David Gill (1843-1914)

and the RTC

Maciej Soltynski

Astronomical History Symposium

March 2018

Born 12 June 1843

48 Skene Terrace, Aberdeen

Father & Grandfather were successful watch and clock makers

Went to Bellevue Academy - a local school - until he was 13

Had a chemistry lab at home

1857 (age 14) at Dollar Academy

“He boarded with the head master, Dr. Lindsay, a man with scientific interests in mathematics, natural philosophy and chemistry, the very subjects for which the boy's mind was naturally receptive; and this was his first introduction to science.”

Forbes 1916

Non-degree student at Marischal College – Aberdeen
1858-60

“I have set up a model of Airy's Transit Circle, and described it to my advanced class to-day. That institution is working well, with a steady attendance of fourteen, who have come of their own accord to do subjects not required by the College.”

James Clerk Maxwell, 1857

1860 – leaves college and joins the family business

1861-1862 – trains as watchmaker in England, Switzerland and France

1863 – Proposes timekeeping service for Aberdeen. Meets Piazzi Smyth. Sets up transit circle at Kings College – uses it regularily

Later again meets Maxwell, who introduces him to Kelvin

1867 – Buys 12 inch reflector and builds an observatory at Skene Street. Photo of the Moon (Huggins, Lindsay), stellar parallax etc

1869 – Becomes head of the watchmaking business

1870 – Marries Isobel Black

Astronomical clock at Besancon Cathedral

1872 - Becomes Director of Lord Lindsay's new observatory at Dun Echt
now he is a fulltime astronomer

1874 – Mauritius solar parallax 8.77”

1874 – Ascension solar parallax 8.78” (now 8.794”)

1878 – applied to be Radcliffe Observer, Oxford

1879 – Appointed as Her Majesty's Astronomer at the Cape of Good Hope

The staff at the Royal Observatory at the Cape of Good Hope - 1879

Nobody was better at astrometry than David Gill: rooting out every possible systematic error, using his considerable mechanical expertise to design minimum error systems and his watchmaking skills to build, modify or repair equipment

He was also a superb organiser, getting people to co-operate by his own enthusiasm

He overhauled and extensively re-equipped the Cape Observatory

He produced a series of reference star catalogues derived from Cape Observatory transit measurements

He perfected the use of the heliometer

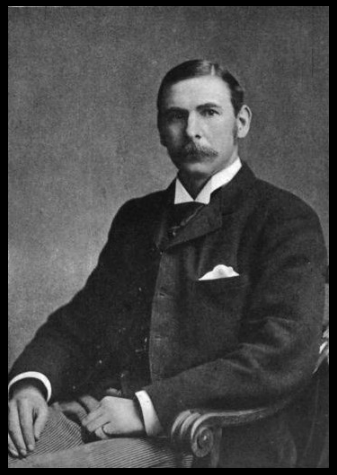
Gill used the parallax of Mars to determine the distance to the Sun, and measured distances to the nearest stars

He was a pioneer in the use of astrophotography, making the [first] photograph of the Great Comet of 1882, which led to a massive project in collaboration with the Dutch astronomer J.C. Kapteyn, and the compiling of an index of brightness and position for some half a million southern stars, the Cape Photographic Durchmusterung

Gill made more observations of Mercury than all other observatories put together and Gill's observations helped Newcomb to arrive at the value for the precession of Mercury, later used by Einstein

Gill is known also for his outstanding geodetic survey work. He established the best geodetic survey backbone in the southern hemisphere, stretching across South Africa and almost up to Lake Tanganyika.

Opposition from the Astronomer Royal



.... if Sir William Christie's (Astronomer Royal 1881-1910) advice had prevailed, astronomers would not now possess Gill's and Kapteyn's Catalogue (C.P.D.); the British nation would not have computed and published Gill's final work on Solar Parallax and the Moon's Mass; the splendid Meridian Marks for his Transit Circle would not have been constructed, and some of Gill's and Hough's work would in consequence have been lost to the world; the staff and equipment of the Cape Observatory would have been seriously crippled; and the Observatory itself would have been transferred from the control of the Admiralty to that of the Cape Colony, with disastrous results.

From: David Gill Man and Astronomer
Memories of Sir David Gill, H.M. Astronomer (1879-1907) at the Cape of Good Hope.
Forbes 1916

The staff at the Royal Observatory at the Cape of Good Hope - 1906

SIR DAVID GILL, K.C.B.

KNIGHT OF THE PRUSSIAN ORDER *POUR LE MÉRITE*
COMMANDER OF THE LEGION OF HONOUR (FRANCE)
HON. LL.D., ABERDEEN AND EDINBURGH; HON. D.SC., OXFORD, CAMBRIDGE,
DUBLIN, AND CAPE OF GOOD HOPE
F.R.S., HON. F.R.S.E., FOREIGN SEC. R.A.S.

Correspondant de l'Institut de France (Académie des Sciences) et de Bureau des Longitudes (France); Foreign Member della Reale Accademia dei Lincei, Roma; Foreign Member of the Royal Academy of Sciences, Amsterdam; Corresponding Member of the Royal Academy of Sciences, Berlin; Corresponding Member of the Imperial Academy of Sciences, St Petersburg. FOREIGN MEMBER of The National Academy of Sciences, Washington; of the Royal Academy of Sciences of Sweden; of the Société Hollandaise Nationale des Sciences (Haarlem); of the American Academy of Arts and Sciences (Boston); of the American Philosophical Society of Philadelphia; of the Italian Spectroscopic Society (Rome). HONORARY MEMBER of the New York Academy of Sciences; of the Société des Sciences de Finlande (Helsingfors); of the Royal Society of Glasgow; of the Royal Society of South Africa; and First Honorary Member of the Astronomical and Astrophysical Society of America. CORRESPONDING MEMBER of the Société Nationale des Sciences, Cherbourg; of the Sociedade de Geographia, Lisbon, &c.

Bruce Medallist of the Astronomical Society of the Pacific (1900); *Watson Medallist of the National Academy of the United States* (1900); *Gold Medallist of the Royal Astronomical Society, London* (1882 *and* 1908); *Royal Medallist of the Royal Society of London* (1903); *Valz Medallist of the Institute of France* (*Acad. des Sciences*) (1882).

The Reversible Transit Circle

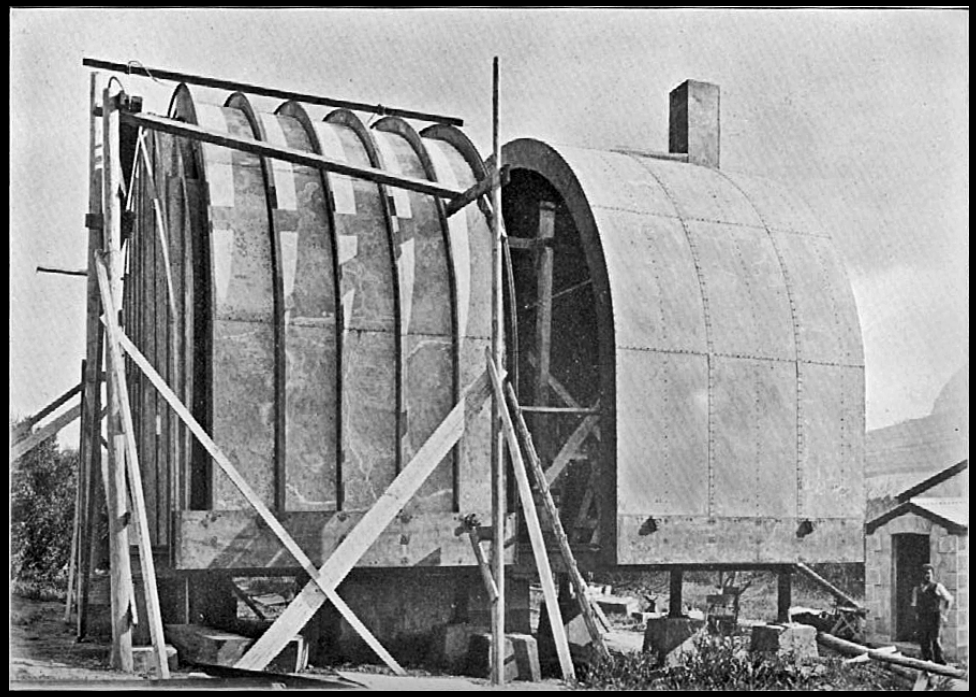
“Soon after my appointment to the Cape in 1879 I drew the attention of the Lords Commissioners of the Admiralty to the fact that there existed at the Cape no refined means for fundamental Meridian observation.

The Cape Transit Circle could neither be reversed on its bearings nor could its object-glass and eye-end be interchanged, …. thus lacking those instrumental conditions of symmetry which are essential for the elimination of a certain class of possible systematic errors.

I also endeavoured to show that a meridian instrument which is placed in an observatory where it is impossible to equalise the internal with the external temperature, could not be relied upon for the determination of fundamental Declinations, on account of the abnormal refraction introduced by the conditions of the installation.

