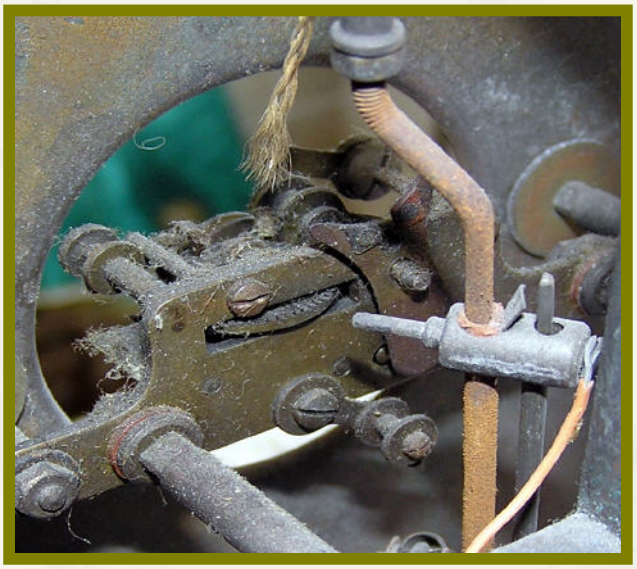
# Restoring A Bulle Clock
# A practical Guide

**Demonstrating the restoration of a Tall Bulle under Glass Dome - Serial No 3824**





*Peter J Smith*

# Section 1

# Bulle Clock Principles

# 1. Bulle clock Principle

The principle involved in the Bulle clock is very simple. Consider the large curved magnet on the base of the clock. This is normally magnetised with 3 poles. Yes I do mean 3 poles. North at the ends and South in the middle. In fact it does not matter whether it was the other way round South North South. It would only mean switching the battery terminal the other way round. Now, as you probably remember from your school days, if you pass a current though a long coil of wire you would invoke a magnetic field.

The poles would depend on which way you connected the battery. If you were therefore to suspend this coil of wire on the end of a rod so that it encased the bar magnet but did not touch it then you have the potential for the magnet to attract one end of the coil to one of it's poles. So if you were able to switch the current on and off at specific points in the swing cycle you would in fact start an oscillation of the coil first being attracted to a pole and then when the current is disengaged the pendulum would fall back to rest. But it's inertia would carry it in the opposite direction past it's resting point.

If you keep switching the current on at the right point then the amplitude would increase until the force of gravity would match the attraction of the magnet and the pendulum settled into a consistent amplitude of swing. Perfect for a clock.

You can experiment with this yourself "by hand". Before the movement is replaced connect the negative side as normal to the frame and also wire the loop past the suspension to the pendulum rod. Then you can tap the silver contact pin on the pendulum with a wire connected to the positive terminal of the battery. Make the connection at the bottom of the swing when the pendulum is swinging to the right. Disconnect before it reaches maximum amplitude. If your timing is good and your reflexes are accurate then the pendulum, will gain in amplitude and it will be quite easy to maintain it.

So now all the Bulle has to do is two things. Provide a switching mechanism and interpret the pendulum swing into displayable time. The movement sub assembly does this by providing a fork mechanism for the pendulum contact pin and a train of gears to drive the hands. The fork has a silver contact on one side and a fibre contact of the other.

When the pendulum swings the contact pin will connect with one side or other of the fork depending on which way it is swinging at the time. If it is the silver side then the circuit is completed with the battery and the coil performs its duty and interacts with the pendulum as we discussed. On the way back it leaves the fork in its rightmost position and crosses to the left side where it engages with the fibre.

Now this being a terrible conductor does not allow a circuit to be completed and therefore provides no current for the coil and the pendulum swings undisturbed. Meanwhile a pawl which is attached to the other end of the fork arbour is also pushed backwards and forwards with each swing of the pendulum. On swinging to the right the pendulum forces the pawl to engage with a ratchet wheel which then moves one ratchet tooth to the right where it it stopped from returning by a second pawl. The pendulum then swings back to the left and the first pawl slides back over another tooth but does not drag it back. The process repeats when the pendulum then swings to the right.

