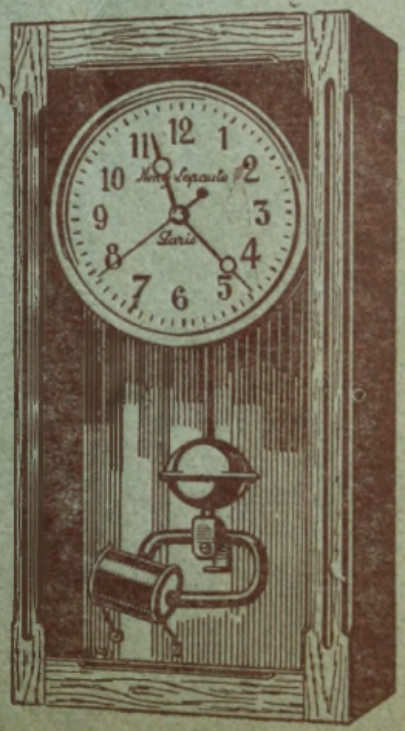
HORLOGERIE ÉLECTRIQUE

DESCRIPTION DES APPAREILS
INSTRUCTION DE MONTAGE



Etablissements HENRY-LEPAUTE
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Lepaute Electric Horology Manual

Translation of Horlogerie Electrique - Description Des Appareils, Instruction De Montage, Henry Lepaute (https://clockdoc.org/gs/handler/getmedia.ashx?moid=26280&dt=3&g=1)

NOTICE No. 1

Electro-Magnetic Regulator

This regulator is essentially composed of a pendulum made of Invar steel, maintained in motion by driving impulses that diminish as the amplitude increases.

This pendulum, suspended by a spring strip, carries a magnet O that can be attracted by a coil H when it is energized by a current from battery P, sent through contact VF.

With each oscillation in one direction, the pendulum A pushes one tooth of the ratchet wheel H via the pawl K. The ratchet H drives the wheel R, on which are mounted the seconds hand, the contact cams, and the minute mechanism.

Its position is secured by the detent E, which also resists its return movement.

This detent is a thin spring steel blade, ending in a contact pin V, fitted with a piece S that tends to fall into one of the ratchet's notches. The pawl is adjusted relative to the ratchet via screw T. The pawl must engage only one tooth and then escape it by just the right amount, so the detent S drops exactly into the next notch. This rising motion of the detent establishes the contact between V and F. This contact generates the driving impulse that sustains the pendulum.

The detent's tension is adjusted by rotating post J. A brass piece holds the blades M and determines the duration of the contact, which can be adjusted with screw L

This contact is slightly frictional and lasts about 1/10th of a second. It occurs when the pendulum passes through the vertical.

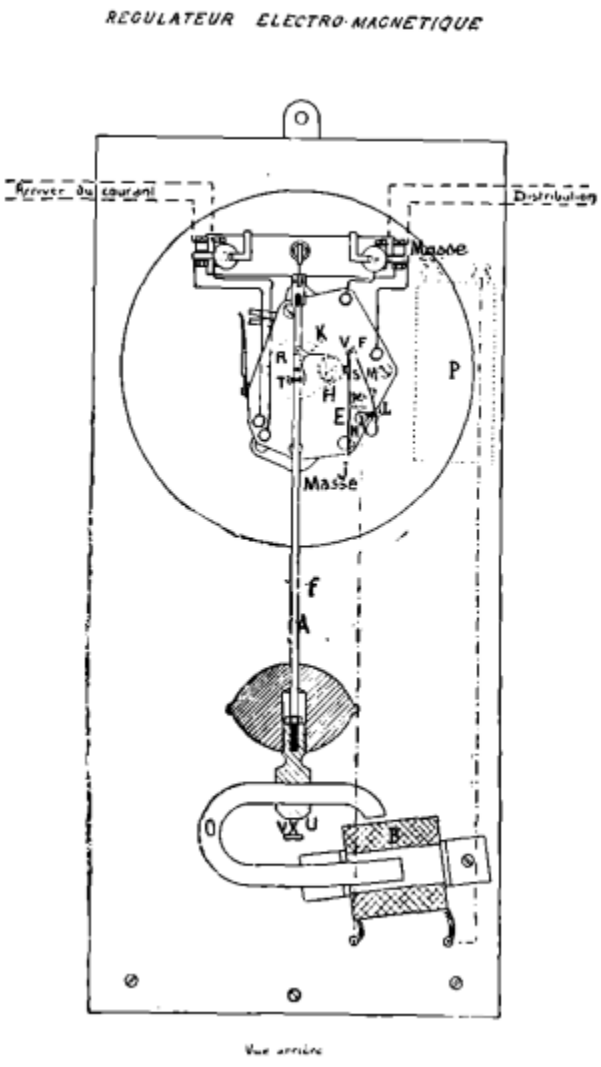
The electromagnetic force thus acts over a constant path, but its effect automatically diminishes when amplitude increases, due to a counter-electromotive induction force proportional to speed.

