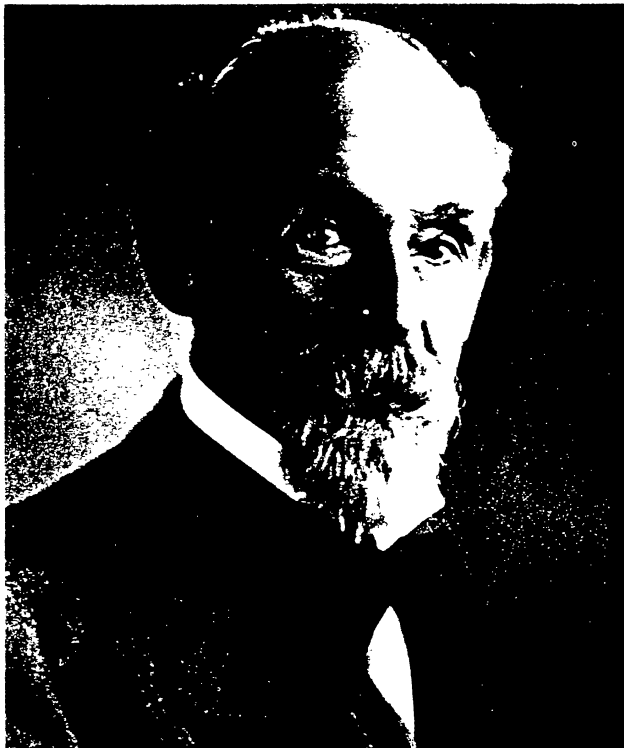
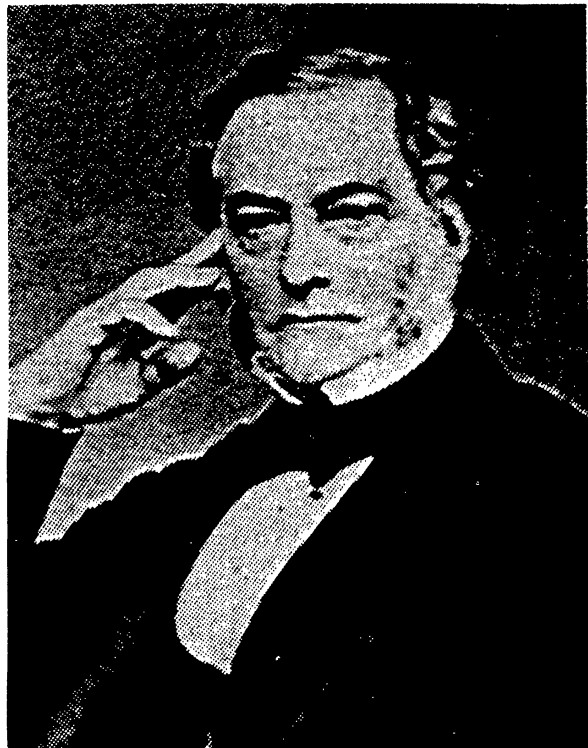


## Cyclopaedia of Telescope Makers Part 3 (K-N)

A.D. Andrews  
 Armagh Observatory



In past issues of the *Cyclopaedia of Telescope makers*, *Parts 1 & 2 (A-J)*, we have already introduced some of the great optical and mechanical innovators in Europe and America, Cooke, the Clarks, Fraunhofer, the Grubbs, the Henrys, William Herschel, Lassell, etc.

Portraits of Thomas Grubb (top left) and John Brashear (top right) which were unavailable earlier are appended to the present *Part 3*. As we proceed with this compilation it becomes clear that the volume of even *minimal* information on the world's telescope makers is phenomenal. Telescopes are very frequently modified during their lifetime and, of course, accessories, auxiliary instrumentation and *improvements* mean that the pristine nature of a particular telescope is difficult to ascertain. Original designer's drawings, early woodcuts and engravings, and maker's catalogues are not always easy to obtain. In *Part 3* we have included, for example, illustrations of Konkoly's instruments and his workshop where much modification and construction took place. Furthermore, under the name,

Merz, we have departed somewhat from our original alphabetical layout by introducing several heliometers (for which Merz made many fine object glasses) produced in collaboration with, for example, Repsold. Also, it was thought useful to gather together several early portable equatorial telescopes (with Nairne and Blunt, therefore, are found Adams, the Dollonds, Ramsden, Short, the Troughtons, and *anonymous* makers. Under Martin, who produced fine small reflecting telescopes, we show similar instruments by Adams and Clode). A few interesting telescopes have come to light in Ireland and the United Kingdom, and these are commented upon as appropriate. Lastly, considerable space has been given to one present-day telescope maker, Meade, since these instruments to some extent dominate commercially, and summary reference to the various classes of equipment epitomizes the 20th century and reflects the innovations over perhaps three centuries.

