tally with requirements: it should be sufficiently long to allow a maximum expansion of the back spring from 45 to 48 mm (1.77 to 1.89 inches) from plate. (See figure 4).
3. The chain must not be twisted.
4. The pulley fixed to the plate must move freely.

Next, see whether the regulating mechanism is in good order. The rotatory movement of regulator R (Figures 3 and 6) must frictionally drive regulator tube V and thereby impart a vertical movement to regulating sleeve X (Figure 3).

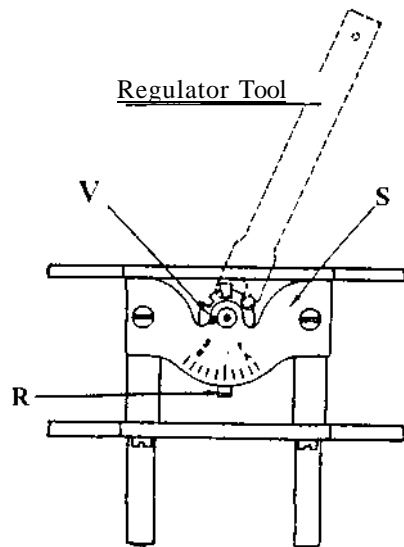


Figure 6

When the framework has been completely dismantled, check that pivot holes of the intermediate wheel and the barrel pivot holes are clean and well polished. These three pivot holes are the only parts of the clock mechanism which should be oiled besides the lubrication of the mainspring. The three pivot holes must be slightly oiled with a fine, not too fluid, lubricant (Chronax D or E, or Moebius No. 3). Also lightly lubricate the mainspring.

When the gear-train has been remounted, use Chain Hook, Tool No. 2 (Figure 5) to replace back spring. A small hook can be fashioned from a piece of stiff wire.

In the event of faulty adjustment, check one factor very thoroughly, vis., the suspension wire and its regulating mechanism.

To unscrew balance, use Key No. 6 (Figure 5) to unlock suspension wire clamping screw inside the balance tube. When this screw has been removed, the wire should appear in the screw arbor lying straight without bend or torsion. It must be held very tightly in the screw to prevent it from slipping. Through the medium of the regulating mechanism, the regulating clamp allows for readjustments by alteration of the working length of the wire. The clamp must grip the wire lightly but sufficiently firm to carry the heavy weight of the balance securely. The two lips of the clamp must lie perfectly parallel to one another and hold the wire at their extremities.

The inside of the balance tube, (M - Figure 1) which passes the suspension wire, must be absolutely clean.

The impulse pin must move perfectly free on its staff.

To replace the wire inside the balance tube, use Tool No. 3 (Figure 5). When the balance roller unit has been remounted, suspend it on the framework. To do this, use Tool No. 1 to push the wire inside the upper bridge and use Tool No. 8 (ring) to raise the balance. Use pliers to draw the end of the wire until banking stem M (Figure 1) lies under lower bridge P. Insert suspension-wire pin N (Figure 3), press it down while stretching the wire, give a light blow on the pin in order to make wire slip and release banking stem from lower bridge. The lower bridge P (Figure 1) must divide the space between the two planes of banking stem M equally, the regulating clamp must be tightened and make sure that the wire is suspended in the center of the tube. There must be no twisting or torsion of the wire between the point where it is attached to the wire sleeve by the pin and the point where it lies inside the threaded clamp.

Check whether the balance is poised and engages the escapement. For poising see Page 7. The balance engages when the impulse pin lies forward while the balance is dead centre. If this is not the case, turn roller through disk O (Figure 3), after having released the screw of said disk O. Then count oscillations of balance for 15 minutes. If variation exceeds 1 second, more or less, per 15 minutes, adjust the balance by adding or lessening oscillating and regulating weights.

1 mm of *oscillating* weight = 8 seconds per 15 minutes.

1 mm of *regulating* weight = 4 seconds per 15 minutes.

The two sets of oscillating and regulating weights can be compared on a very sensitive pair of scales, so that, when set in place on the balance wheel itself, the latter will not be put out of poise. As soon as sufficiently accurate timing has been obtained by adjustment of these sets of weights, the final rating

can be obtained by regulator R (Figures 3 and 6) which allows for exact determination of the required adjustment:

1 division = 10 seconds per 24 hours

If variation exceeds 50 seconds per 24 hours, adjust for 50 seconds when the regulator is in the middle of its run, by displacing the latter to left or right; then lock regulator tube V (Figure 6) with appropriate Tool No. 10 (Figure 5) and pull regulator in opposite direction (it will turn without modifying adjustment) and finish adjusting after having freed the regulator tube.