The contact breaks when current intensity is nearly zero, placing the contact under ideal conditions for durability and reliability.

Moreover, with frictional resistances reduced to a minimum, the pendulum's damping coefficient is very low, and only a minimal amount of energy is required to maintain operation with great precision.

This type of regulator can be produced:
- without distribution contacts,
- with second-distribution contacts,
- or with quarter- or half-minute distribution contacts.

The latter model is the most widely used in time distribution systems, to remotely control receivers that move the hands of dials of all shapes and sizes, as well as control and signaling devices.



NOTICE No. 2

Current-Reversing Receivers

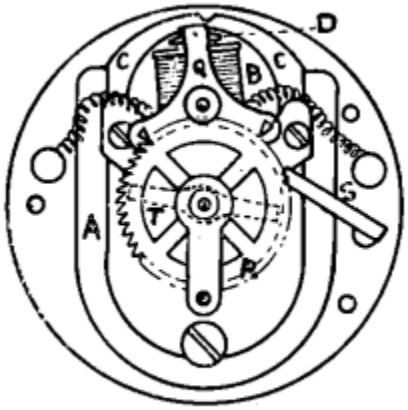
These receivers are composed of:
1. A permanent magnet A ending in polar expansions C.
2. A soft iron armature D, able to oscillate between the magnet poles, around which are mounted the coils B.
3. A mechanical system that forces the wheel R to always rotate in the same direction.
4. A motion-work adapted to the size and arrangement of the hands.

The principle of operation is comparable to that of a DC electric motor, where the permanent magnet acts as the field (inductor).

The armature receives, at regular intervals (generally every half-minute), a current from the master clock. This current alternates in direction with each impulse. Each time, the armature oscillates: since its polarity is reversed, the magnetic force compels it to take the shortest path through the magnetic field lines. This movement causes wheel R to advance by half a tooth, which moves the minute hand and, through the motion-work, also the hour hand.

Advantages of Polarized Receivers with Current Reversal:
- Eliminates the risk of double contacts.
- Offers complete operational security.
- Very low power consumption.

Models:
RECEIVER No. 0 – For dials up to 15 cm. Wheel R is driven via an anchor Q. Hands are driven by friction T, allowing manual setting. The wheel R is controlled by means of an anchor Q. They are driven by friction T; they can therefore be turned by hand to reset the time.

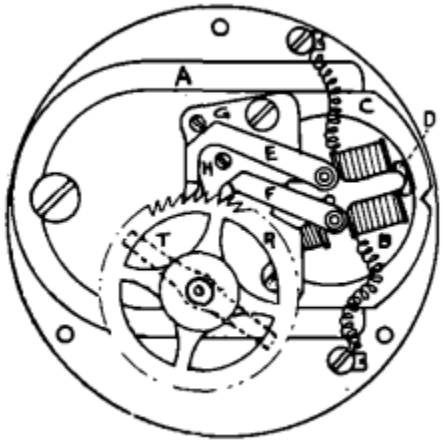


Récepteur N° O

RECEIVER No. 1 – For dials up to 50 cm. Uses dual pawls and eccentric stops to ensure correct operation and manual adjustability. The rotation of the wheel R is done by a system of 2 ratchets E and F placed on either side of the armature axis. Their movement is limited in both directions by the eccentric stop screws G and H. The adjustment of these eccentric screws is made in such a way that at the end of the armature travel, one pawl pops, the other falls back with 2/10ths of play in the previous tooth.

