

The Great Melbourne Telescope Project

A Joint Venture by Museum Victoria, The Royal Botanic Gardens and the Astronomical Society of Victoria

7. The Great Melbourne Telescope's Clock Drive

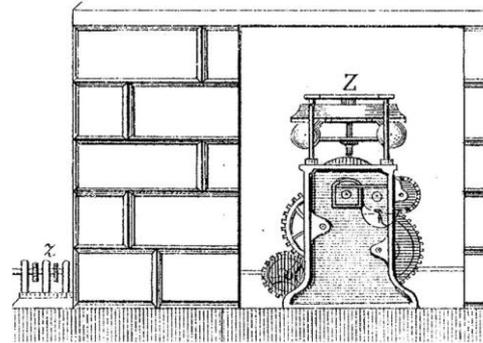
The Great Melbourne Telescope (GMT) shown below was installed and commissioned in the Melbourne observatory in 1869. In its day it was the largest fully steerable telescope in the world. Thomas and Howard Grubb of Dublin Ireland engineered many technical innovations for the GMT. One of these was the precision clock drive.



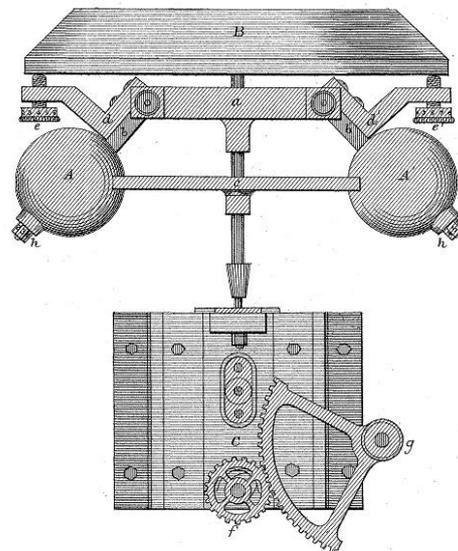
The GMT at Melbourne Observatory 1870. The clock drive can be seen in the southern pier alongside the gentleman.

The polar axis drive mechanisms employed in telescopes of the day used weight-driven clockwork devices with speed regulation by means of a centrifugal governor. The governor was a device originally invented for limiting the speed of steam engines subject to varying loads and steam supply. Even under favourable circumstances, such governors can only be relied upon to within about one or two percent of the desired speed. Small differences between the rotational rates of the telescope and the Earth are magnified by the same factor that applies to the object being observed. For tasks such as precise measurements of the separations of double stars and photography with extended exposure times, much greater accuracy was required. Thomas Grubb and his son Howard devised and applied new methods of manufacturing gears to minimise periodic errors in the GMT polar axis drive train. A few years later, Howard perfected a secondary governor controlled by a clock

escapement that was held synchronous with regulator clock beats to produce unprecedentedly accurate tracking of the stars. These modifications were applied to the GMT.



The original Robinson & Grubb GMT clock drive mechanical drawing.



The GMT clock drive showing the governor spheres which regulate the speed.

The Great Melbourne Telescope Project Information Fact Sheet

This fact sheet is one of a series providing information on the GMT historical background, technical details of the instrument and the efforts to reconstruct this magnificent telescope for use by the public.