## Wiring

The actual wiring for this complete cycle of events is therefore simple. The negative terminal needs to be permanently connected to one side of the coil while the positive side needs to be connected intermittently via the fork and contact pin.

## Negative Side

So from the negative terminal on the battery in the base of the Clock the black wire should connect to anywhere on the column of the clock. Nothing as sophisticated as this was available to the earlier models though. The whole column was, in effect, the negative side of the circuit.

This is normally one of the three or four screws that hold the column to the base. Later clocks continue the wire up the tube and exit from the hole on the side of the smaller column tube that holds the movement sub assembly. From here it passes to an arm at the top of the column.

This is then connected to the pendulum via a coiled hair spring (**photo 1/1**).Because the suspension unit separated the pendulum from the column via two

pieces of non conductive silk there needs to be a method of jumping the gap.

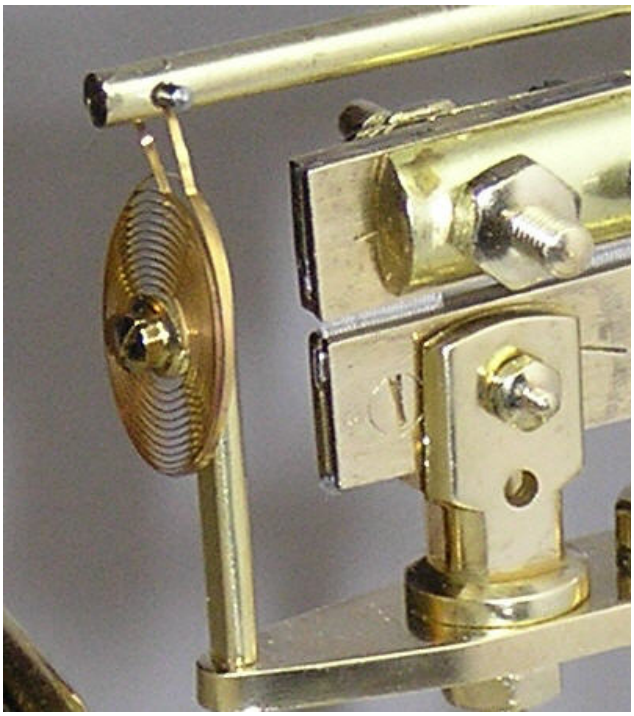


**Photo 1/1**

This is achieved by connecting a long loop of silver coated wire from the top suspension nut and bolt to the lower nut and bolt. The lower connection was sometimes made via a small screw attached just underneath the suspension bolt (**photo 1/2**)

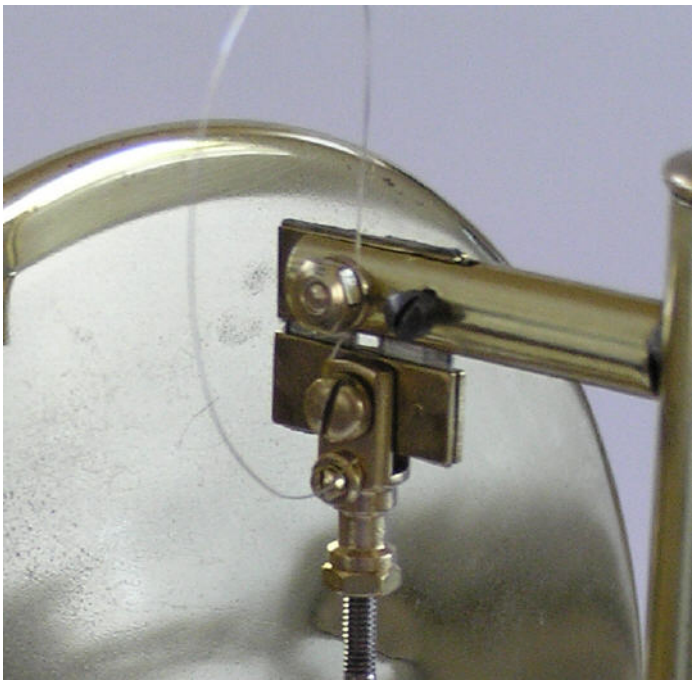


**Photo 1/2**

The negative side now could travel all the way down the iron rod to the first of two wire connections that attached the coil.

