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SETTING UP A SYNCHRONOME SYMPATHETIC PENDULUM SLAVE CLOCK

by

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Introduction

These notes were derived from my experience of setting up a slave movement with a 7" centre-seconds dial with a half-seconds pendulum. The slave movement came from Brooklands Park, a BBC transmitter site which opened in March 1930. Such a organisation would have required to know the time to the second rather than to the half-minute.

The clock movement was stamped with 'Patent 26279' which is in fact an application number, the patent was granted to Hope Jones on Sept 13 1928, number 323,001 so this movement must date from 1927-28.

Adjustments are best made with the front glass and frame removed.

The Clock System

This system was introduced so that a seconds hand could be driven by a master clock giving half minute impulses. The slave clock is basically an electric motor comprising a pendulum which is impulsed, via an armature and solenoid, every half-minute by a master clock. A movement with centre seconds is advanced by the pendulum through a crutch.

Fixing the clock case

Use the mirror plate on the case to hang the clock, then use the three screw holes to secure the clock, one at the bottom and two at the top of the case. Do not rely on the mirror plate alone or just one screw at the bottom. As with all clocks, rigidity is essential.

Setting the master clock

Make sure the master clock is properly adjusted. The normal current for a slave dial is 300mA, maximum 500mA. I adjusted the master clock to give 400mA. To set the working current put an AVO meter, set to mA, in series with the battery. Add a lead with two croc clips across the master clock armature return arm and the top terminal, this shorts out the contact and causes the reset armature to pull in. Adjust the variable resistor until the meter reads 400mA. Remove the meter and shorting link, reconnect the battery and set the clock to time as necessary.

Adjusting the armature and pole pieces

There are two screws underneath the pole pieces which serve to lock and adjust their level. First adjust these so that the pole pieces are level, then lower the front pole slightly, this I think makes for easier adjustment. Ensure the armature is parallel to the pole pieces and clears the rear pole piece with minimal clearance, this may take hours of fiddling. Then adjust the two screws so that the front pole piece just clears the armature. Secure the locking screw.

Adjusting the pendulum

The objective of this is to get the pendulum to time. Open the door so that the clock movement is not driven by the pendulum. A little pointed flag made out of some

coloured insulation tape is very helpful at this stage. Stick it onto the rating nut so that you can record its position .

If you have had to replace the suspension spring start by putting a shorting link across the slave terminals so the coils are inoperative. Give the pendulum a push and using a quartz clock with a seconds hand observe the pendulum. Time the interval between the pendulum being in synchronisation with the seconds hand, and coming again into synchronisation. (the tick of the quartz clock may be a better guide). What you are doing here is measuring the time between the beats of your quartz clock and the free period of the slave's pendulum. Adjust the rating nut, say a turn at a time, keep a record of what you are doing. Aim for a period between beats of 5 minutes or more.

It may be useful at this stage to reset the adhesive tag to the front of the rating nut. Next stage is to remove the short from the coils. With the pendulum at rest it will start swinging due to the half-minute impulses. Stroke the pendulum up to a suitable amplitude since it will not gain a full amplitude on its own. Again, keep a record of what you do. Now adjust the pendulum so that its amplitude is a maximum. I suggest you try 1 turn at time, then $\frac{1}{4}$ turns when you get close to the maximum. I think I found that over $\frac{1}{2}$ turn there was little noticeable change in amplitude. I used a pin held by piece of blue-tak in the case bottom as an indicator of pendulum amplitude.

Now reset the adhesive tag.

Adjusting the crutch
The crutch is eccentric and adjustable. I can't say I've got a solution for how to adjust it, but aim for the arm to be picked up about mid swing of the pendulum.

Readjusting the pendulum
In normal use the pendulum is a compound one comprising the pendulum and the crutch. With the pendulum alone adjusted correctly, it will not keep correct time when working in the clock due to the additional effect of the crutch. Lower the pendulum 4 turns to counteract the compound pendulum effect, then carry on to the start the clock and readjust the pendulum for maximum amplitude.

Starting the clock
Make a prop of wood, brass or plastic. It needs to be about 2" long such that when inserted between the right-hand case wall and the pendulum armature, it holds the pendulum close to the pole pieces, say about half-way across them. This is to ensure the clock starts in the correct phase. Just giving the pendulum a swing is not good enough since it will almost certainly not start in the correct phase relative to the impulses.

With the prop in place, wait for the next impulse, this will give the pendulum an impulse and move it towards the pole pieces, the prop will then drop out so have it on a piece of cotton or get ready to catch it. Increase the pendulum amplitude with a few strokes of a finger and close the door such that the crutch is on the right of the pendulum rod.

Readjusting the pendulum
If you are lucky the clock will now run, but almost certainly it will stop. When running properly there is a visible jerk of the pendulum every time there is a half-minute impulse. If the clock stops you must adjust the pendulum, (now compound) so that its

period is half-seconds. Stop the clock and adjust the pendulum again a turn at a time. Keep records or you will forget what you have done. Keep on restarting the clock and monitoring it until it works with maximum pendulum amplitude.

Setting the clock to time

With the case open, and the crutch pushed to the right, the hands may be rapidly advanced by spinning the wheel nearest to you with your finger. Set the clock to a time which is a minute or so slow of the final time. Set the clock going, close the movement and allow a few minutes for the pendulum amplitude to stabilise. Now advance the seconds hand by giving it a flick when the pendulum is to the right. Final accurate setting can be done by placing a finger on the dial, say at half-past, then flicking on the seconds hand which will then stop at your fingrer, right on the half-past mark.

More information?

It has taken me some time to decode this clock. It is not very surprising that these slave were scarce in number, due to their specific purpose, and due to their finicky starting and setting up. If you have any comments or improvements on dealing with these slaves, then please let me know.

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