HOW TO REPAIR

ATMOS

The Perpetual Motion Clock

For the Exclusive Use of
Watch Repairers and Watchmakers

VACHERON & CONSTANTIN-LE COULTRE WATCHES, INC.
580 FIFTH AVENUE • NEW YORK 19, N.Y.

IMPORTANT INSTRUCTIONS

TO REPAIRERS AND WATCHMAKERS

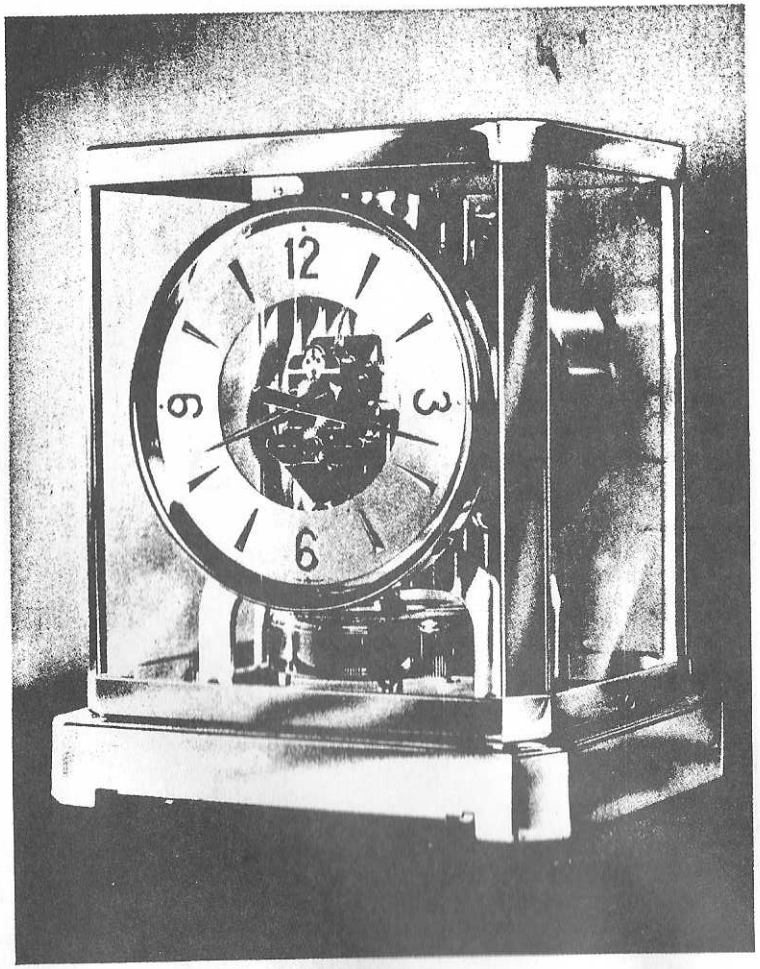
ATMOS

The Perpetual Motion Clock

Published by

Vacheron & Constantin-LeCoultre Watches, Inc.

580 Fifth Avenue • New York 19, New York



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
   Pull out the two pins (A - Fig. 4) 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
   While the clock is uncovered, level the ATMOS by turning the two thumbscrews on the base (C-C - Fig. 4) until the bubble in the round spirit level is in the exact center of the liquid.

3. HOW TO SET
   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 fork.

4. REPLACE THE GLASS CASE

5. HOW TO START AND STOP
   To start, push the locking lever on the front of the clock base (B - Fig. 4) slowly from right to left. This starts the balance wheel to oscillate slowly.

6. NEVER TOUCH THE BALANCE WHEEL. To stop and lock balance wheel, push locking lever on the base from left to right.

INSTRUCTIONS FOR REPAIR OF ATMOS CLOCKS

To secure a good performance, 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 spirit level G (Fig. 1) and also by the balance itself. It suffices if the banking stem M (Fig. 1), which is fixed on the balance staff, is centered over aperture L (Fig. 1) in the bridge through which it passes.

