The Nobles Stromberg Mystery Movement: Model 31

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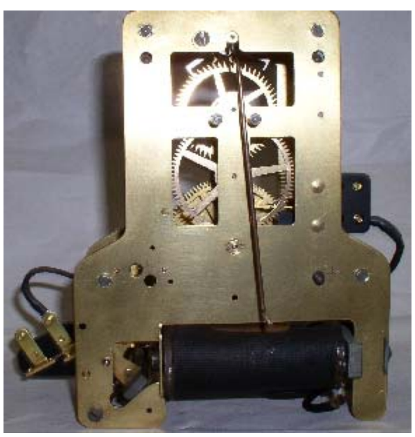
We rarely see Stromberg of Chicago master clock movements. In over 8 years of doing business on the internet and 32 years prior to that, we have seen perhaps 8 in all. I believe them to be fairly rare. A large part of the reason may be their oddball voltages (10 volts and 20 volts), and somewhat plain style cases. Given these factors we guess that they tend to be disposed of instead of conserved. This is horrific, but likely to be true, despite the fact that they are remarkably well engineered clocks. With simple servicing and care they could run reliably for many decades!



Self Winding Clock Co. units are relatively plentiful because of their much more intriguing case styles and of course the readily available substitute power sources (a pair of D batteries will basically run them). We have no history on the relative number of Stromberg master clocks produced, and even less data on how many may have survived, unfortunately.

The most common Stromberg movement we see is the Model 45. It is a minute wind unit with a contact switch actuated by a cam on the seconds shaft of the movement. However there were vibrating motor hourly wind units produced as well which we believe pre-dated the minute wind. We don't know how many of these remain in existence, but we were fortunate to come upon a 120-beat example that needed enough work to warrant some investigation into its nature.

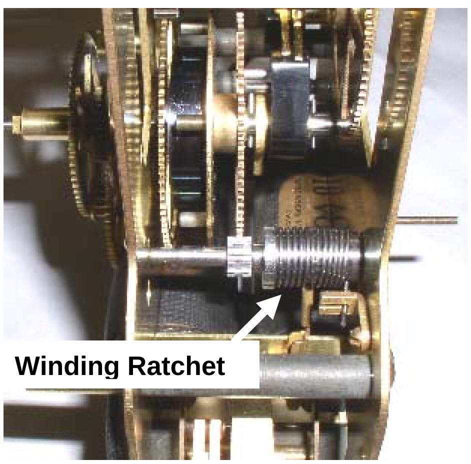
The plates are marked "1418-V." The coils on the clock are marked 10V. The owner insisted that the clock was marked as 10 volts. However it must be noted that we could not, no matter what we tried, get this unit to wind correctly, let alone efficiently on 10 volts. It would simply quiver, but would not wind strongly. No contact adjustment was of help in curing the problem. Coil resistance was 80 ohms. Our experience with Model 45 movements is that the 10 volt versions were 30 ohms.

We hypothesized that perhaps there was some external electrical resonant circuit arrangement with these vibrating clocks to help boost the winding efficiency. But this does not make sense either. You cannot boost the current, which is limited by the coil resistance to be 125mA at 10 volts, if this were the voltage intended. It's the current that determines the magnetic field strength needed to move the massive motor armature and drive the heavy winding train.

There is great similarity in function between the SWCC Style F and the Model 31. We compared the magnetic strength of a 3 volt Style F coil pair with a DC bias of 3 volts applied, to the Stromberg coil pair with 10 volts applied. The Stromberg was notably weaker in magnetic strength at 10 volts, but very similar at 20 volts. Given that the mainspring is wider and stronger on the Stromberg than the Style F, the motor components heavier and winding drag substantially higher; it does not add up that this particular Stromberg would be meant to operate at 10 volts.

We measured the power required to drive the Stromberg and ultimately concluded it required 0.88 watts average power to basically operate properly (which occurs at 16 volts). This compares very favorably with the SWCC 24 volt models that require 1.2 watts to operate. It is despite the heavier motor, mainspring, and overall winding mechanism resistance of the Stromberg Model 31.

As received, the mainspring was disconnected and the arbor pin sheared off at the arbor. These problems were easily rectified and the mainspring cleaned, replaced in the cage and pre-wound 3 turns. Notably, even when the mainspring was disconnected the motor would weakly vibrate at 10 volts, and then would stall to a quiver when any practical load was placed on it.



The winding ratchet is a spring-friction affair. It offers substantial resistance to movement. However it also could not be adjusted for less resistance without negatively affecting the winding efficiency or function.

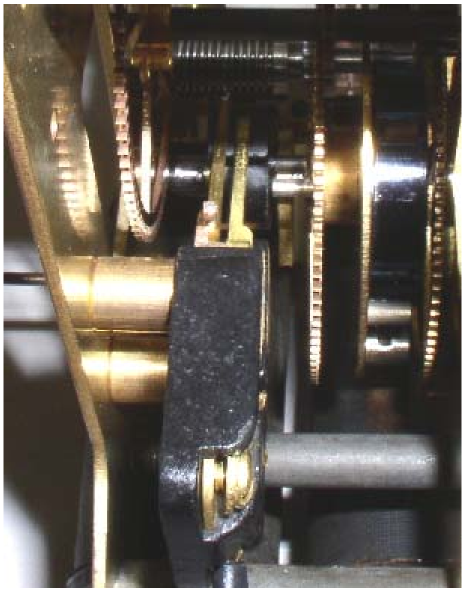
Once all the usual mechanical issues with the clock were rectified, a 1500 ohm shunt resistor was placed across the coil to provide damping of the flyback voltage from the coil. Operating current jumped from 60mA at 19.2 volts to 80mA. Looking closer, we realized that the damping resistors were already built into the coils! This represented innovation! It avoided the issue of the delicate outboard resistors being damaged on these clocks. There is a thick wire and a thin wire going into the coils. The thick wire is the copper turns. The thin one is evidently the damping resistor, probably wound non-inductively. So the 1500 ohms was removed. We do not know what the actual resistance is, but there is no sign of any arcing at the contacts at all.

