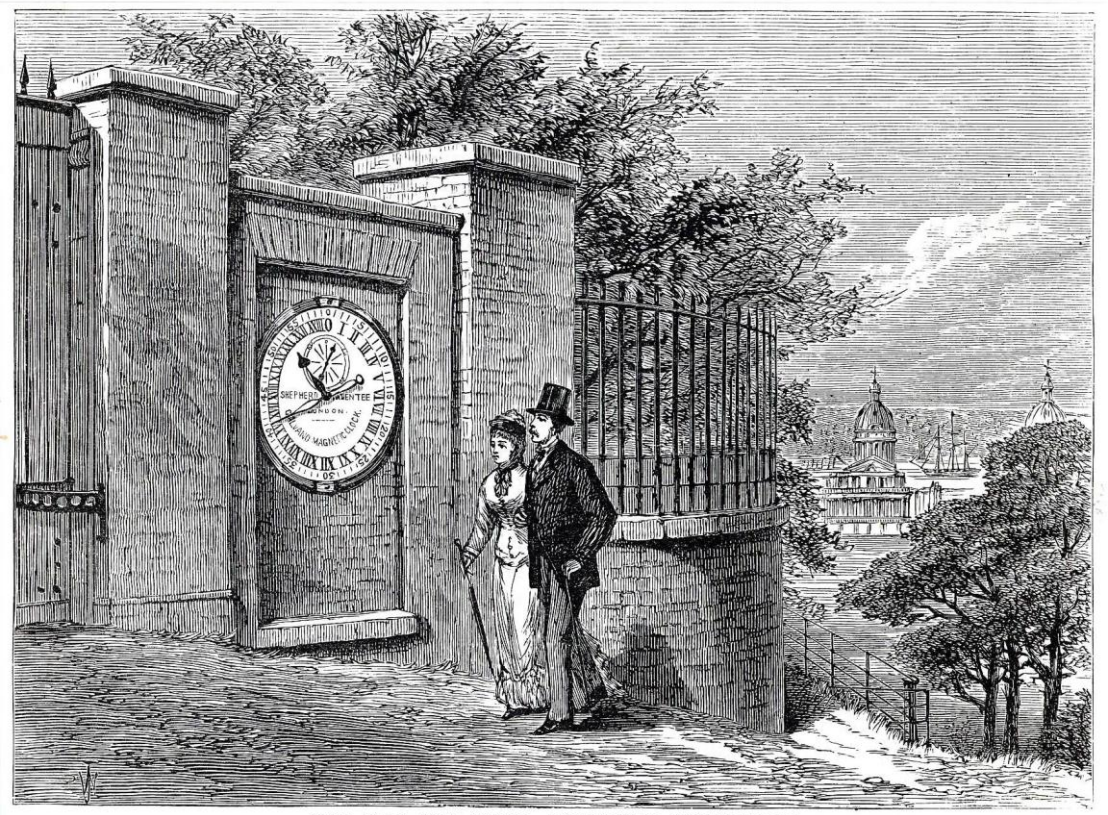
# The Charles Shepherd Electric Master Clock System

The 24 hour slave dial of Charles Shepherd's electric clock system, placed outside the front gate of the Royal Observatory at Greenwich, is famous all over the world because it represents the time at zero longitude, the world's prime meridian.
This engraving was published in 1883.



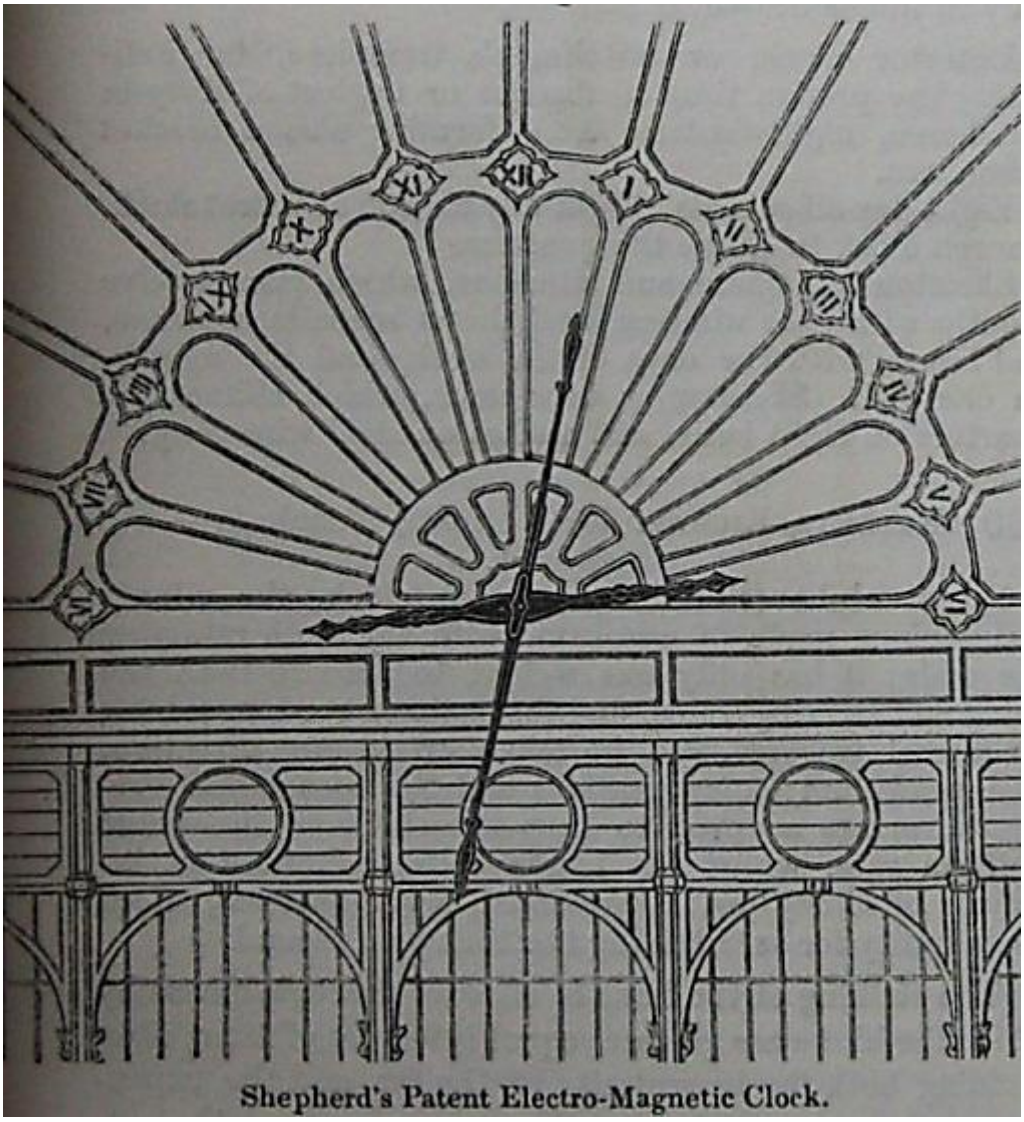
THE MAGNETIC CLOCK, GREENWICH OBSERVATORY.