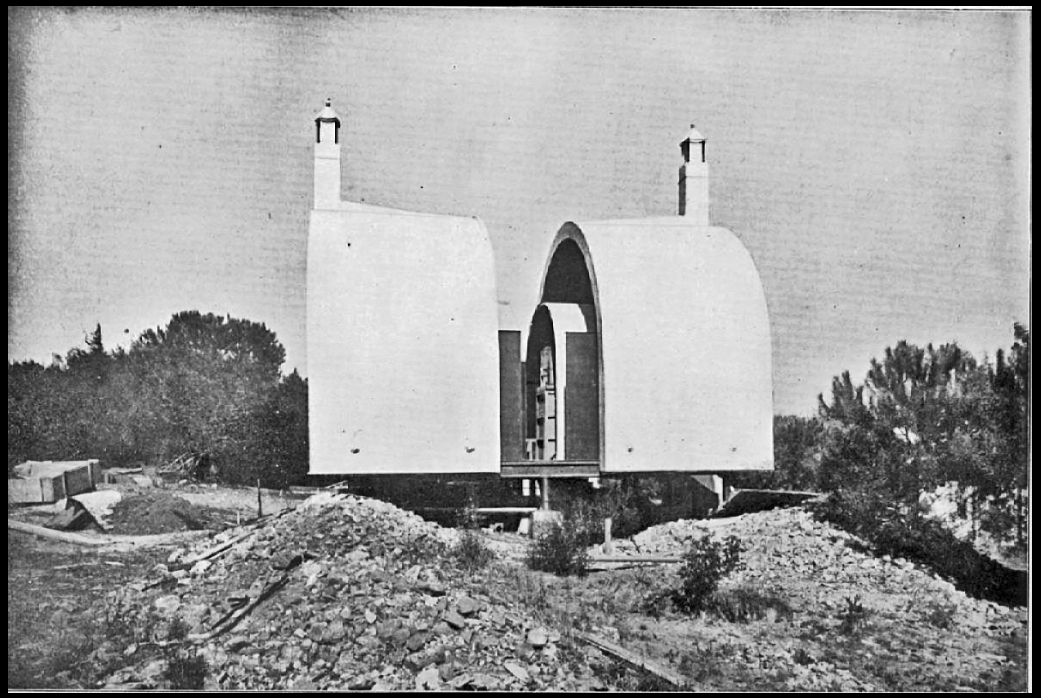
These views, however, were, not accepted for many years, and it was not until 1897 [19 years later]-that estimates-for the construction of a new Transit Circle and observatory were sanctioned. Specifications were at once prepared, both for the Transit Circle and its observatory.”

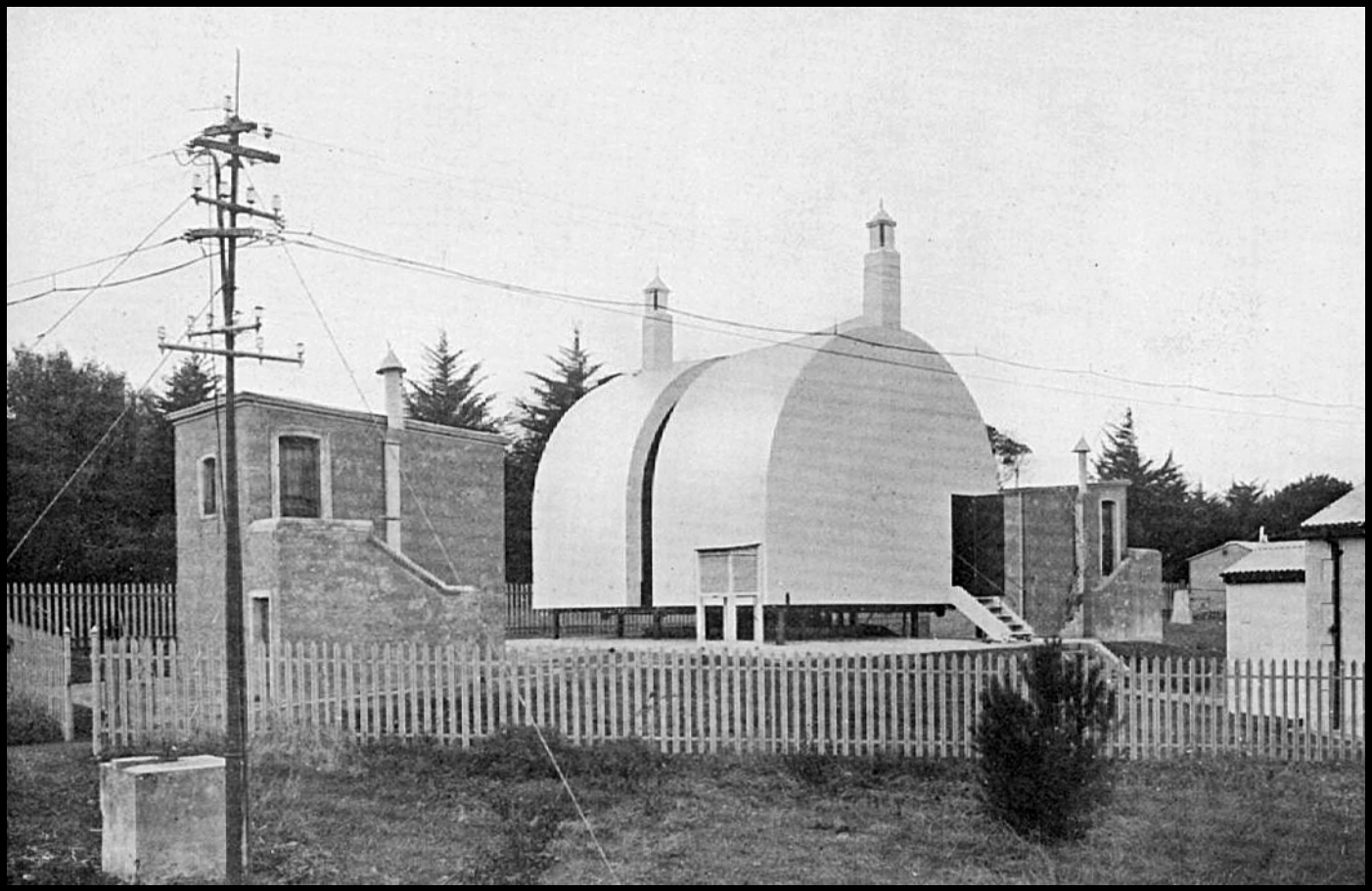
Gill, D A History and Description of the Royal Observatory Cape of Good Hope 1913 – (Part III pp 36-117)