As delivered, there was botched work performed by a previous clock person. Because the arbor pin was sheared off, the hourly cam was inoperative. To achieve an hourly wind, the switch was fastened into the top of the plate, with holes haphazardly drilled, and machine screws used to hold down the switch. To actuate the contacts, the minute pipe wheel had a “lump” soldered to it such that as the hands turned, the “lump” pushed up on the contacts and caused the actuation of the winding mechanism. Of course this was pure folly, because:

1. The winding would actuate when the hands were set, or could miss winding for the same reason,

2. Once it started, the winding would not stop until the "lump" had advanced and released the switch. This would force wind the spring fully and then it would force forward the escape wheel in a death spiral.
3. Battery life would be dismal and switch life would be right behind it.

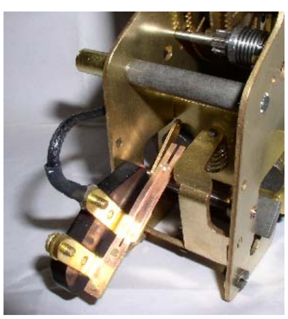
The poor workmanship resulted in a broken switch that needed remolding to repair. The repair was perfect but then the contacts needed to be trimmed to work in the cam arrangement. The offset was chosen to be about .120" between the upper and lower contacts which achieved a 100% reliable winding.



The larger contact was reconditioned with .01" palladium because it was burned nearly through. The other contact, much smaller, had plenty of material remaining and was reused. It was hypothesized that palladium would be a good alternative contact material to platinum, and was therefore selected. It is a very close cousin to platinum but is much more affordable. It is difficult to know for sure whether the originals were platinum or palladium. No doubt platinum was rather expensive in its day as it is now.

It is also worth noting that, unlike the SWCC Style F, this movement will not suffer from contact drag. The contacts are forced together by the release off the cam of the upper contact, and the winding is stopped when the advancing cam releases the lower contact. So, commutation of the winding is quite positive!

The movement was not clean as received, but was functional. It was cleaned, dried and inspected. All pivots were polished. Bushing restoration was minimal, with only the winding ratchet upper hole requiring attention. The pallet faces were worn and out of adjustment but this wear was easily polished out and adjustment made to the relatively soft pallet arms. This movement shaped up to be a rare beauty. It is notable that the overall time train wheels could be interchanged with the Stromberg 45 units. Of course the main wheel and ratchet wheels have some obvious differences.



As fully reconditioned, the motor contact pair was polished to remove burn and pit marks. They were reusable. They were adjusted to provide the most efficient winding. The upper bumper spring was adjusted to be .062" above the contact release. This is a similar requirement to the SWCC vibrating motor. Without any other maintenance information this adjustment seemed appropriate and worked well. Later, this position was varied but no improvement in motor behavior was noted. The wind time was as noted below.

Operating Voltage. To test the optimum motor voltage vs. battery life we stepped up the voltage and observed the result. Battery life numbers exclude effects of idle current from converter and self discharge of cell, and are for comparison only.

Voltage (volts)	Wind Time (sec)	Start Current (mA)	Current (mA)	1900R Battery Life (hours)	mWatt-sec	Comments
10	35	125	30	5485.714	10500	Starts ok then quivers
12	11	150	50	8727.273	6600	Very weak wind
14	9	175	50	9142.857	6300	Weak wind
16	7.2	200	55	9090.909	6336	Acceptable wind
18	6	225	60	8888.889	6480	Strong Wind
19.2	5.3	240	63	8984.726	6410.88	Exceptionally strong wind, almost strained

Conclusion: Winding voltage around 16 volts gives an acceptable wind and the best battery life.

Based on the above, we decided on a 16 volt operating point for reliable operation. Keep in mind that this clock will draw 200mA peak at start, manageable by the 1900R-16V but not recommended as a continuous load rating for the device. The series PNP within the device will begin to self limit if the motor is somehow left stalled.

It is possible that a lower voltage could have been used if the pre-wind tension on the mainspring was lowered. This might result in longer battery life and might be worth exploring. However it might also be futile since it is unlikely that the mainspring tension differential gain by so doing is much in comparison with the drag from the winding system overall.

In conclusion we made the decision to go with a 16 volt winding voltage. The 1900R-16V battery life calculates to be on the order of 9091 hours with the given wind time and load. This neglects power supply leakage current and battery self-discharge, which of course will likely lower the value by close to 40%. Realistically, a 6-7 month run time between charges is to be expected.

Also note that it is difficult to tell an entire story from a single clock. Hopefully we will see more clock movements like this in the future from which we can fill in gaps. In the meantime, it is the judgment of this author that running this clock on 16 volts will not harm it in any way, and will give it reliable performance with a very long battery life.