It would seem to be a paradox, therefore, that almost nothing is known about the Shepherd electric master clock itself. However, that is because its mechanism, as exemplified in his patent of 1849, was not reliable and few examples survive. Nevertheless, his ideas in combining clockwork with telegraphy, in combination with the support and involvement of Sir George Airy, the Astronomer Royal, had a fundamentally important role in introducing GMT in the UK.

Shepherd's patent was an early example (perhaps the earliest) of using electricity to reset the gravity arm of a master clock. The system was first seen by the public in the Crystal Palace when the Great Exhibition was opened by Prince Albert and Queen Victoria on 1st May 1851.
The British Nave at the Exhibition was designed to show the latest British achievements in science and technology and amongst the newest technologies exhibited were examples of the electric telegraph. A technology that, as well as sending messages in Morse code, could also be used to send time signals along the wires.

It was intended that the Shepherd System would be used to provide standard time at the Exhibition but, unfortunately, the system, failed to perform reliably. (Just as the Shepard system that was delivered to J. F. Pawson & Co. in 1849 soon failed.)

1851 Great Exhibition Catalogue Illustration



Shepherd's Patent Electro-Magnetic Clock.

Ever since the introduction of telegraphy, Airy had been keen to replace local time in the UK (based on sundials) with Greenwich Mean Time.
In 1852 with the Shepherd clock in place, Airy arranged a connection to the railway's telegraphic system and GMT pulses from the Shepherd system began to be sent to the GPO and the Railways on the hours agreed.
From then onwards, local time began to be replaced by unified time by sending signals from Greenwich Observatory, along wires to other parts of the country.

Sir George Airy makes it clear in his autobiography that he had visited both the Crystal Palace and Pawson & Co in order to examine the Shepherd system, so he must have known that it had problems. Nevertheless, he recognised its potential in connection with the distribution of time and placed an order for the Observatory that was delivered in 1852. In addition to problems with reliability, the master clock could not have been a good time keeper because all the energy used for switching was taken from the pendulum itself.

Nevertheless, if the Astronomer Royal was to make progress with his plan to replace local sundial time by the distribution of GMT on a national basis by telegraphy, It seems certain that he had little choice but to "make do" with Shepherd's system. Once the distribution of GMT was complete, there would be no difference in time according to location because all locations would show Greenwich Time.

Greenwich Time was called mean time because each hour was of exactly the same duration. This was in marked contrast to sundial time in which the length of the hour varies according to the season and time of day; the day being longer in the summer than in the winter.

The working principles and details of Shepherd's master clock can be understood by examining his patent No.12,567 of 1849. However, it is a great deal easier to understand it (including its inherent weakness with respect to the amount of work that must be carried out by the pendulum) by reference to the simplified diagram and text provided by F. Hope-Jones in his *book Electrical Timekeeping* first published in 1940.

The Shepherd master clock is of great historical interest because of its important role in the dissemination standard time on a national basis.
In spite of this Hope-Jones wrote,
*"The inventor and George Airy himself expected great things of it as a precision regulator; but If you refer to the diagram of the Shepherd mechanism you will see how primitive and crude it is. It leaves us wondering how Airy, whose papers on pendulum mathematics and theory have long since been recognized as classics, could have entertained any such hopes".*
In other words it could not have been a good timekeeper. However, there can be no doubt that Airy realised this and the reason he used the system has been ignored by Hope-Jones.
In my opinion, it was the very great interest that the Astronomer Royal had in introducing unified time in the UK, and the importance he attached to that objective that allowed him to use the clock. It was, at that time, the only gravity arm electrical clock available to send out pulses of unified time via telegraphy, and that trumped the deficiencies inherent in its mechanism.

Shepherd slave dial

Sold at Bonhams in 2009

Price £7800

David Read – April 2015