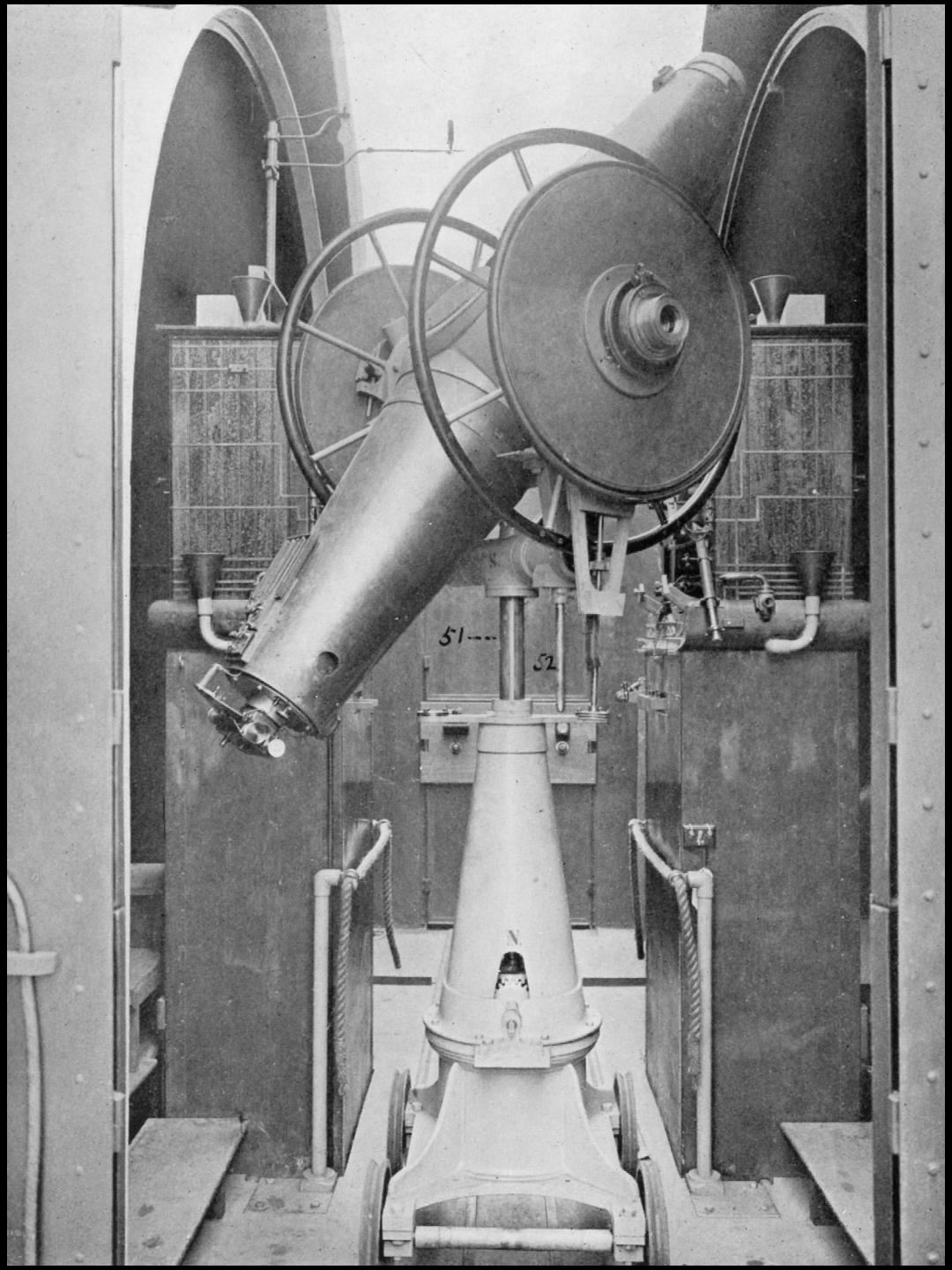


The Reversible Transit Circle

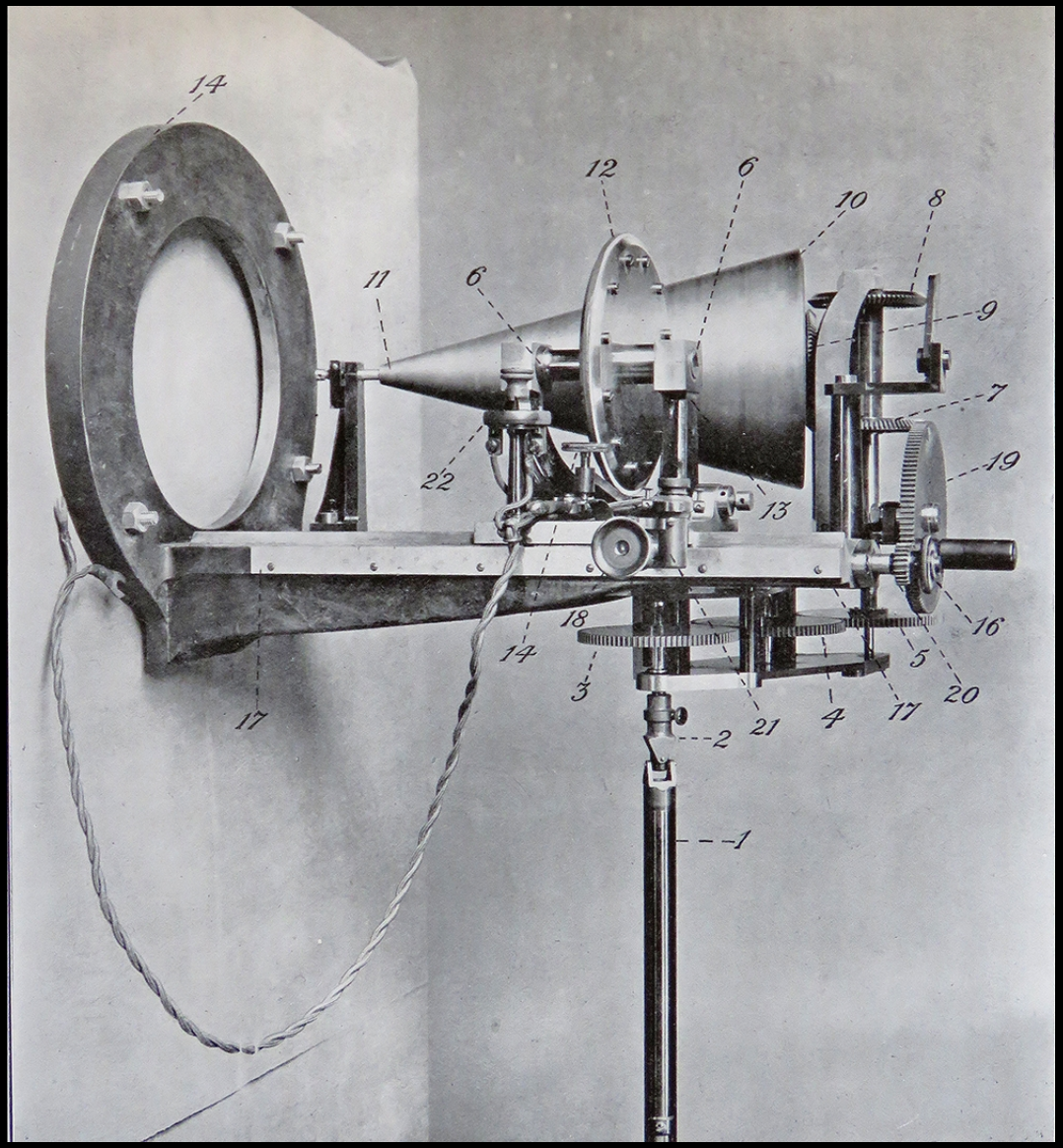
1900



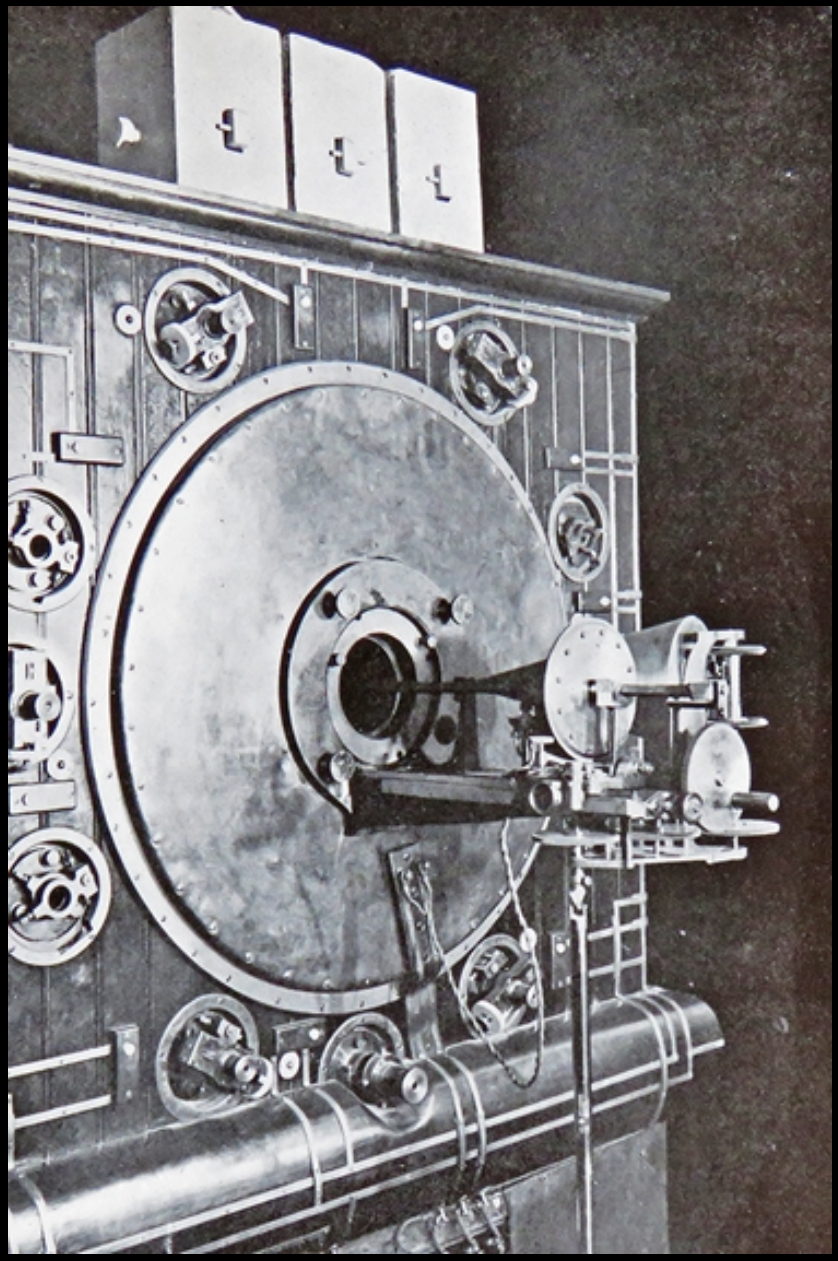



51
52

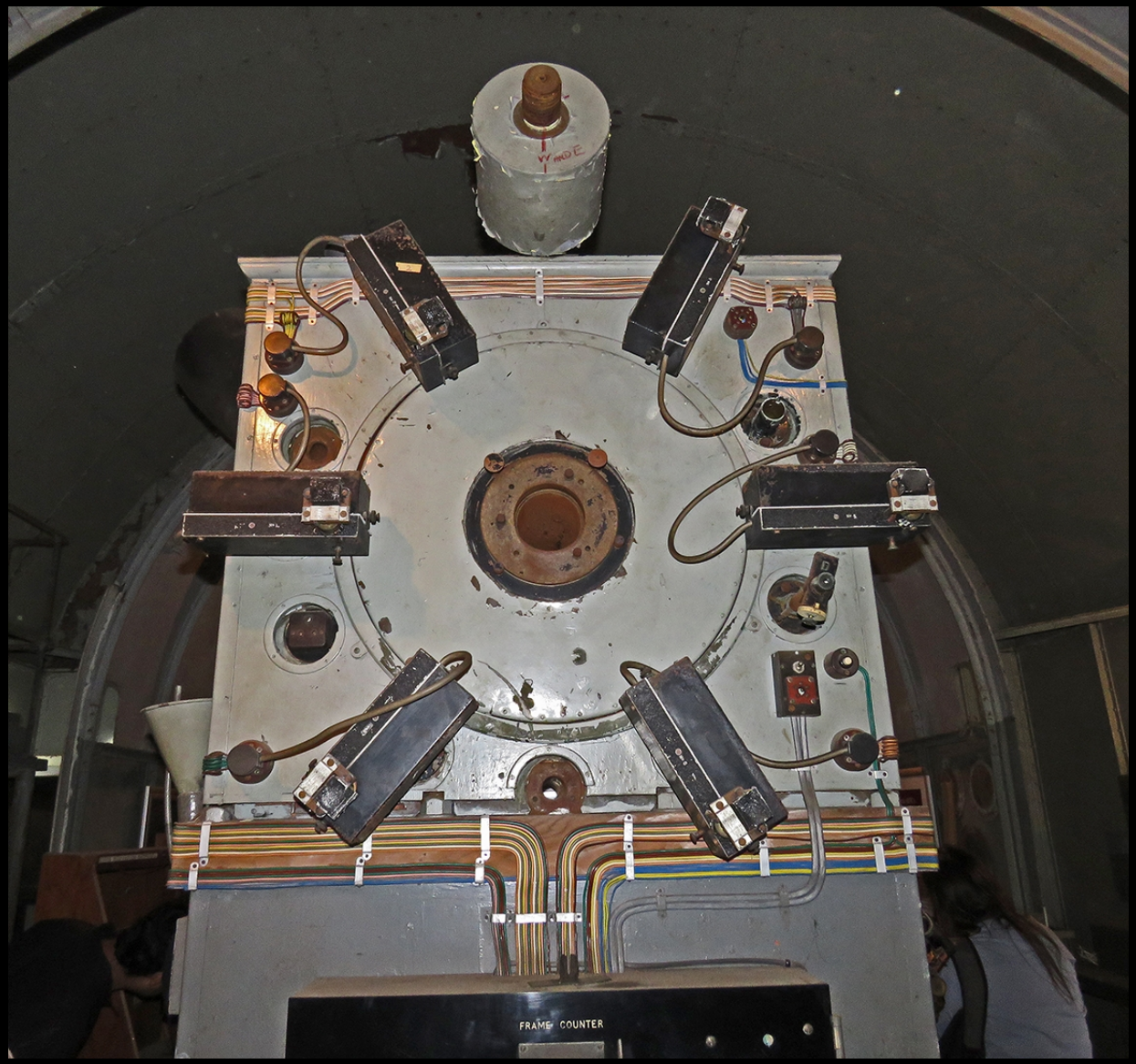

NADIR
17.2° 4.7°
CAMERAS