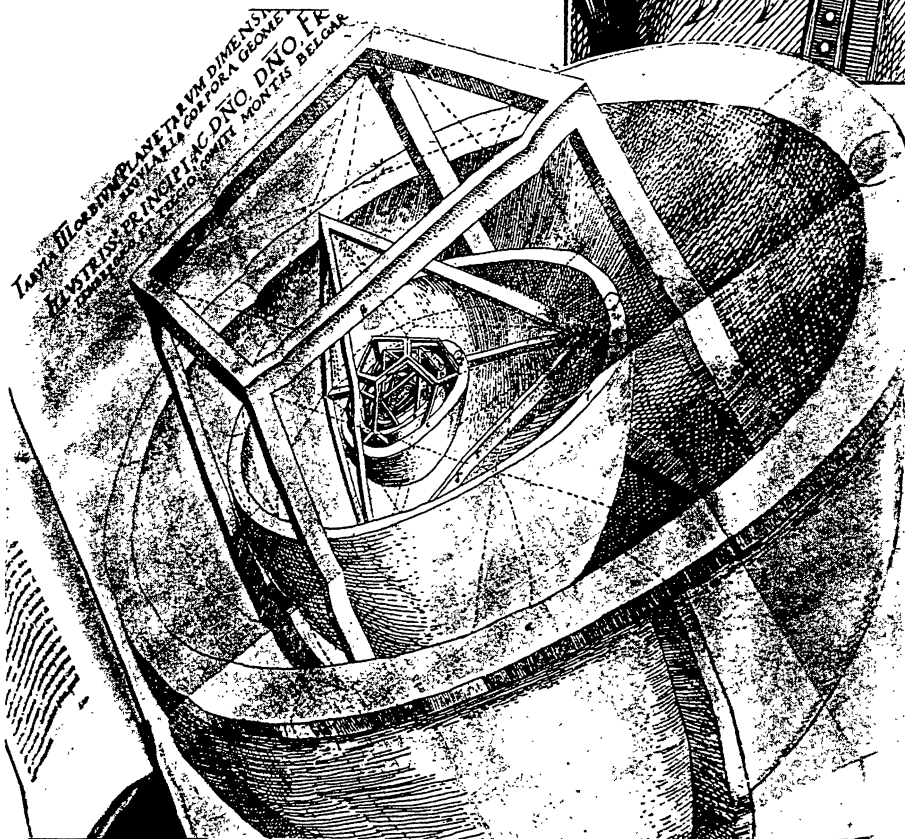


Figure 115: (a) KEPLER's birthplace in *Weil der Stadt* from an engraving c.1868 (*Courtesy of Archiv der Kepler Kommission, Munich*).

(b) Engraving of Johannes KEPLER (1571-1631), father of the *Keplerian telescope*, the forerunner of the giant "aerial telescopes" in which GALILEO's bi-concave lens eyepiece was replaced with a convex lens (after Furckius' original engraving of 1650. *Courtesy of Burndy Library*).

(c) KEPLER's model of the spheres from "*Mysterium Cosmographicum*" (1596).

## K

**KATER** Henry (Capt) - English military surveyor, 1777-1835. He employed **CRICKMORE** at *Ipswich* to make Gregorian telescopes. With an interest in optical experiments, he made a comparative study (c.1813) of the merits of Gregorian and Cassegrain telescopes. <sup>1</sup>

**KEIR** James - English glass manufacturer, fl.1765-89. <sup>2</sup>

**KELLNER** Carl - German optical manufacturer, *Wetzlar*, 1826-55. <sup>3</sup> The firm was taken over by **LEITZ**. He is noted for the **KELLNER** ocular (1849), or semi-achromatic version of the **RAMSDEN** eyepiece. <sup>4</sup>