For repair work, operate as follows:

a. Check horizontal position of clock.

b. Check if power reaches escapement by gently releasing balance from its locked position; the operation of the pallets can be observed through the apertures made for this purpose.

c. Check if hands move quite freely.

d. Check condition of motor. (See page 8.)

Having made these four checks, lock balance wheel by pulling lever B (Fig. 4) from right to left. Then remove hands by means of Tool No. 4 (Fig. 5), together with dial and dial bezel. The hands must be perfectly counterbalanced. (A badly poised minute hand will stop the clock; a similarly faulty hour hand will cause variations of a quarter turn in the amplitude of the balance.)

When removing the movement, care must be taken not to bend the fork, nor to let the gear-train run. Hold the first wheel so as to be able to count the turns of the Barrel (normal winding: 5 to 7 revolutions or turns).

Next, remove motor by unscrewing the four screws, using Key No. 5 (Fig. 5).

When the motor and movement has 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.

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

To free the balance, unscrew regulating clamp screw J and wire sleeve screw K (Fig. 6). Gently, pull out pin N (Fig. 6) while holding up the balance; then gently disengage the balance by raising 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.)

When balance has been removed, check winding mechanism.

To wind the mainspring, compress back spring H (Fig. 2) in the hand. (Stop movement of gear-train and allow 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 back spring H (Fig. 2) 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 ½ 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 of from 45 to 48mm (1.77 to 1.89 inches) from plate. (See Fig. 2).
3. The chain must not be twisted.
4. The pulley fixed to the plate must move perfectly free.

Next, see whether the regulating mechanism is in good order. The rotatory movement of regulator R (Figs. 6 and 7) must frictionally drive regulator tube V (Fig. 7) and thereby impart a vertical movement to regulating sleeve X (Fig. 6).

When the framework has been completely dismantled, check that pivot holes of the intermediate wheel and the barrel pivot hole 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 lubricate mainspring.

When the gear-train has been remounted, use Chain Hook, Tool No. 2 (Fig. 5) to replace back spring.

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 (Fig. 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 perfectly straight without a bend or torsion. It must be held very tightly in the screw to prevent its slipping. Through the medium of the regulating mechanism, the regulating clamp allows for re-adjustments 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, through which passes the suspension wire, must be absolutely clean.

The impulse pin must move perfectly free on its staff.

The roller also must move freely on the balance tube. To obtain this, the spring connecting the roller to the tube must be free.

To replace the wire inside the balance tube, use Tool No. 3 (Fig. 5). When the balance roller unit has been remounted, suspend it on the framework. To do this, use Tool No. 1 (Fig. 5) to push the wire inside the upper bridge and Tool No. 8 (ring) to raise the balance. Use pliers to draw the end of the wire until banking stem M (Fig. 1) lies under lower bridge P (Fig. 1). Insert suspension-wire pin N (Fig. 6), 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 (Fig. 1) must divide the space between the two planes of banking stem M (Fig. 1) 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 balance is poised and engages escapement. For poising see Page 4, sixth paragraph. 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 (Fig. 6), 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 operated by regulator R (Figs. 6 and 7). The scale engraved on upper bridge S (Figs. 6 and 7) allows for an 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 (Fig. 7) with appropriate Tool No. 10 (Fig. 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 good operation of balance locking mechanism.

Should the movement require overhauling (for which, use Tool No. 7, Fig. 5) we wish to stress that, owing to the minimum power which is transmitted and the slow movement of the mechanism, all wheels and pinions must be clean, (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 movement has been remounted, put it back and also check 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 has had to be readjusted, care must be taken to secure perfect poise. The escapement is regulated by the pins attached to the ¾ plate, as the banking pins fixed to the upper bridge come into operation only in case of over-banking. Allow a space of 2 to 3/100ths 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* (Fig. 1) fixed to the inside base of the motor, are visible a few millimeters behind the back plate (through the apertures).

At 25°C (77°F) they appear a few millimeters above T*, (Fig. 1). If the motor (diaphragm) is in bad condition, the base is

**In the 1952 models, part 3810 (capsule bottom) and Studs T, which were indicators only, have been eliminated, since motor-diaphragm failure is very infrequent.*

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.