7 8 9 10 11 12
SHUTTERS



The Cone Apparatus for driving the movable wire

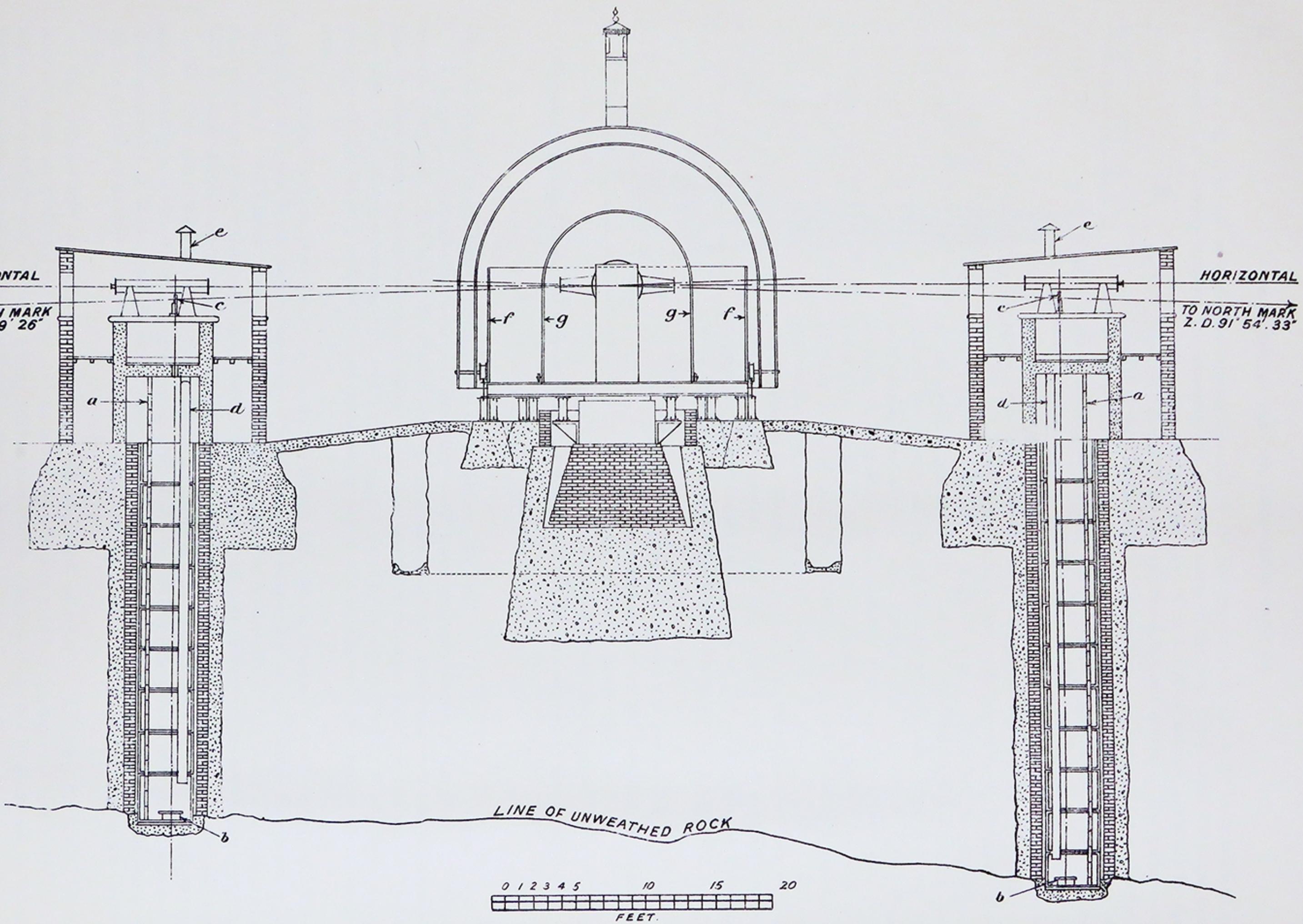



8
9
8

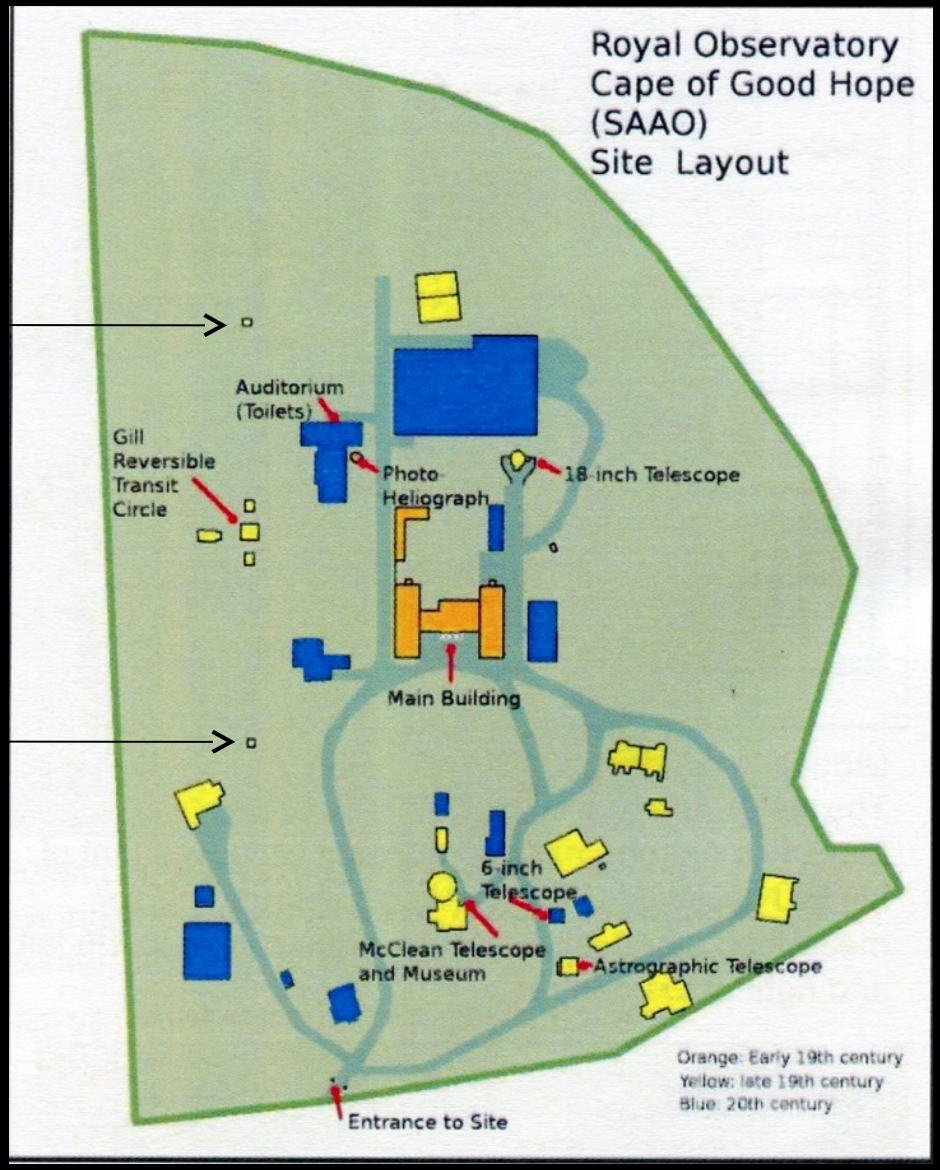

FRAME COUNTER

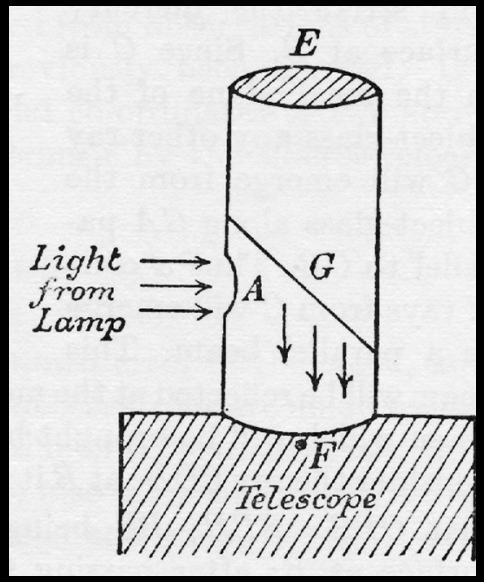
To face page 41.