**KEPLER** Johannes - eminent mathematician and astronomer, 1571-1630/31. <sup>5</sup> At an early age already famous as the young author of "*Mysterium Cosmographicum*" (1596), he briefly became assistant to the eminent Danish astronomer, Tycho (Tyge) **BRAHE**, in *Prague*. <sup>6</sup> Most importantly **KEPLER** analysed **BRAHE**'s observations from *Uraniborg* <sup>7</sup> but also studied refraction <sup>8</sup> and dispersion of light,

the anatomy of the eye, and the optical defect, spherical aberration which is common to both the human eye and many optical instruments. <sup>9</sup> The so-called Keplerian telescope consists of a simple convex objective and another convex lens of shorter focal length as ocular or eye lens, employed by others in the aerial telescope. See *Cyclopaedia Part I*, *Fig.3*. <sup>10</sup>

**KESSELS** Heinrich Johann - German instrument maker and clockmaker, *Altona. nr. Hamburg*, 1781-1849. <sup>11</sup>

**KEUFFEL** and **ESSER** - manufacturer and importer of drawing materials, mathematical and surveying instruments, *New York*. Their catalogues are recorded from 1873. <sup>12</sup>

**KEY** H.Cooper (Rev) - gentleman astronomer, c.1868. He was assisted by **WITH** in the construction of an 18in diameter mirror. <sup>13</sup>

**KIMBELL** Isaac - English optician, *21 Dean St, Fetter Lane, London*, fl.1775-1828. <sup>14</sup>

**KING** Alfred and Joseph - instrument makers. <sup>15</sup>

**KING** G - US instrument maker (surveying instruments, compasses), *19C, Boston*. <sup>16</sup>

**KING** Henry C - eminent scientific historian, well-known as the author of "*The History of the Telescope*" 1955, the essential starting point for a study of the instrument.

<sup>1</sup>See Ref.Hersch 73 (For key to abbreviations to references see *Cyclopaedia Part 1* in *Irish Astron. Journ. vol.20, No.3, 1992*). **KATER** is well-known for his work on the standard linear measure, and his seconds pendulum frequently employed for measurements of the Earth's gravity. We note that the mercury compensating pendulum was suggested earlier by George **GRAHAM** in 1715 and the grid (steel /brass) pendulum had been made by John **HARRISON** in the early 1730's. **KATER** devised an escapement for an astronomical clock. See *Dict.Nat.Biogr.* and *Tayl* 343.

<sup>2</sup>The author has been unable to establish a connection with the optical instrument trade, although being in the glass trade a supply link might be found. See *Tayl*.

<sup>3</sup>King 185, Handlist.

<sup>4</sup>Whilst **RAMSDEN**'s eyepiece consisted simply of two crown lenses (of differing focal lengths, with inwardly-facing convex surfaces, the lenses being separated by a distance equal to, or slightly less than their mean focal length), the original **KELLNER** eyepiece had an achromatic doublet nearest the eye, with a crown bi-convex and flint plano-concave component. There is also an achromatic **RAMSDEN** in which both field and eye lenses are doublets consisting of a crown bi-convex and a flint meniscus component. **BROWN** constructed an achromatic **RAMSDEN**-type eyepiece utilising plano-concave flint components to each doublet. See also **HUYGENS**.

<sup>5</sup>Born at *Weil der Stadt* and dying in *Regensburg*.

<sup>6</sup>**KEPLER** worked one year (1600-01) with **BRAHE**, and took **BRAHE**'s position at his death. However, he moved to *Linz* to teach in 1610 to support himself. He lived in *Ulm* in 1626-27. **KEPLER** is said to have spent most of his life as a religious fugitive, although not faring so badly as **GALILEO**.

<sup>7</sup>**KEPLER**'s laws of planetary motion 1609-19

<sup>8</sup>Regarding **KEPLER**'s approximate law of refraction, see "*Astronomiae Pars Optica*", Frankfurt 1604. c.f. **SNELL**.

<sup>9</sup>**KEPLER**'s eyesight was impaired following a childhood illness, and he never made much use of his optical devices. See **KEPLER**'s "*Dioptrice*" describing an astronomical telescope (inverse image) and a terrestrial telescope with reversing lens. See A.Turner's *ESI* 90.

<sup>10</sup>His contemporary, **SCHEINER**, produced a Keplerian telescope, and **SCHYRLÄUS** attempted to improve on the design.

<sup>11</sup>**KESSELS** supplied clocks to the Danish Navy.