Their shape also prevents the rotation of the needles under the action of accidental causes, such as wind, snow, etc. …

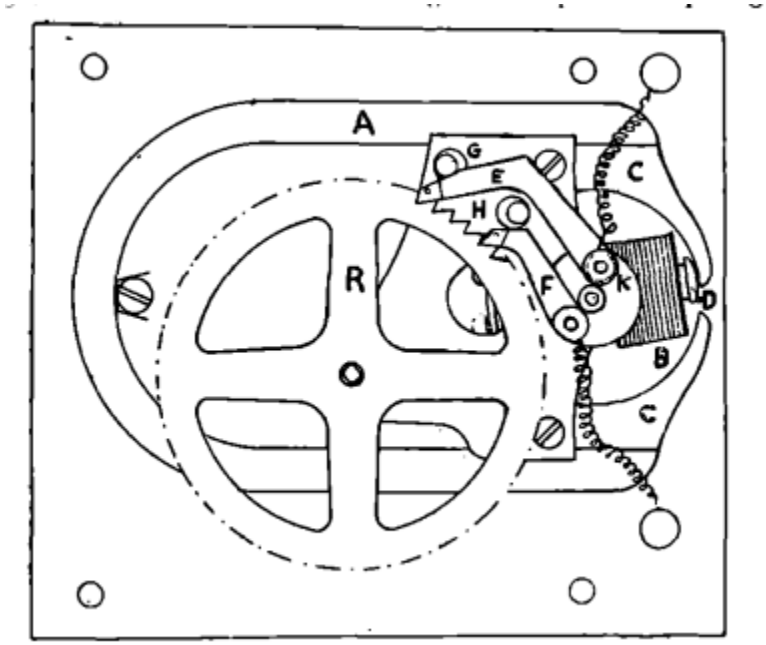
The reset of this receiver is also carried out by friction, by turning the needles.



Récepteur N° 1

RECEIVER No. 2 – For dials up to 1.25 meters and control systems, to operate timekeeping devices, time-controlled devices for chimes, ignition signals, etc. ... The control is also done by ratcheting. Since the hands are no longer driven by friction, due to inertia, to reset the

time, unscrew the button K, release the pawl E and turn the wheel R by hand.



Récepteurs N° 2 et au dessus

RECEIVERS No. 3, 4, 5 – For dials from 1.25 to over 3 meters, similar to No. 2 but larger.

NOTICE No. 3

Mounting and Adjustment of the “LEPAUTE” Electromagnetic Regulator

LOCATION

Choose a thick, rigid wall not subject to vibrations, which could compromise the proper functioning of the regulator.

MOUNTING THE PAWL

1. Carefully unpack the regulator, avoiding any shocks that could damage essential components.
2. Remove the case by pulling it from the base and lifting it upward to disengage the hooks (fig 1).
3. Take the small envelope placed inside the coil and remove the pawl P (very fragile) (fig 2).
4. Using flat pliers, remove the pin A that passes through the upper third of the pendulum rod.
5. Insert the ears O of the pawl so that their holes align with the hole in the pendulum rod, and reinsert the pin carefully.

Ensure the wider, beveled arm of the pawl is perpendicular to the pendulum rod and that the pawl moves freely on the pin (fig 2). Also make sure the pawl is free on the pin.

fig. 2

HANGING THE REGULATOR

1. Remove the movement by pulling it out of the grooves cut into the brass columns A and B which hold it on the marble, after having loosened the two external locking screws a and b. (fig 3).
2. If the location where the regulator is to be fixed is not made of wood, put a pad or better a rawl dowel into which screw C (the shortest screw) will be screwed (fig 5).
3. Fix the bare marble to this screw.
4. Carefully attach the pendulum to the suspension, taking care not to damage it (fig 4).
5. Adjust the position so that points V and V1 align, using tilt and screw height adjustments E and F..
6. Mark the final hole on the wall, drill it, and fix the marble in place with the two screws C and G (fig 5).