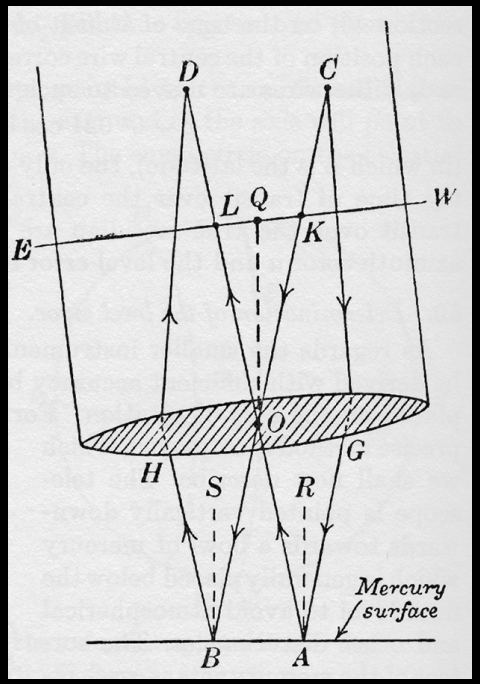
Plate I.



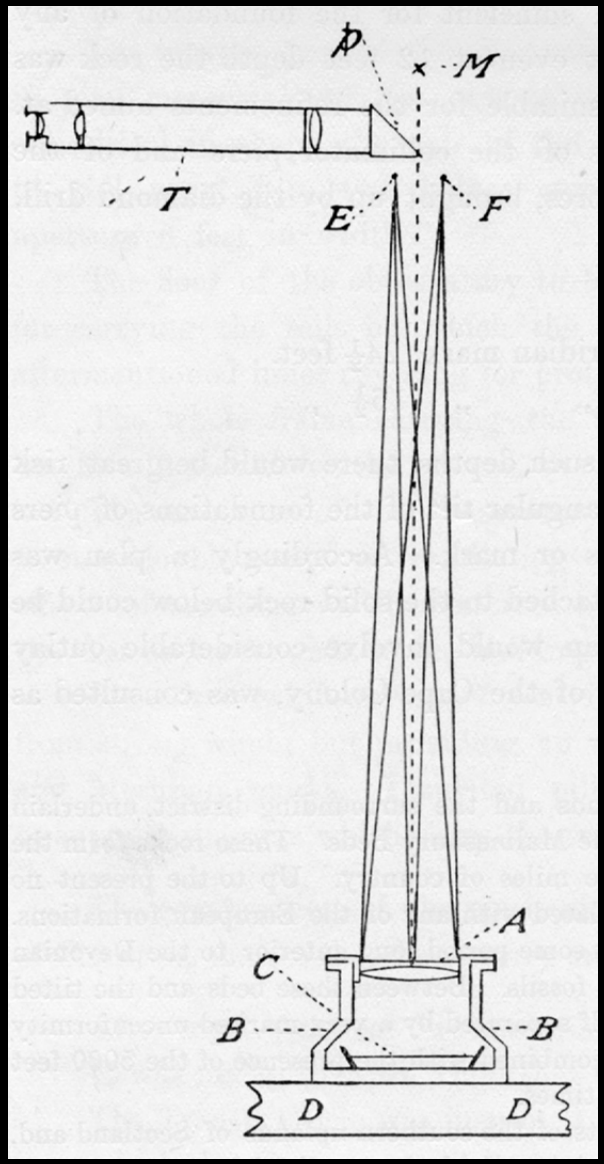
Weller & Graham Ltd Litho. London


Royal Observatory
Cape of Good Hope
(SAAO)
Site Layout
Auditorium
(Toilets)
Gill
Reversible
Transit
Circle
Photo-
Heliograph
18-inch Telescope
Main Building
6-inch
Telescope
McClean Telescope
and Museum
Astrographic Telescope
Entrance to Site
Orange: Early 19th century
Yellow: late 19th century
Blue: 20th century





Gill adapted the idea of the Bohnenberger eyepiece, used to check whether a telescope was vertical, to project the Meridian Marks exactly vertically from the stable bedrock 5 to 10 metres below



“It was, indeed, not until September 1905 that these lenses (A) were procured and mounted”

Due to ill health, returned to London in October 1906

He was the second longest serving HM Astronomer at the Cape of Good Hope

Very active in London until his death in 1914

A HISTORY AND DESCRIPTION

OF

THE ROYAL OBSERVATORY,

CAPE OF GOOD HOPE.

BY

SIR DAVID GILL, K.C.B.

KNIGHT OF THE PRUSSIAN ORDER *POUR LE MÉRITE*
COMMANDER OF THE LEGION OF HONOUR (FRANCE)
HON. LL.D., ABERDEEN AND EDINBURGH; HON. D.SC., OXFORD, CAMBRIDGE, DUBLIN, AND CAPE OF GOOD HOPE
F.R.S., HON. F.R.S.E., FOREIGN SEC. R.A.S.

Correspondant de l'Institut de France (Académie des Sciences) et de Bureau des Longitudes (France); Foreign Member della Reale Accademia dei Lincei, Roma; Foreign Member of the Royal Academy of Sciences, Amsterdam; Corresponding Member of the Royal Academy of Sciences, Berlin; Corresponding Member of the Imperial Academy of Sciences, St Petersburg. FOREIGN MEMBER of The National Academy of Sciences, Washington; of the Royal Academy of Sciences of Sweden; of the Société Hollandaise Nationale des Sciences (Haarlem); of the American Academy of Arts and Sciences (Boston); of the American Philosophical Society of Philadelphia; of the Italian Spectroscopic Society (Rome). HONORARY MEMBER of the New York Academy of Sciences; of the Société des Sciences de Finlande (Helsingfors); of the Royal Society of Glasgow; of the Royal Society of South Africa; and First Honorary Member of the Astronomical and Astrophysical Society of America. CORRESPONDING MEMBER of the Société Nationale des Sciences, Cherbourg; of the Sociedade de Geographia, Lisbon, &c.
Bruce Medallist of the Astronomical Society of the Pacific (1900); Watson Medallist of the National Academy of the United States (1900); Gold Medallist of the Royal Astronomical Society, London (1882 and 1908); Royal Medallist of the Royal Society of London (1903); Valz Medallist of the Institute of France (Acad. des Sciences) (1882).

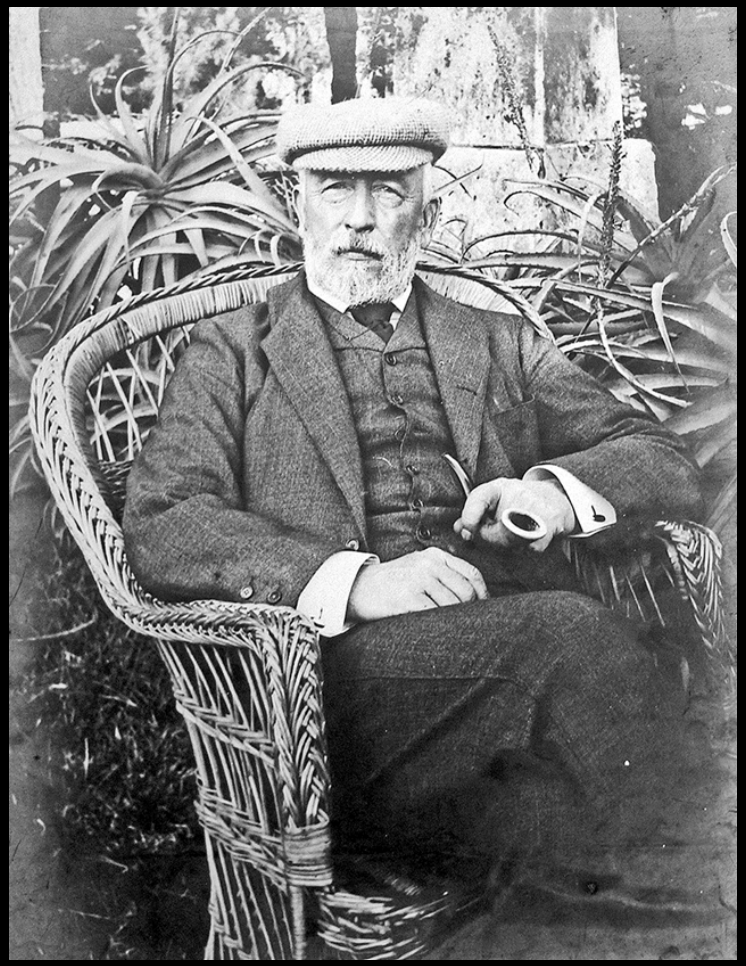
Published by Order of the Lords Commissioners of the Admiralty in obedience to His Majesty's Command.

LONDON:
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

PRINTED BY NEILL & CO., LIMITED, BELLEVUE, EDINBURGH.

1913.

Of him, and of the future verdict of history upon him, we may fittingly quote the well-known words of Horace :



Crescit, occulto velut arbor aevo
Fama Marcelli, micat inter omnes

Julium Sidus, velut inter ignes,
Luna Minores

Obituary by Roberts 1915

The fame of Gill grows like a tree imperceptibly through the ages

And Caesar’s comet shines like the Moon among little fires

David Gill (1843-1914)

and the RTC

Maciej Soltynski

Astronomical History Symposium
March 2018

Born 12 June 1843

48 Skene Terrace, Aberdeen

Father & Grandfather were successful watch and clock makers

Went to Bellevue Academy - a local school - until he was 13

Had a chemistry lab at home

1857 (age 14) at Dollar Academy

“He boarded with the head master, Dr. Lindsay, a man with scientific interests in mathematics, natural philosophy and chemistry, the very subjects for which the boy's mind was naturally receptive; and this was his first introduction to science.”

Forbes 1916

Non-degree student at Marischal College – Aberdeen
1858-60

“I have set up a model of Airy's Transit Circle, and described it to my advanced class to-day. That institution is working well, with a steady attendance of fourteen, who have come of their own accord to do subjects not required by the College.”

