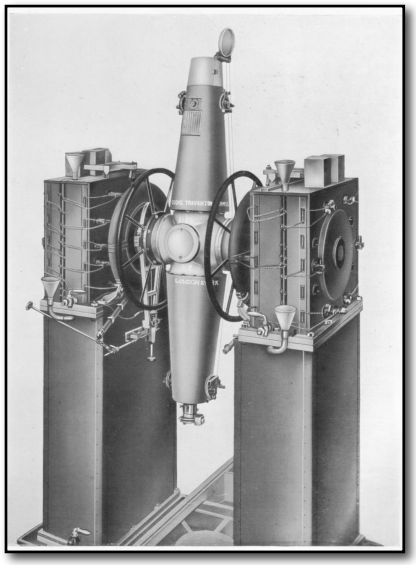
# The Gill Reversible Transit Circle (RTC)

## The Telescope

In 1897 Sir David Gill, dissatisfied with the performance of the old Airy Transit Circle for measuring the positions of stars, designed an entirely new type of instrument. It was constructed in London by Troughton and Simms and put into service here in 1905.

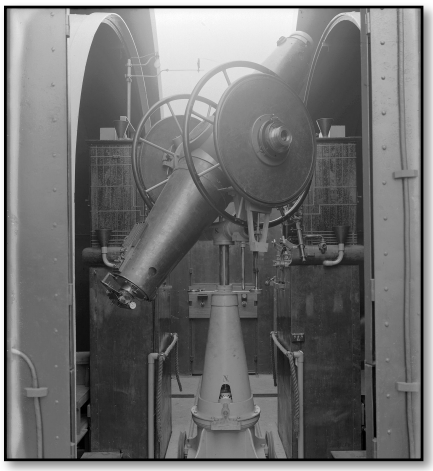


## Special features

The mounting was filled with water to give high thermal stability. The telescope itself was designed so the eyepiece and lens ends could be exchanged.

In addition, the whole telescope could be lifted off its bearings and turned around east-west (the "Reversible" in its name).

These features ensured that even the smallest deformations of the tube and mount could be measured and allowed for.



*Above: Reversing the telescope on the special trolley. The tube could be completely removed so that the collimators could face one another.*

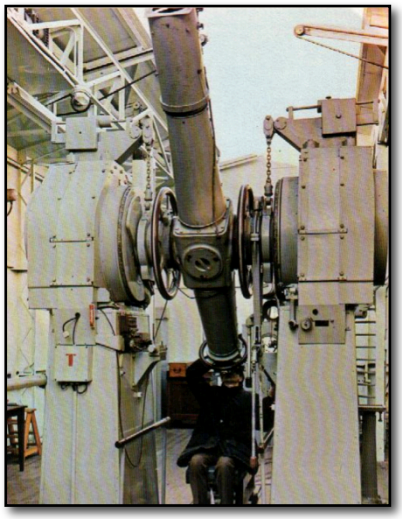
## Observing

The sidereal time when a star reaches its highest point in the sky gives its Right Ascension (similar to geographic longitude).

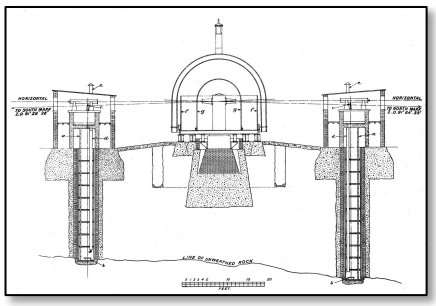
First the telescope is set to the expected position of the star. The observer then looks through the eyepiece and moves the telescope so that the star passes exactly through the centre of the cross-hairs. Then he presses a button to record the time on a paper tape machine located near the telescope.

In older instruments the observer's personal reaction time could affect the timing. This telescope had a motor-driven cross-hair moving at the same speed as the star image so that all he had to do was to get the star on top of the cross-hair before pressing the button.

Originally, the north-south position of the star, called its Declination (like geographic latitude) was measured off the large circular scale by six microscopes and the readings were averaged afterwards. After 1960 the scale was photographed automatically by six cameras and the films were scanned and digitised afterwards to save observing time.



## The Building



*Above: The RTC Building and its two collimator houses that are connected optically to the bedrock for aligning the telescope. Much further away to left and right (not shown) are the two mark houses. Also not seen in this view is a small building nearby which used to contain a darkroom and a radio receiver for time signals.*

*Below: The housing as it appeared in the 1960s when open. Unlike a normal dome, it only had to allow the meridian (north-south line) to be viewed.*

The building was constructed by T. Cooke and Sons of York out of sheet steel and incorporated many novel features designed to keep the temperature stable. The roof and walls have hollow layers designed to carry away the heat of the Sun by convection through chimneys at the top.

The wells under the collimators were used to refer the north-south line to the bedrock.

Deep trenches were dug around the foundations to control the ground water level. The swelling of wet soil was enough to disturb the level of the telescope.

*(left) Gill's design was highly successful and was copied elsewhere, for example, at the Royal Greenwich Observatory (UK, 1936), San Fernando (Spain, 1948) and Carlsberg (Denmark, 1952).*

This telescope was in nightly use for 65 years - until the late 1970s.
Most precise star position measurements are nowadays carried out by satellites such as Hipparcos and Gaia, though there is not always one available.