ACCROCHAGE DU REGULATEUR

Figure 3

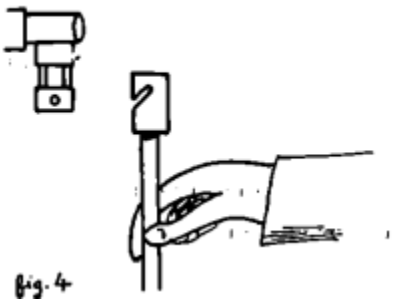


fig. 4

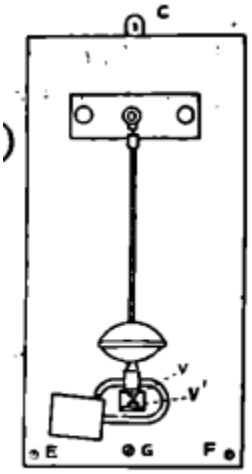
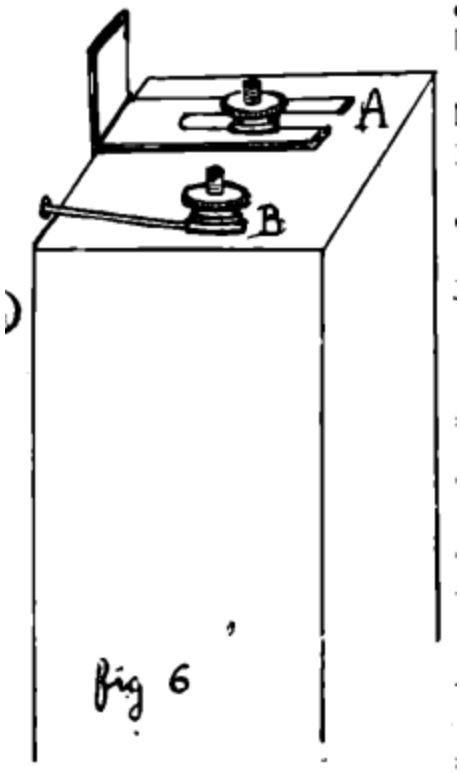


fig. 5



INSTALLING THE BATTERY

Mount the battery by tightening its central terminal (positive terminal) into the bracket. Unscrew the other terminal to insert and clamp the eyelet A (fig 6) Then completely unscrew the other terminal to engage the eyelet B which will be locked at the bottom..

STARTING THE CLOCK

Gently move the pendulum 3 to 4 centimeters to the left, that is, in the direction where the lower branch of the magnet is engaged in the coil; release the pendulum, avoiding any sudden movement that could loosen the suspension.

If the preceding instructions have been scrupulously followed, the movement will continue until the small battery is exhausted.

SETTING THE TIME

Turn the hour and minute hands in either direction. Never move the second hand backward. Align the minute hand properly when the second hand passes zero.

ADJUSTMENT

To advance time, turn the pendulum weight to the right (clockwise). To delay, turn it left. Each mark changes the time by ~10 seconds per day.

CASE

To replace the case, tilt it (fig 1), hook it on top, then lower it into place.

NOTICE No. 4

Mounting the Receivers and Their Connection to the Regulator

Secure the receiver clocks in place with appropriate hooks.

ESTABLISHING THE LINE
Remember that in all cases, the receivers are connected in series.

For the proper functioning of the installation, the line must be perfectly insulated. It should preferably consist of leaded cable of 9, 10 mm^2 with one or two conductors depending on the arrangement of the devices.

If the installation has more than 5 receivers, it is advisable to equip them with shunts (fig 1). For the connections to be made, in this case, follow the diagram opposite (fig 2). For small installations with only a few receivers, the use of shunts is no longer obligatory; in this case, comply with the diagram opposite (fig 3).

TIME RESET SWITCH
For the connections to be made, follow Figure 4 exactly.

CONNECTION TO THE REGULATOR
The power source for the receiver is connected to the terminals located to the left and top of the controller.

This power source should preferably consist of high-capacity liquid batteries.

Calculate the number of elements to be commissioned according to the following table.

1) For dials less than 50 c/m in diameter, plan for 0.4V per device.

2) For dials from 50 c/m to 80 c/m in diameter, plan for 1.5V per device.

3) For dials from 0.80 to 1.20 m in diameter, plan for 2.5V per device.

4) For central patrol stations, 1.5 per device.

5) For bell systems, 2.5 per device.

6) For staff clock-in and clock-out registers, 4V per device.

For dials with a larger diameter, please contact us.

Add to the voltage found necessary, the voltage drop in line, which is 1V for 150 meters of 9, 10 mm^2 lead cable with 2 conductors.

Example: For an installation comprising 4 dials of 250 m/m, 1 card time clock, 1 bell mechanism with a 150 meter line, the voltage must be provided as follows:

4 bull's-eyes: 0.4V X 4	= 1.6V
1 Time clock	= 4V
1 Bell mechanism	= 2.5V
Voltage drop for 150m of line	= 1V
==========	
	= 9.1V

or a battery of 9 cells.