Then replace base plate and check for good operation of balance locking mechanism.

Should the movement require overhauling (use Tool No. 7-Movement Holder) we wish to stress that, owing to the minimum power which is transmitted and the slow movement mechanism, all wheels and pinions must be cleaned, (not lubricated) and run perfectly free. The surfaces of rest and impulse of all runners must be perfectly polished, the pallets very clean and the locks slight with only a small back lash.

Carefully observe poise of the fork which is suspended by the two pivots of the pallet staff (like a watch balance on the poising tool); the fork must be slightly heavier on the horn side, to secure one complete oscillation per minute. At rest, the fork must have a perfectly vertical position on the tool; if not, correct by adding a counterweight as required. (This slight fault in poise is important for it may prevent good timing.)

When the movement is remounted, put it back and also check the good operation of the escapement and the fork. If



the clearances of the guard pins are irregular, turn the pallet fork slightly on its adjustment. If for some reason or other, the arch of the fork had to be re-adjusted, care must be taken to secure perfect poise. The escapement is regulated by the pins attached to the 3/4 plate, as the banking pins fixed to the upperbridge some into operation only in the case of over-banking. Allow a space of 2 to 3/100th mm between the horns of the fork and the banking pins of the bridge.

It is easy to check immediately whether the motor is in good working condition. At a temperature of 18 to 20 C (64.4 to 68 F) studs T (Figure 1) fixed to the inside base of the motor, are visible a few millimeters behind the back plate (through the corresponding holes in the back frame).

At 25 C (77 F) they appear a few millimeters above T. If the motor (diaphragm) is in bad condition, the base is completely collapsed and touches the bottom of the inside case; even at 25 C (77 F), it will remain in the same position, whereas a motor in good condition will, at this temperature, completely compress its large inner spring and the studs will be fully visible.

Inside the sealed diaphragm is a gas which acts on a flexible metal membrane. Under the effect of variations of temperature (and also of atmospheric pressure) it contracts and expands, thus causing displacement of the inner base.

When the temperature rises, the motor compresses the back spring H (Figure 4) of the clock (invisible when the motor is in place) to which the chain is fixed. When the temperature decreases, the base contracts and allows the back spring to expand.

The motor operates within temperature limits of 8 to 30 C (46.4 to 86 F). Beyond these limits, the motor no longer winds up the clock, but the mainspring has a normal minimum running reserve of one year.

Within the limits specified, the motor obtains from the variations of ambient temperature, a driving power several times greater than that required to keep the balance going. The power of the back spring is calculated so that it cannot wind the mainspring by more than 5 to 7 turns. As soon as the spring reaches this amount of tension, the motor "idles" until, when a small fraction of power has been absorbed, the back spring again comes into contact with the base of the motor. This signifies, practically, a constant driving power.

It is at this point, that is to say, at the maximum at which the back spring is able to wind the barrel spring, that the amplitude of the balance wheel turns should be checked. It will have to be about one and a half turns.

In 90% of ATMOS repair work, there is no need to dismantle the balance completely. It is usually sufficient to clean the movement and check whether all of the parts operate freely. If the clock really does not give satisfaction, then only is it necessary to dismantle the balance and the suspension wire completely.