James Clerk Maxwell, 1857

1860 – leaves college and joins the family business

1861-1862 – trains as watchmaker in England, Switzerland and France

1863 – Proposes timekeeping service for Aberdeen. Meets Piazzi Smyth. Sets up transit circle at Kings College – uses it regularily

Later again meets Maxwell, who introduces him to Kelvin

1867 – Buys 12 inch reflector and builds an observatory at Skene Street. Photo of the Moon (Huggins, Lindsay), stellar parallax etc

1869 – Becomes head of the watchmaking business

1870 – Marries Isobel Black

Astronomical clock at Besancon Cathedral

1872 - Becomes Director of Lord Lindsay's new observatory at Dun Echt
now he is a fulltime astronomer

1874 – Mauritius solar parallax 8.77”

1874 – Ascension solar parallax 8.78” (now 8.794”)

1878 – applied to be Radcliffe Observer, Oxford

1879 – Appointed as Her Majesty's Astronomer at the Cape of Good Hope

The staff at the Royal Observatory at the Cape of Good Hope - 1879

Nobody was better at astrometry than David Gill: rooting out every possible systematic error, using his considerable mechanical expertise to design minimum error systems and his watchmaking skills to build, modify or repair equipment

He was also a superb organiser, getting people to co-operate by his own enthusiasm

He overhauled and extensively re-equipped the Cape Observatory

He produced a series of reference star catalogues derived from Cape Observatory transit measurements

He perfected the use of the heliometer

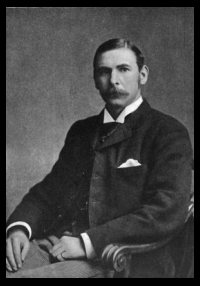
Gill used the parallax of Mars to determine the distance to the Sun, and measured distances to the nearest stars

He was a pioneer in the use of astrophotography, making the [first] photograph of the Great Comet of 1882, which led to a massive project in collaboration with the Dutch astronomer J.C. Kapteyn, and the compiling of an index of brightness and position for some half a million southern stars, the Cape Photographic Durchmusterung

Gill made more observations of Mercury than all other observatories put together and Gill's observations helped Newcomb to arrive at the value for the precession of Mercury, later used by Einstein

Gill is known also for his outstanding geodetic survey work. He established the best geodetic survey backbone in the southern hemisphere, stretching across South Africa and almost up to Lake Tanganyika.

Opposition from the Astronomer Royal



.... if Sir William Christie's (Astronomer Royal 1881-1910) advice had prevailed, astronomers would not now possess Gill's and Kapteyn's Catalogue (C.P.D.); the British nation would not have computed and published Gill's final work on Solar Parallax and the Moon's Mass; the splendid Meridian Marks for his Transit Circle would not have been constructed, and some of Gill's and Hough's work would in consequence have been lost to the world; the staff and equipment of the Cape Observatory would have been seriously crippled; and the Observatory itself would have been transferred from the control of the Admiralty to that of the Cape Colony, with disastrous results.

From David Gill Man and Astronomer
Memories of Sir David Gill, H.M. Astronomer (1879-1907) at the Cape of Good Hope.
Forbes 1916

The staff at the Royal Observatory at the Cape of Good Hope - 1906

SIR DAVID GILL, K.C.B.

KNIGHT OF THE PRUSSIAN ORDER *POUR LE MÉRITE*
COMMANDER OF THE LEGION OF HONOUR (FRANCE)
HON. LL.D., ABERDEEN AND EDINBURGH; HON. D.SC., OXFORD, CAMBRIDGE,
DUBLIN, AND CAPE OF GOOD HOPE
F.R.S., HON. F.R.S.E., FOREIGN SEC. R.A.S.

Correspondant de l'Institut de France (Académie des Sciences) et de Bureau des Longitudes (France); Foreign Member della Reale Accademia dei Lincei, Roma; Foreign Member of the Royal Academy of Sciences, Amsterdam; Corresponding Member of the Royal Academy of Sciences, Berlin; Corresponding Member of the Imperial Academy of Sciences, St Petersburg. FOREIGN MEMBER of The National Academy of Sciences, Washington; of the Royal Academy of Sciences of Sweden; of the Société Hollandaise Nationale des Sciences (Haarlem); of the American Academy of Arts and Sciences (Boston); of the American Philosophical Society of Philadelphia; of the Italian Spectroscopic Society (Rome). HONORARY MEMBER of the New York Academy of Sciences; of the Société des Sciences de Finlande (Helsingfors); of the Royal Society of Glasgow; of the Royal Society of South Africa; and First Honorary Member of the Astronomical and Astrophysical Society of America. CORRESPONDING MEMBER of the Société Nationale des Sciences, Cherbourg; of the Sociedade de Geographia, Lisbon, &c.

Bruce Medallist of the Astronomical Society of the Pacific (1900); *Watson Medallist of the National Academy of the United States* (1900); *Gold Medallist of the Royal Astronomical Society, London* (1882 *and* 1908); *Royal Medallist of the Royal Society of London* (1903); *Valz Medallist of the Institute of France (Acad. des Sciences)* (1882).

The Reversible Transit Circle

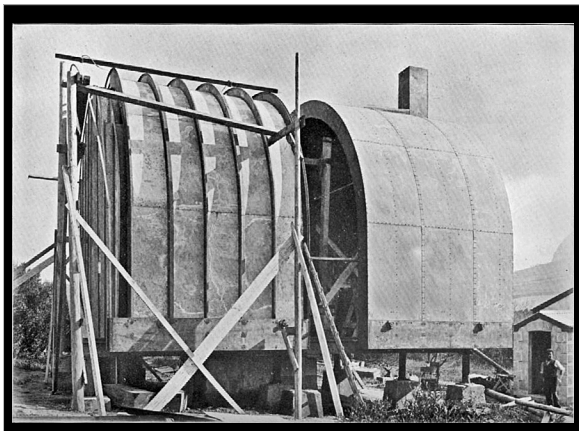
"Soon after my appointment to the Cape in 1879 I drew the attention of the Lords Commissioners of the Admiralty to the fact that there existed at the Cape no refined means for fundamental Meridian observation.

The Cape Transit Circle could neither be reversed on its bearings nor could its object-glass and eye-end be interchanged, …. thus lacking those instrumental conditions of symmetry which are essential for the elimination of a certain class of possible systematic errors.

I also endeavoured to show that a meridian instrument which is placed in an observatory where it is impossible to equalise the internal with the external temperature, could not be relied upon for the determination of fundamental Declinations, on account of the abnormal refraction introduced by the conditions of the installation.

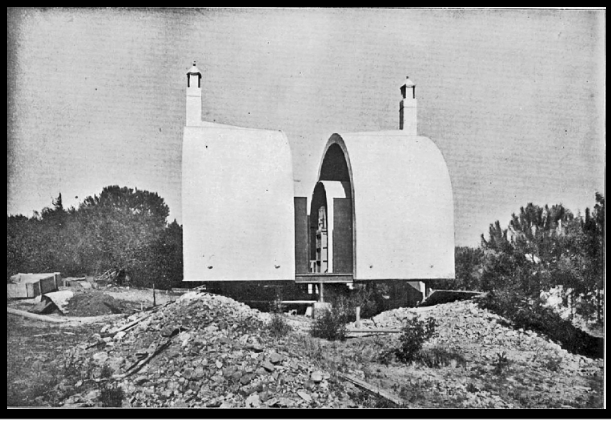
These views, however, were, not accepted for many years, and it was not until 1897 [19 years later]-that estimates-for the construction of a new Transit Circle and observatory were sanctioned. Specifications were at once prepared, both for the Transit Circle and its observatory."

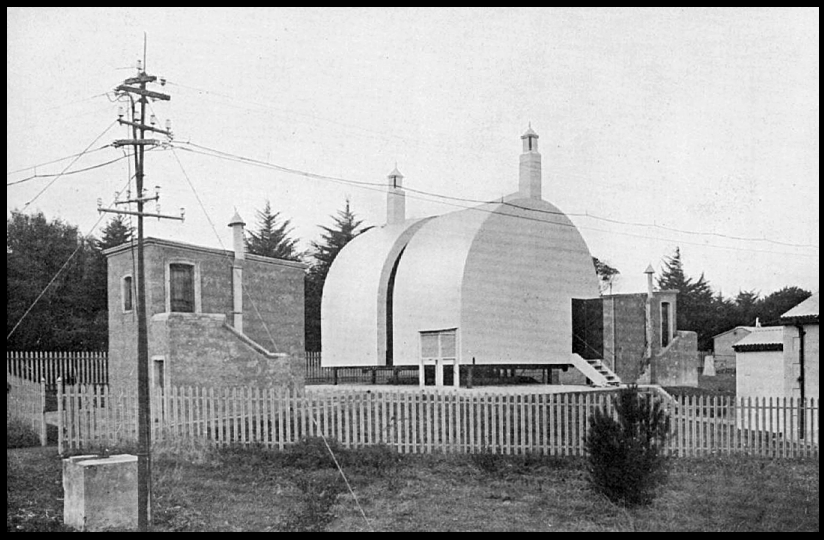
Gill, D A History and Description of the Royal Observatory Cape of Good Hope 1913 – (Part III pp 36-117)