To the two terminals on the right and at the top of the regulator, connect either the two wires coming from the time reset switch, or directly those from the receiving devices if there is no time reset switch (fig 4).

SETTING THE TIME ON DEVICES

To set the time on receivers with a dial diameter of 50 c/m or less, the hands can be turned in either direction and brought into the correct position.

For those with a dial diameter greater than 50 c/m, as well as for strike mechanisms and central round controller posts, refer to the description of receiver no. 2 for time setting.

To reset the entire system, use the reset switch as follows:

1) Remove plug AB
2) Turn knob C alternately in either direction at a rate of 1 per second. Each movement advances the receivers by half a minute
3) Check that knob C is correctly positioned in neutral
4) Replace plug AB, ensuring it makes good contact

INSTALLATION MAINTENANCE

Check the battery voltage approximately every 4 months (this voltage must not be less than 1 volt in closed circuit, per cell).

Add salt water when the level drops and replace the zinc plates when they are worn.

Fig. 1

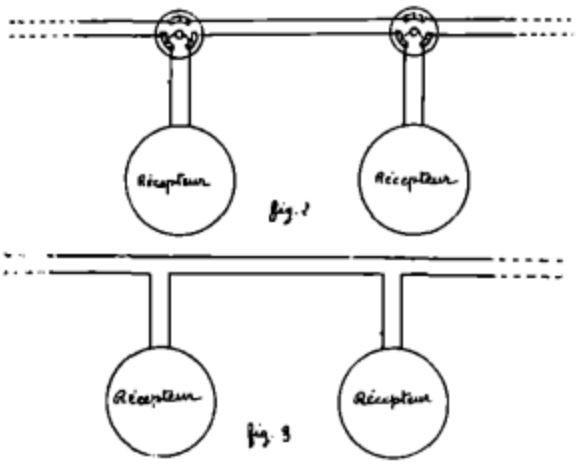


fig. 2 fig. 3

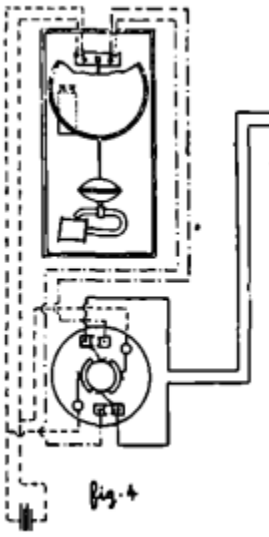


fig. 4

LIAISON AU REGULATEU

La source d'énergie pour l'alimen
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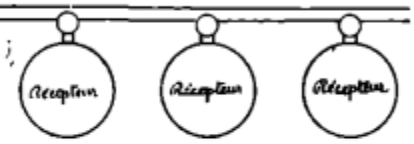
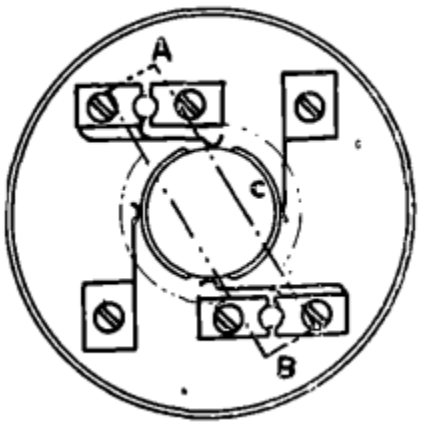


Cette source d'énergie doit être co
préférence par des piles liquides à gran

Calculer le nombre d'éléments à
service d'après le tableau suivant :

1° Pour les cadrans inférieurs à
diamètre prévoir : 0 v 4 par appareil.

2° Pour les cadrans de 50 c/m à
diamètre, prévoir 1 v 5 par appareil.