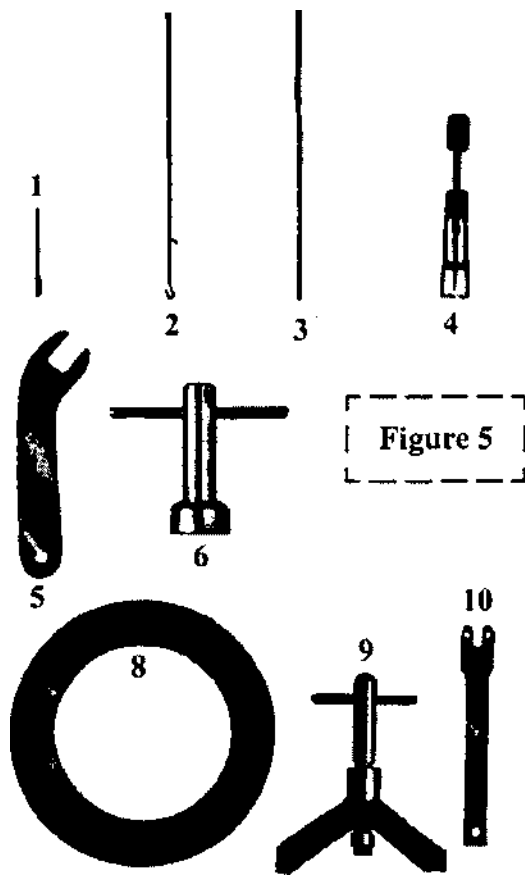
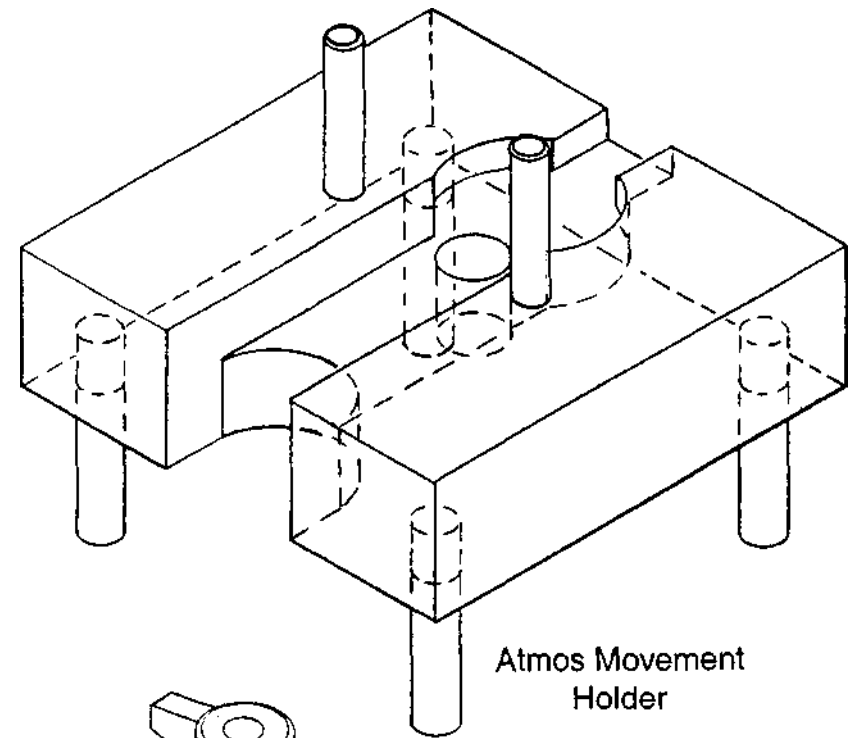
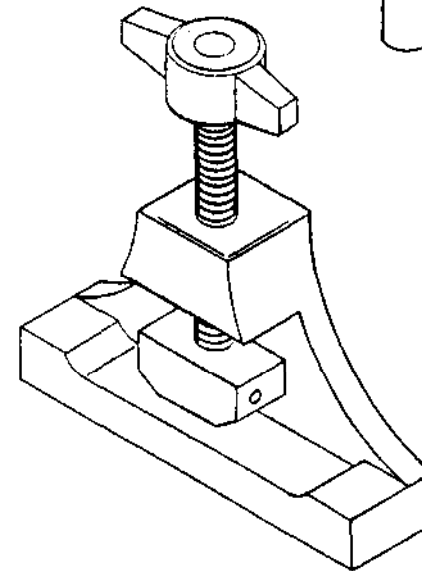


Figure 5

1. Tube permitting passage of wire inside the upper bridge.
2. Tool to pull the chain to inside from behind the spring.
3. Tool to pass wire inside the balance stem (tube).
4. Tool for removing the minute hand (hand puller).
5. Key for removing the motor (8 mm spanner).
6. Key for removing the cylinder which attaches balance to the balance canon.
7. Movement holder (see next page).
8. Ring to raise the balance to allow suspension.
9. Tool for centering balance by bending the tube (poise).
10. Tool for holding the regulating canon while moving the regulator, (regulator spanner).



Atmos Movement Holder



Detail of Balance Tube Poising Tool