<sup>12</sup>See Handlist. A very fine 4.25-inch brass refractor (length open 67.5in) with 2 drawtubes, one terrestrial eyepiece, rack and pinion focus, on alt-azimuth tripod mount with central stabilising weight and two steadying rods, slow motion and finder, inscribed **KEUFFEL & ESSER** and the above address on the end-plate, was recently seen at *Odin Antiques, Brighton*. In 1913 **KEUFFEL** and **ESSER** Co. were found at several addresses in *New York, Chicago and Montreal*.

<sup>13</sup>King 274.

<sup>14</sup>**SIMON. KIMBELL** was associated with **MARTIN**.

<sup>15</sup>See Chapman's article in *Vistas* vol.32, p.341.

<sup>16</sup>We record also Charles G **KING**, mathematical, nautical and surveying instrument maker, *7 Broad St, Boston*. See *ChrJun92*, compasses and trade tables.



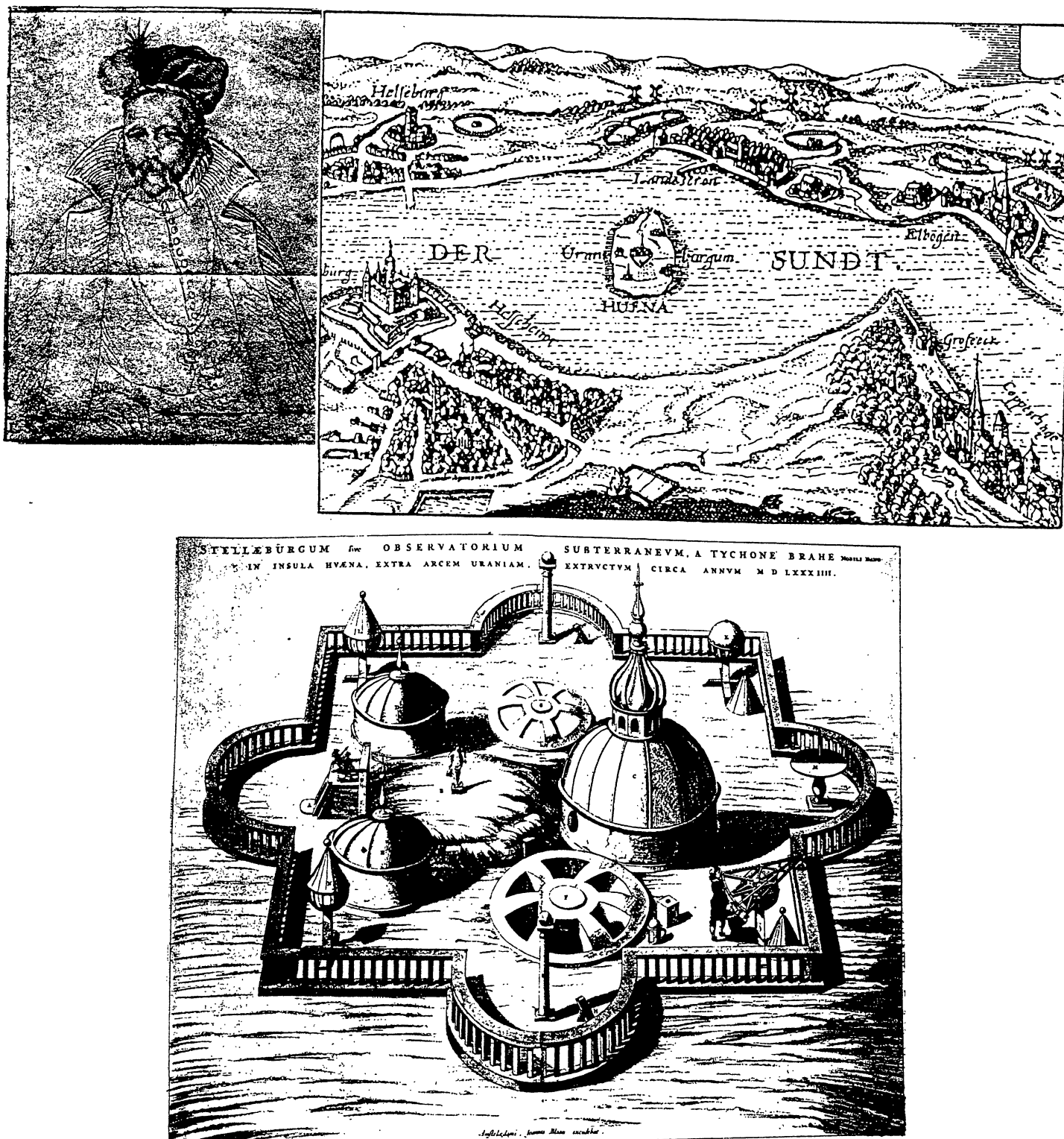


Figure 116: (a) Engraving of the Danish astronomer, Tycho (Tyge) BRAHE, whom KEPLER briefly assisted (1600-01) in *Prague*.