NOTICE No. 5

Troubleshooting in a Lepaute Electric Clock Installation

1. 1. All Devices Are Stopped
    a. If the master clock is also stopped
        i. Mechanical checks: alignment, pawl engagement, detent operation, hand clearance.
        Check successively
            1. 1st: Plumb (U and V points aligned in both directions)
            2. 2nd That the magnet does not rub inside the coil and that the suspension is not distorted
            3. 3rd That the pawl engages its tooth properly and that it escapes when it has pushed it just enough so that the dentent E falls back into the next hollow (adjusted using screw T)
            4. 4th That when the jumper has fallen, the break in the maintenance circuit is very clear and that there is 05.-0.6 mm of play between the 2 contact pieces V and F (adjusted using screws L)
            5. 5th That there is no mechanical stiffness in the movement
            6. 6th That there is enough play in the hands, that they do not catch or rub on the dial or the glass of the bezel.
        ii. Electrical checks: battery voltage, contact integrity, continuity.
        Check successively
            1. 1st Check the voltage of the maintenance battery (minimum 1V), unblock the vent, and check that the terminals are making good contact.
            2. 2nd Check that the maintenance contact is making good contact with each oscillation of the pendulum when it passes through the vertical plane and clean it if necessary with a piece of cardboard or a small piece of very clean wood soaked in gasoline.
            3. 3rd Check that the pendulum's maintenance circuit is well established throughout, particularly between the current-taking spring fixed to the marble and the insulated terminal N
    b. If the master clock is not stopped
        i. Take the voltage at the terminals of the distribution source; make sure that it corresponds to the number of cells in service (at least 1V per battery cell and 2V per battery in closed circuit)
        ii. Check that the zincs and connections are in good condition

iii. Connect an ammeter in series with the distribution line; if the current does not flow clearly or does not flow at all, first examine the distribution contact and check its value using a voltmeter or, better still, a small 2V pilot lamp, with an element as a source; if necessary, adjust the position and pressure of the blades, or clean the contact with a piece of cardboard or a very clean piece of wood soaked in benzine. If the contact is good and the ammeter shows no deviation, there is a break in the line and it can be located with a voltmeter, an ohmmeter, or in any other way.

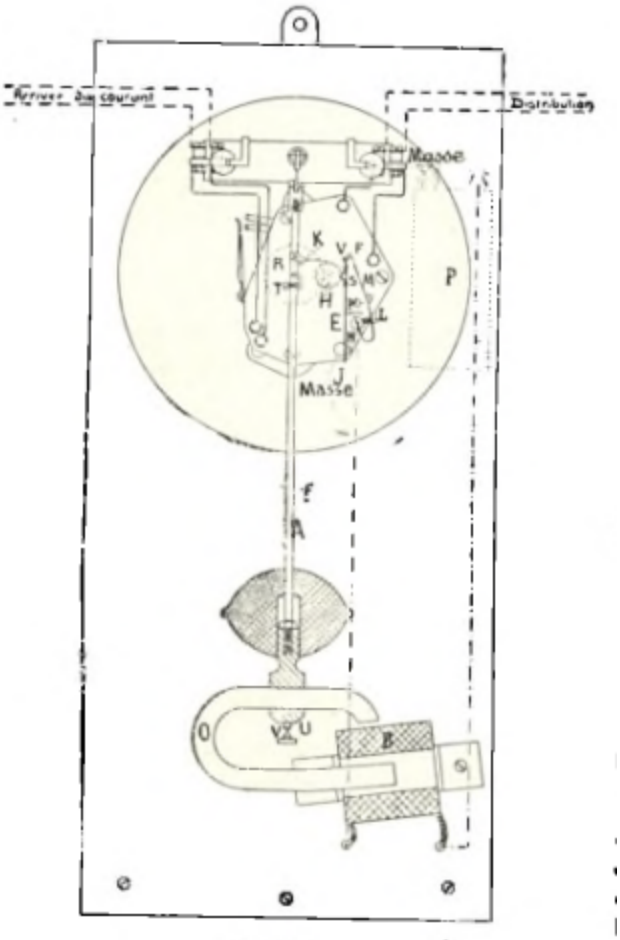
iv. Check the contacts of the general time reset box

If, on the contrary, the intensity is higher than the normal value, it means that there is a short circuit between two wires or with the earth. In the latter case, the fault will be searched for by making isolated measurements between wires and to the earth in successive sections of the line.

