Alexander Bain Electric Pendulum Clock – Additional information

How did it all begin?
Between 1841 and 1852 Scottish-born Alexander Bain (1810-1877) took out a series of patents for electrically-driven pendulum clocks. The Hunterian’s clock relates to an Edinburgh patent from 1845. His clocks were electrically driven, and capable of electrically controlling other geographically distant clocks. Bain realised the technical possibilities of connecting clocks electrically: one central clock could drive many others, exactly synchronised. In 1846, Bain tested his theory. He installed a telegraph line alongside the railway from Edinburgh to Glasgow and showed how one of his electric clocks in Edinburgh could be used as a master to synchronise a connected clock in Glasgow.

Extract from *A Short History of the Electric Clocks* (1852) by Alexander Bain
How was it powered?
Bain's original designs were powered by an 'earth battery' consisting of two electrodes, one made of zinc, the other made of copper or carbon, buried in the moist ground. The pendulum bob contains a coil of wire, and the two brass "arms" fastened to the clock case contain permanent magnets. The electrodes in the ground created a circuit inducing a small but stable current to flow through a coil of wire within the pendulum bob.

Where did the pendulum fit in?
The pendulum operated a sliding switch – here’s how:

The electric current running through the coil had the effect of making the pendulum temporarily magnetic. When put in motion by a small push, the pendulum was attracted to one of the two permanent magnets inside brass tubes on the sides of the clock case. As the pendulum swung, a sliding switch higher up the pendulum rod passed over and beyond gold contact points, breaking the circuit (like an ‘off’ switch). With no electric current, the pendulum is no longer magnetic and so its own weight pulled it the other way.

As the pendulum swung back in the opposite direction, the switch closed to its ‘on’ position, completing the circuit again. This meant the pendulum bob was once again magnetic and being pulled to the opposite permanent magnet. So the process continued leading to the familiar back and forth movement or “oscillation”.

The motion of the pendulum itself drove the clockwork, and the pulsating current could be readily routed (by cabling) to drive duplicate clocks elsewhere.

What is different about an electric pendulum clock?
Unlike nearly all other pendulum clocks, where the clockwork drives the pendulum, Bain's system was the reverse of that. This was marvellously ingenious and as well as the ability to drive other clocks, it did not need to be wound up. However, it did not keep time accurately, since the pendulum was not isolated from outside influence as it is in a normal clock. Thus, our clock must be regarded as a pioneer rather than as a prototype.