(b) The island of *Hven*, *Denmark* (engraving 1632) where the famous astronomer, BRAHE, obtained his observations (without optical telescopes) which were subsequently interpreted by KEPLER.

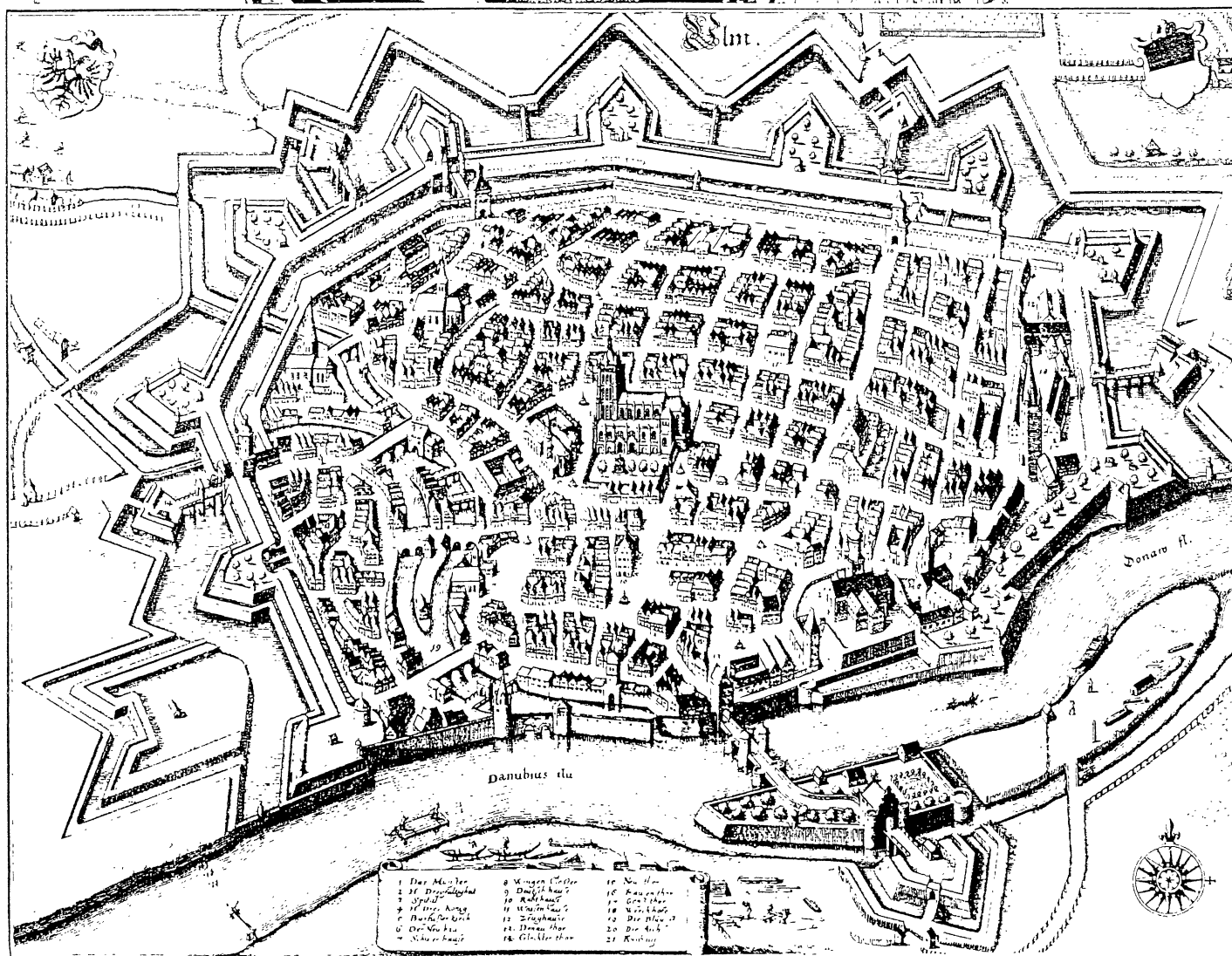
(c) BRAHE's Observatory on Hven (1584), nearby to Uraniborg.