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 (Fig. 2) 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 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.

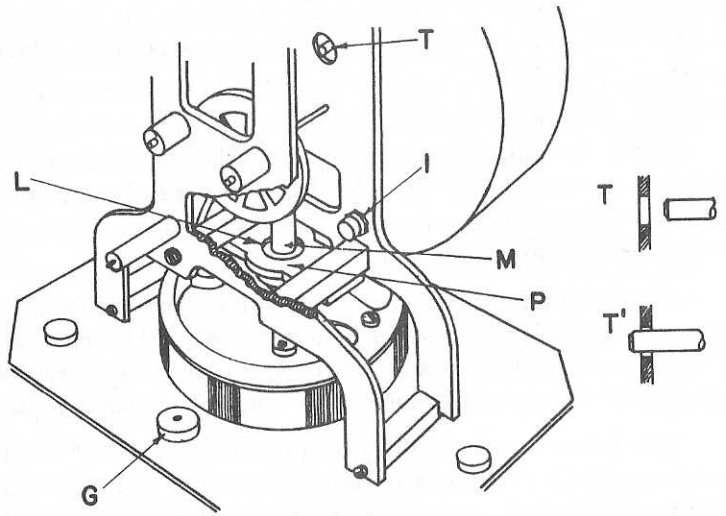


Fig. 1

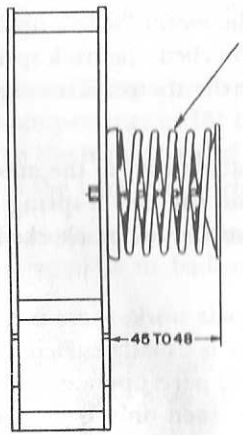


Fig. 2

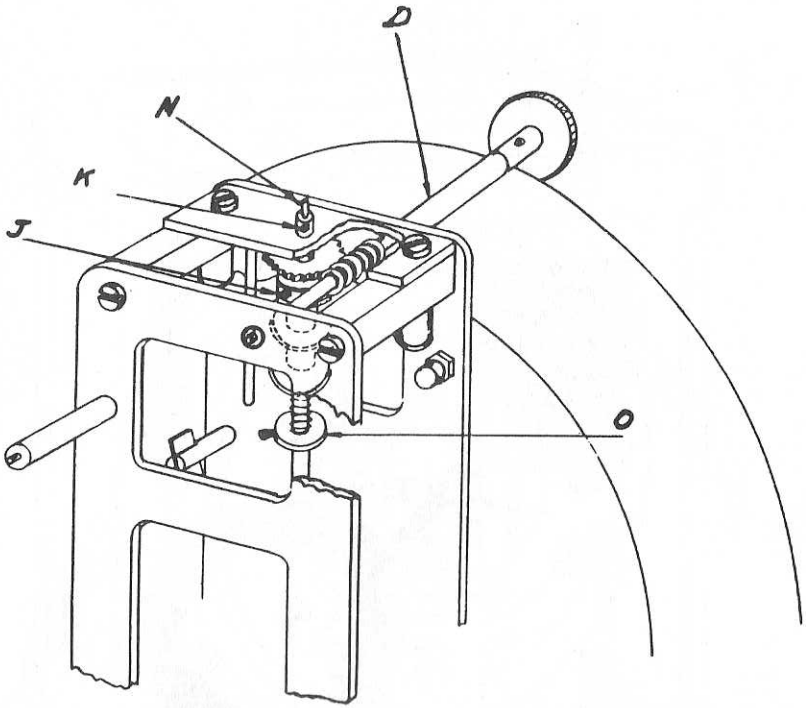


Fig. 3

Note Regulating Mechanism D in models manufactured prior to 1951.