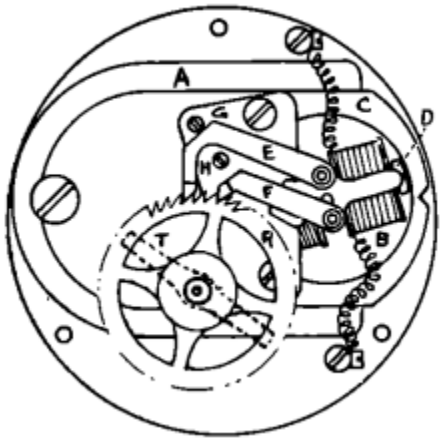
2. Irregular Operation:
   Repeat all of the above tests.
3. Some Receivers Malfunctioning
   Carry out the same tests as before. If everything is normal, it is then necessary to look for the fault in the receivers themselves.
   a. A receiver is running fast - There may be two causes:
      i. The needle friction is too loose; it will need to be tightened.
      ii. The hook may turn forward despite being engaged. Adjust the pawl stops (G and H) (receivers #1 above).
   b. A receiver is running slow or stopped
      Before touching anything, connect the ammeter in series with the receiver line. Then measure the voltage across the receiver terminals.
      i. If the voltmeter needle deviates and the ammeter needle remains at 0, this indicates a broken wire in the coil. Repair it or replace the coil
      ii. These two measurements do not indicate any current. You will need to look for a fault in the branch line or in the time reset box (bad contacts)
      iii. The intensity in the main line is normal, but the voltage at the receiver terminals is too low (change the shunt which is not resistant enough or may be short-circuited)
      iv. These two measurements are normal, it is in the mechanical part that the fault will have to be looked for
         1. Check the ratcheting. The pawls should fall very freely into the bottom of the teeth with a clearance of 0.2 - 0.5 mm at the stop, and should not get stuck with the eccentric screws when moving up the tooth, adjust the stops G and H (receivers no. 1 and above)

2. Check that the air gap is well divided, that there is no friction or any dust or metal grains
3. Check that the timer is free, that the hands are well balanced and have some play at the ends. Check that they are not catching on each other and that they are not rubbing on the dial or the glass
4. Make sure the slider does not interfere with the rotation of the counterweight or short out the wires
5. Clean the rubbing parts and grease the pivots with clock oil

REGULATEUR ELECTRO-MAGNETIQUE



Vue arrière



NOTICE No. 6

Maintenance of Lepaute Electric Clock Installations

To ensure perfect operation of the device, a regular inspection must be carried out every month.

These visits are intended to correct any small adjustment deviations that the regulator may have suffered, but above all to ensure the good condition of the battery which powers the receivers.

It is recommended that the same person always carries out this check.

His attention should be focused on the following points and in the order indicated.

1. Master Clock
If the difference observed in the month is greater than 30 seconds, stop the pendulum then act on the adjustment ball following the instructions in notice no. 3.

To stop the pendulum, gently grasp it when the magnet is engaged in the coil and slowly bring it back to the vertical position. Never stop the pendulum when the seconds hand is between 28 and 30 or between 58 and 60 because these positions correspond to the establishment of the distribution contact and a prolonged stop could drain the battery. It is therefore preferable to have the seconds hand around 15 or 45.

2. Batteries
First, ensure that the liquid level is sufficient: 2 to 3 centimeters from the top edge of the jar (AD 235 batteries), 5 millimeters below the zinc tail (Leclanche battery).

Replenish the level if necessary with pure water or a diluted solution of ammonia hydrochloride.

a) Electrolyte - The presence of abundant crystals and a milky appearance indicate the depletion of the electrolyte which must be regenerated and replaced with a fresh solution.

b) Zinc - If crystals cover them, they must be scraped. If they are worn too much, they must be replaced.

c) Positives - They must also be freed from the crystals covering them by scraping them with a wooden scraper. Do not forget to unblock the central ventilation hole (AD 235 batteries)

d) Current - Connect a milliammeter in series at the battery output. When current is being transmitted, the needle should indicate a current of around 100 milliamps for installations whose receivers are connected without shunts, and 150 milliamps for those whose receivers have shunts.

If the measurements taken were different by more or less 15% to 20% from the figures indicated above, the cause should be investigated, which could be due to poor battery condition or an error in the initial start-up of the installation.

3. Receivers
Inspect all receivers in the installation and ensure they are set to the same time as the distributor clock.

In the event of misalignment, follow instructions no. 5 to locate the fault.

To set the time on a receiver with a fixed bezel, unhook it, insert the reset key into the existing hole on the rear face of the protection box, turn it slightly to the left so that the pin fits into the key slot, and reset the hands by turning it in either direction.

To set the time on other receivers, refer to instructions no. 4.

4. Time-Setting Switch:
To advance all receivers, follow instructions no. 4.

To stop all receivers, remove the pin as long as necessary.

When replacing it, ensure that it makes good contact.

On request, a special service is available to our customers for battery replacement and general installation checks at a price of __ France per battery.