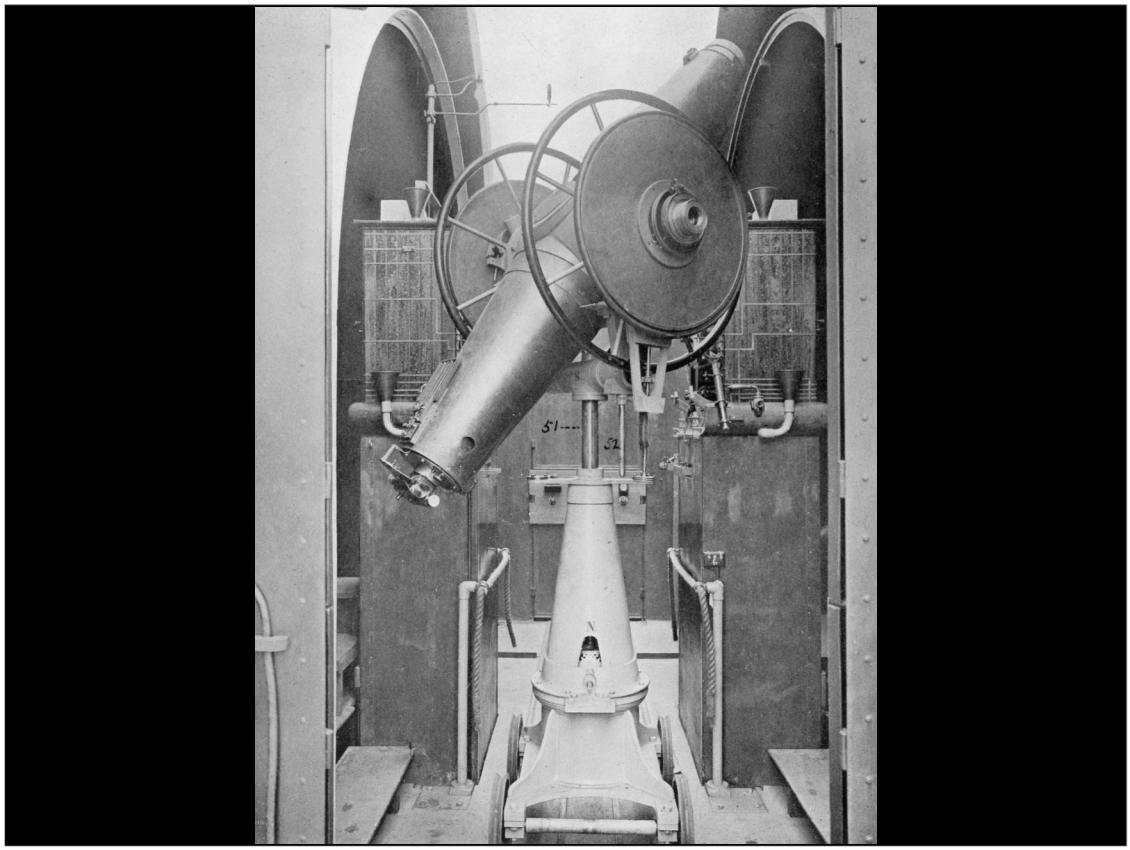


The Reversible Transit Circle

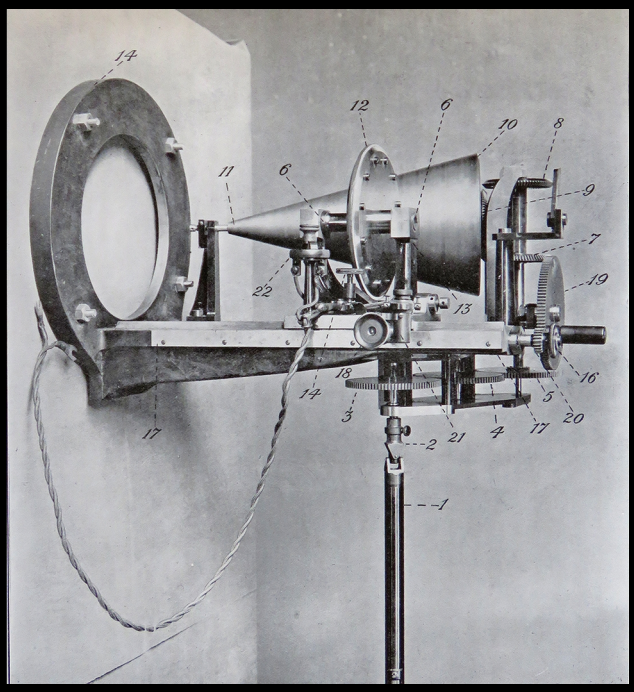
1900



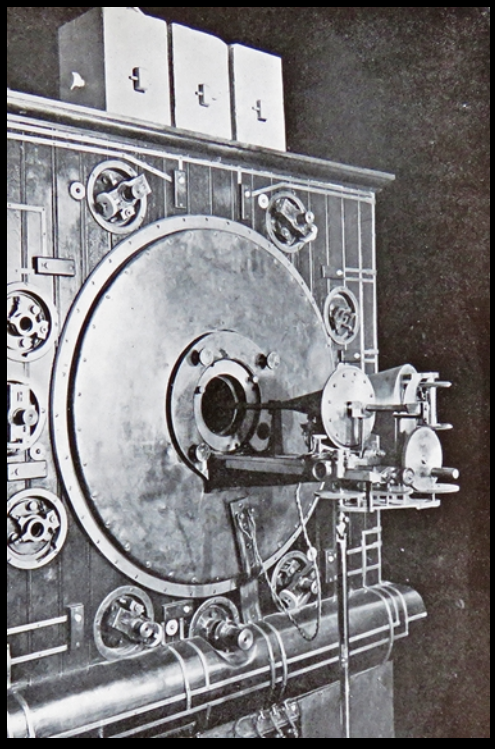


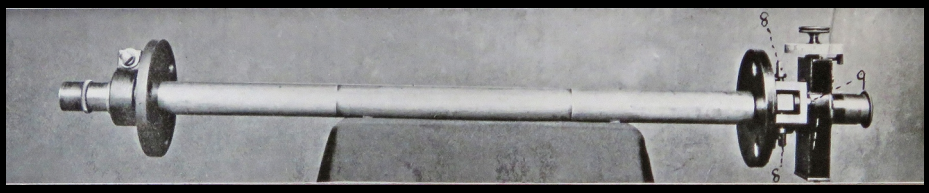

51---
52

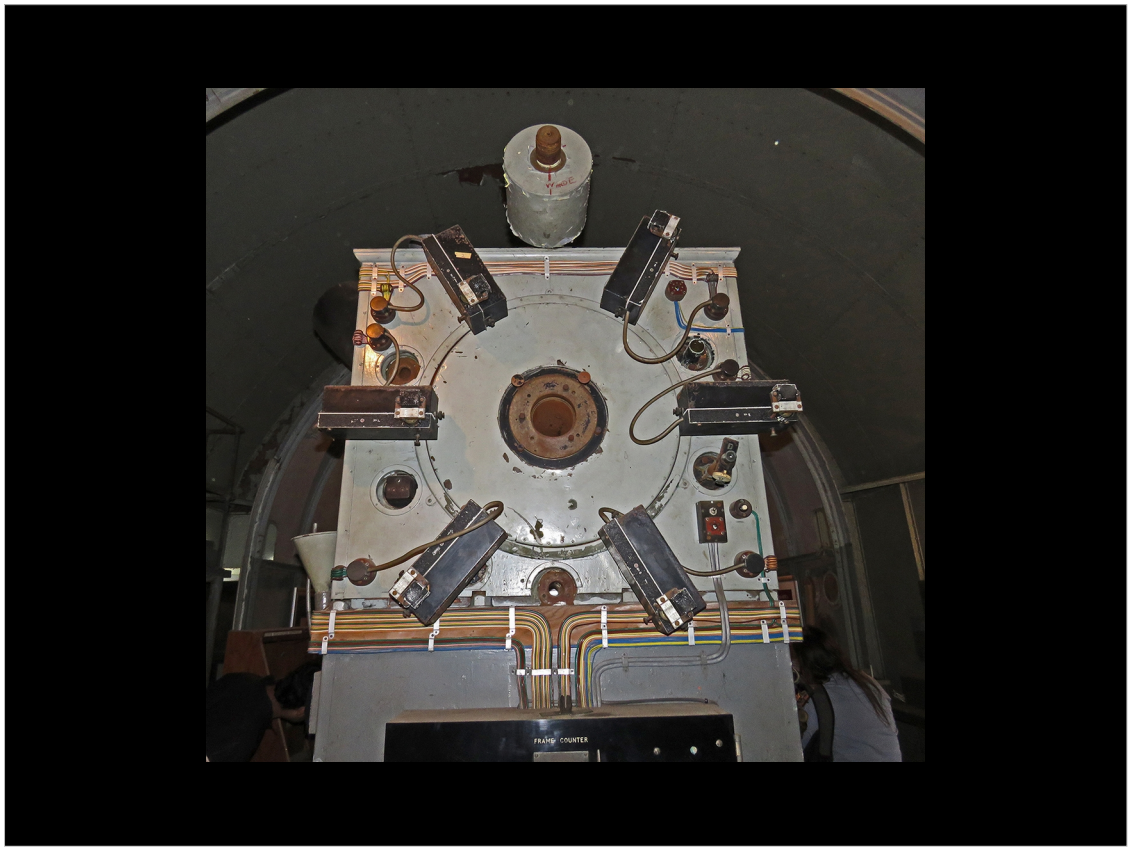

CAMERAS
SHUTTERS

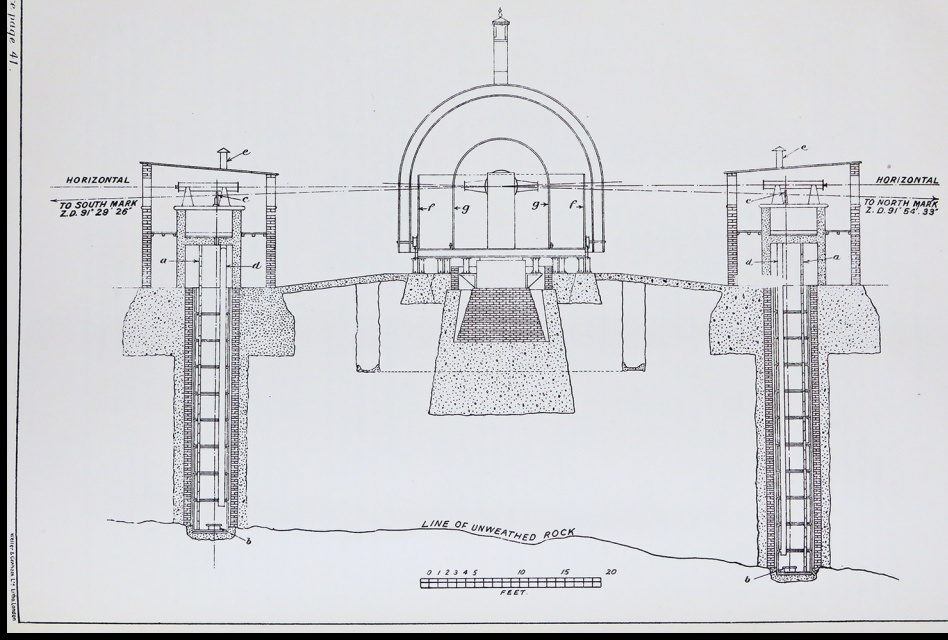


The Cone Apparatus for driving the movable wire

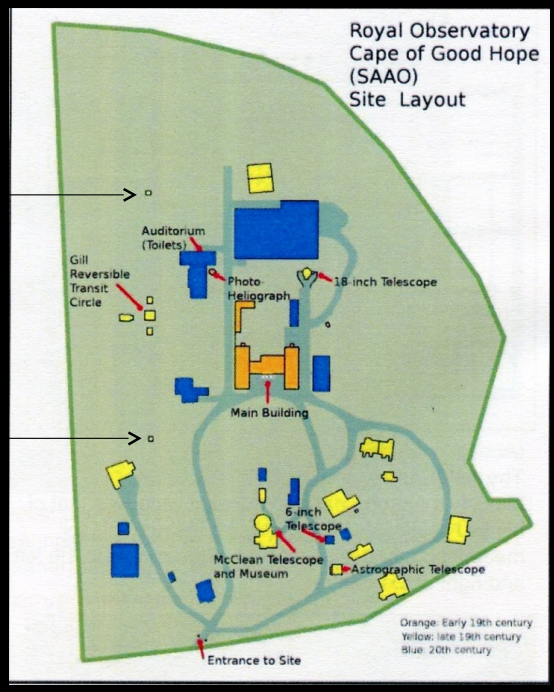


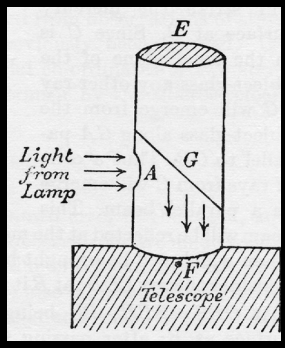

8
9
8

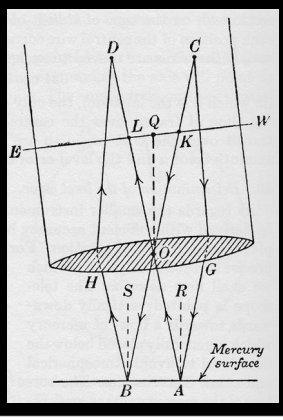

FRAME COUNTER



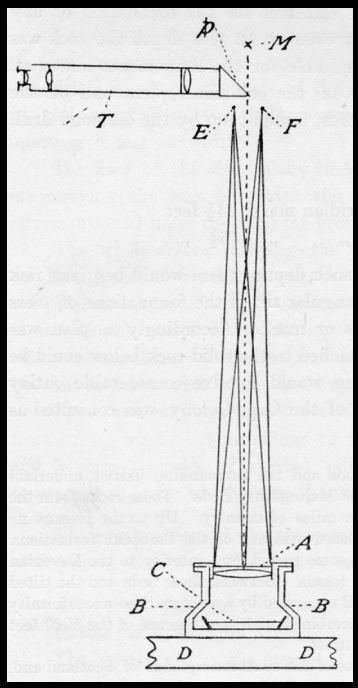
To face page 41


Royal Observatory
Cape of Good Hope
(SAAO)
Site Layout
Auditorium
(Toilets)
Gill
Reversible
Transit
Circle
Photo-
Heliograph
18 inch Telescope
Main Building
6 inch
Telescope
McClean Telescope
and Museum
Astrographic Telescope
Entrance to Site
Orange: Early 19th century
Yellow: late 19th century
Blue: 20th century





Gill adapted the idea of the Bohnenberger eyepiece, used to check whether a telescope was vertical, to project the Meridian Marks exactly vertically from the stable bedrock 5 to 10 metres below

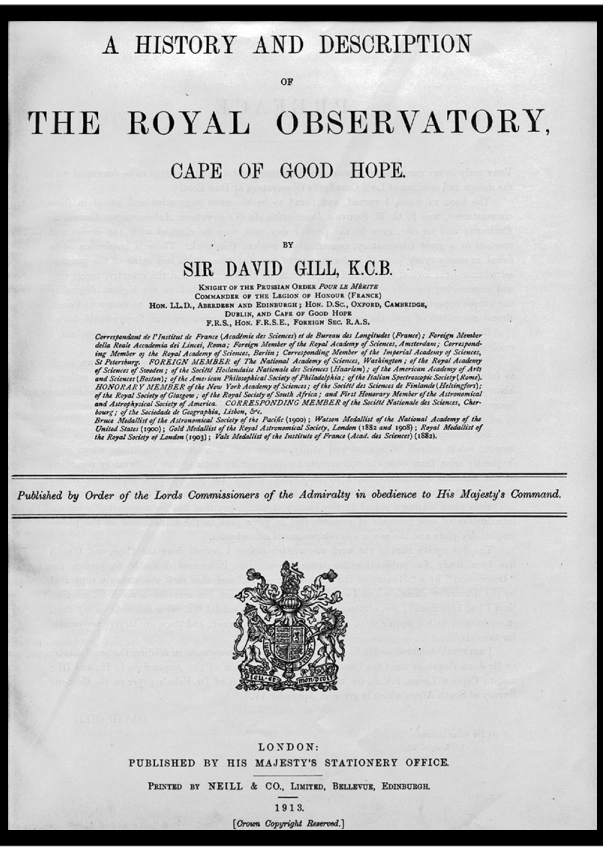


“It was, indeed, not until September 1905 that these lenses (A) were procured and mounted”

Due to ill health, returned to London in October 1906

He was the second longest serving HM Astronomer at the Cape of Good Hope

Very active in London until his death in 1914



A HISTORY AND DESCRIPTION

OF

THE ROYAL OBSERVATORY,

CAPE OF GOOD HOPE.

BY

SIR DAVID GILL, K.C.B.

KNIGHT OF THE PRUSSIAN ORDER *POUR LE MÉRITE*
COMMANDER OF THE LEGION OF HONOUR (FRANCE)
HON. LL.D., ABERDEEN AND EDINBURGH; HON. D.SC., OXFORD, CAMBRIDGE, DUBLIN, AND CAPE OF GOOD HOPE
F.R.S., HON. F.R.S.E., FOREIGN SEC. R.A.S.