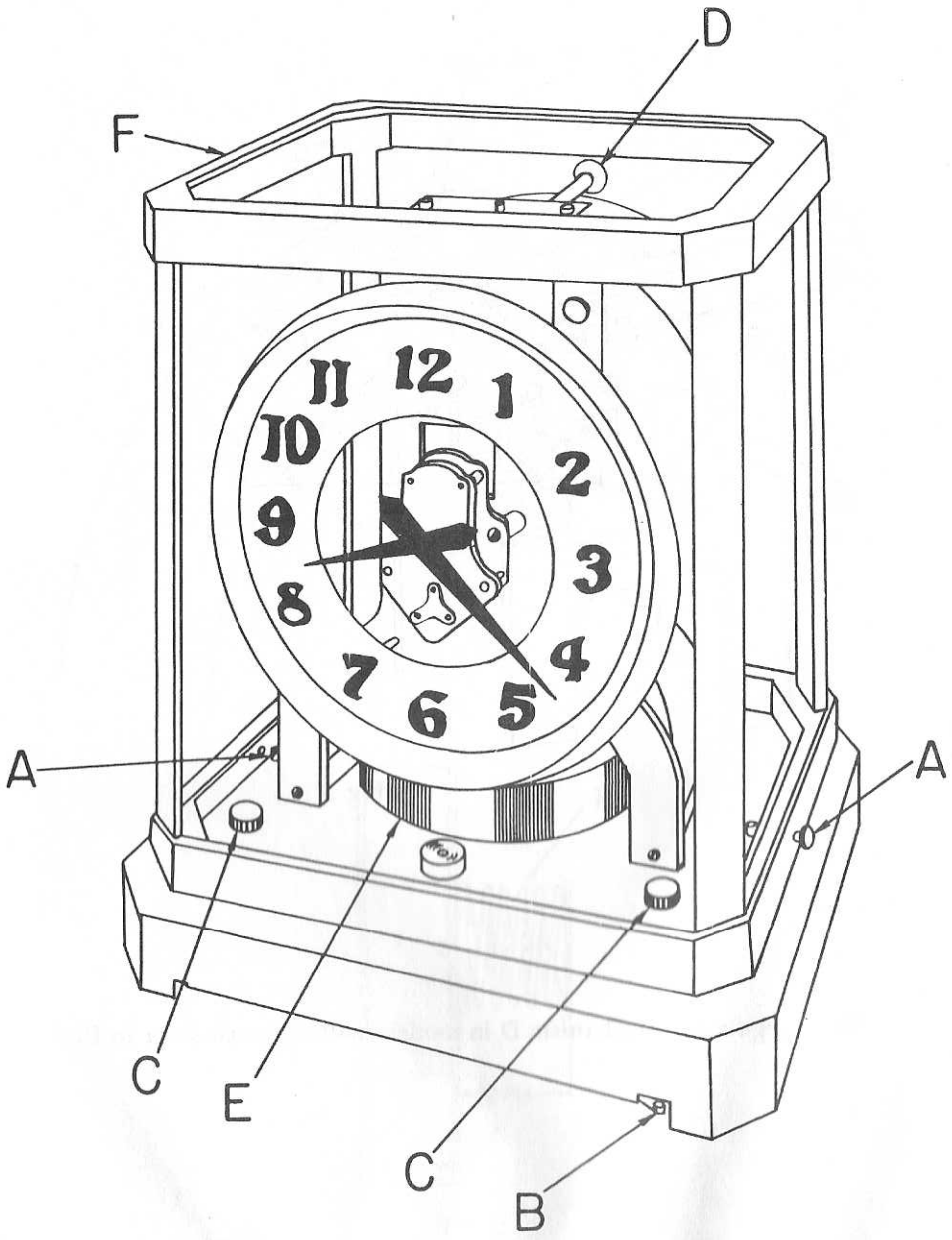


Fig. 4

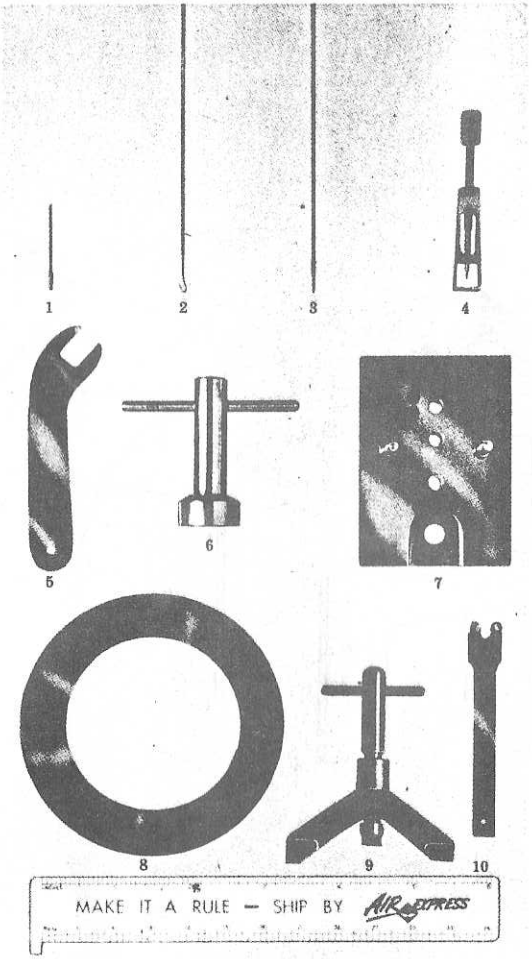


Fig. 5

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.
4. Tool for removing the minute hand.
5. Key for removing the motor.
6. Key for removing cylinder which attaches balance to balance canon.
7. Stand for placing the clock movement when overhauling.