This one would not normally be seen as it was inside the coil cover. As the iron pendulum rod was bolted to the cover all that was needed was to wrap a few loops of the coil wire around the end cap spacer tube which was then pulled up tight to the coil cover by the thread on the end of the iron pendulum rod. The current could then flow around the coil and out the other side.

This side must now be insulated completely from the cover and any other part of the frame. So it starts it's journey back to the positive side of the battery by looping though an insulating waxed material tube that passed though the brass coil cover and up to the thin brass rod that traveled up the back of the iron pendulum rod but still insulated from it. This rod must not touch the pendulum at any point so it also is pushed down into the same wax jacket. The top end of the brass rod terminates in a small bracket in which is embedded the silver contact pin.

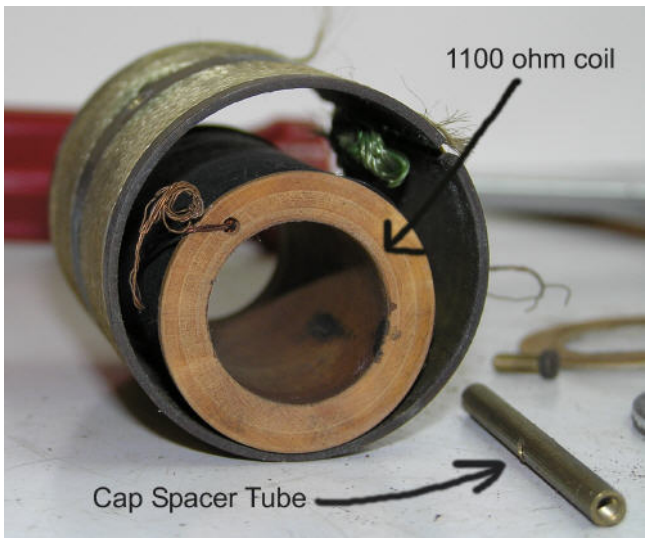



**Photo 1/3**

This bracket must also be completely insulated from the iron pendulum rod. It does this by using a fibre sleeve that completely encompasses the iron pendulum rod before being clamped tight by a screw. The silver pin is therefore the end of the line for our wandering negative connection.

**Positive Side**

Now for the positive side. This starts from the battery up via the red wire through the column to appear at the small hole on the side of the smaller top column. It must be completely insulated from the column. It then travels a short distance in the open air to a nut on the back of the movement. The movement itself is insulated from the rest of the clock by fibre washers that are positioned

in front and behind the movement at the two points where it is bolted to the frame. If these fibre washer are missing then the clock ain't gonna work. As the fork is part of the movement it becomes the closest positive point to the negative silver contact pin.

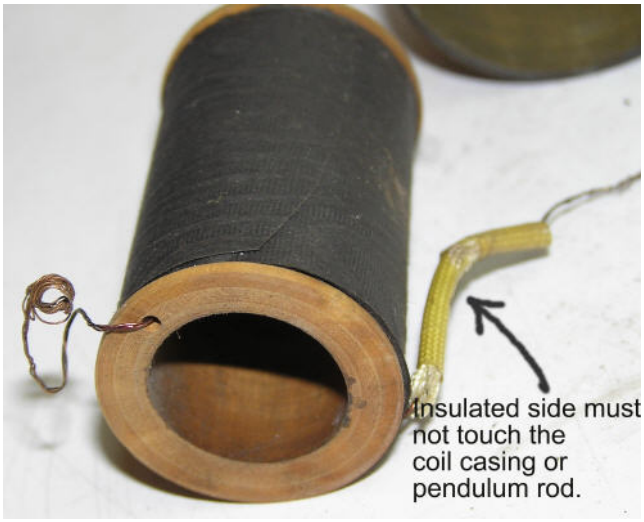



**Photo 1/4**

So if the pendulum swings to the right the pin will contact the fork and the circuit is made thereby passing a current through the coil and inducing a magnetic field that drives the clock. It does this at the lower end by passing (still in its wax jacket), through a brass lug that protrudes backwards from the top of the brass coil cover. It then attaches to the brass vertical rod via two nuts and washers between which the wire is clamped.