Correspondant de l'Institut de France (Académie des Sciences) et du Bureau des Longitudes (France); Foreign Member della Reale Accademia dei Lincei, Roma; Foreign Member of the Royal Academy of Sciences, Amsterdam; Corresponding Member of the Royal Academy of Sciences, Berlin; Corresponding Member of the Imperial Academy of Sciences, St Petersburg. FOREIGN MEMBER of The National Academy of Sciences, Washington; of the Royal Academy of Sciences of Sweden; of the Société Hollandaise Nationale des Sciences (Haarlem); of the American Academy of Arts and Sciences (Boston); of the American Philosophical Society of Philadelphia; of the Italian Spettroscopic Society (Rome). HONORARY MEMBER of the New York Academy of Sciences; of the Société des Sciences de Finlande (Helsingfors); of the Royal Society of Glasgow; of the Royal Society of South Africa; and First Honorary Member of the Astronomical and Astrophysical Society of America. CORRESPONDING MEMBER of the Société Nationale des Sciences, Cherbourg; of the Sociedade de Geographia, Lisbon, &c.
Bruce Medallist of the Astronomical Society of the Pacific (1920); *Watson Medallist of the National Academy of the United States* (1900); *Gold Medallist of the Royal Astronomical Society, London* (1882 and 1908); *Royal Medallist of the Royal Society of London* (1903); *Valz Medallist of the Institute of France (Acad. des Sciences)* (1882).

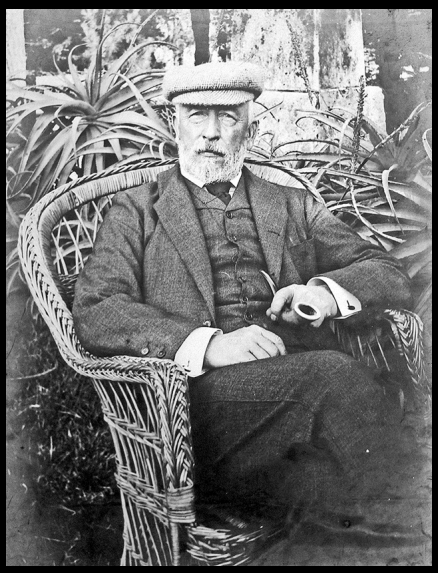
Published by Order of the Lords Commissioners of the Admiralty in obedience to His Majesty's Command.

LONDON:
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

PRINTED BY NEILL & CO., LIMITED, BELLEVUE, EDINBURGH.

1913.

Of him, and of the future verdict of history upon him, we may fittingly quote the well-known words of Horace :



Crescit, occulto velut arbor aevo
Fama Marcelli, micat inter omnes

Julium Sidus, velut inter ignes,
Luna Minores

Obituary by Roberts 1915

The fame of Gill grows like a tree imperceptibly through the ages

And Caesar’s comet shines like the Moon among little fires