8. Ring to raise the balance to allow suspension.
9. Tool for centering balance by straightening tube.
10. Tool for holding the regular canon while moving the regulator.

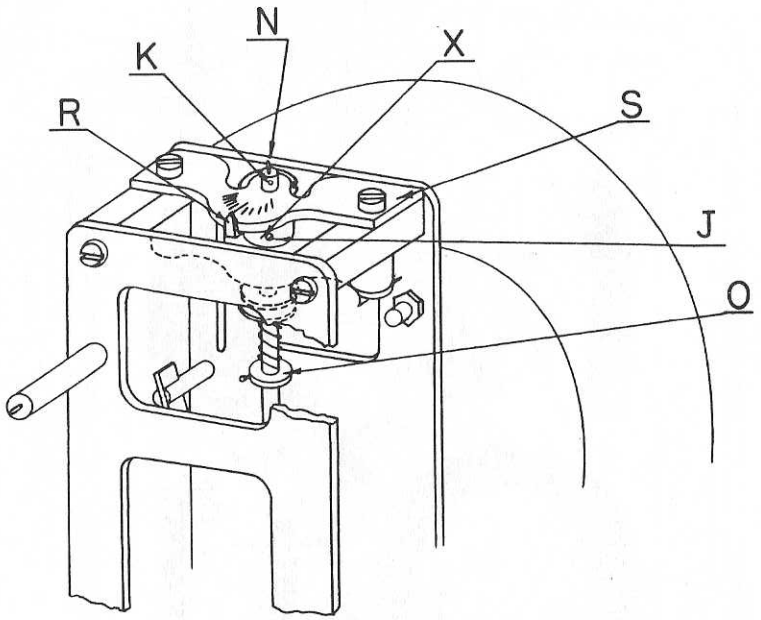


Fig. 6

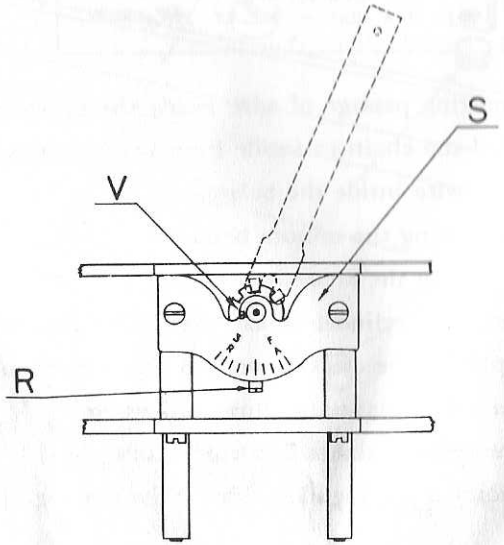


Fig. 7

First Printed 1952
Reprinted 1991