Figure 117: (a) KEPLER's house (centre) in Rabengasse, Ulm (1626-27).

(b) The Danube town of Ulm, Württemberg. KEPLER lived north of the Cathedral. From Ulm he published his *Tabulae Rudolphinae* (1627).



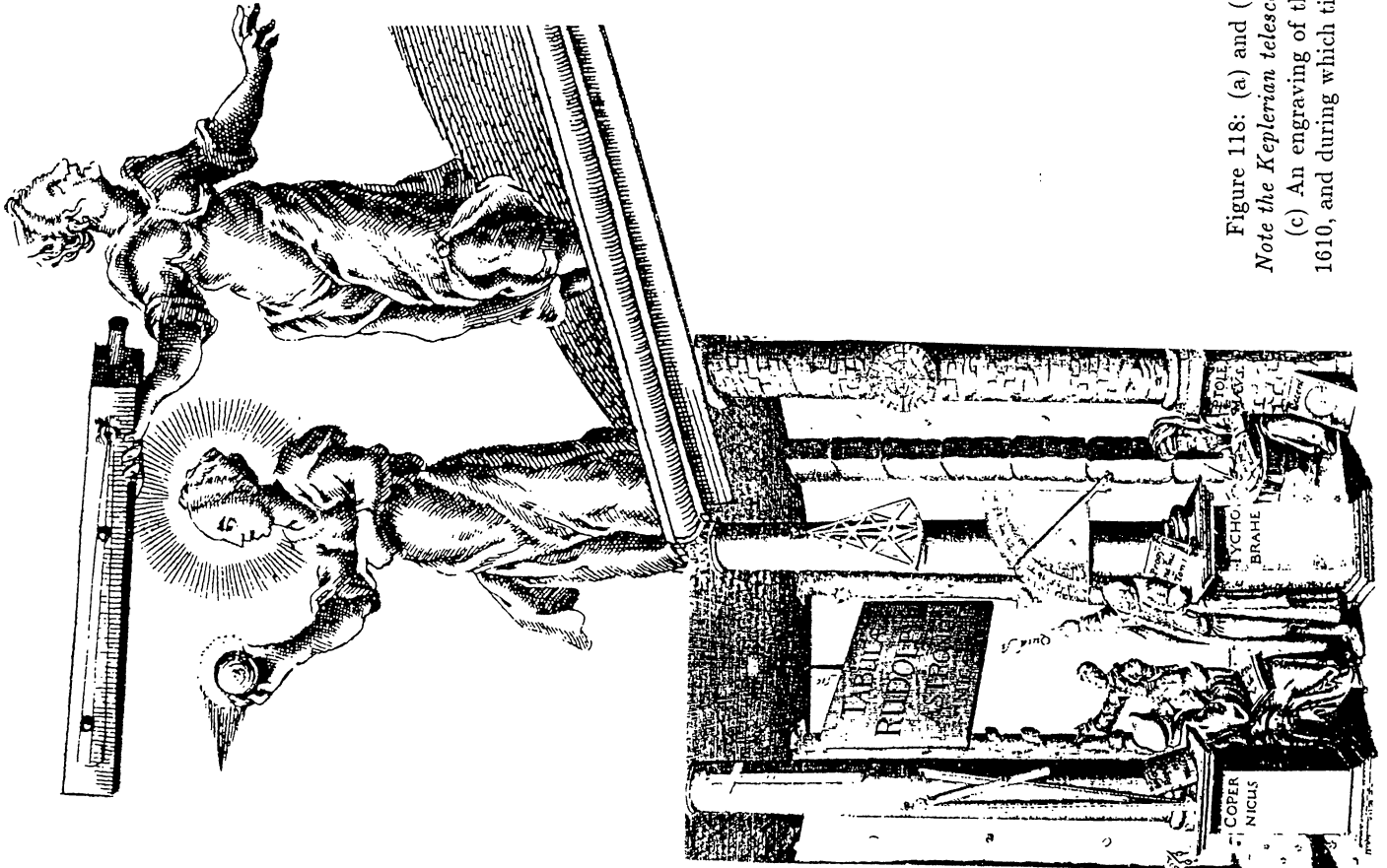


Figure 118: (a) and (b) Two details from the frontpiece of "*Tabulae Rudolphinae*" (1627).  
Note the Keplerian telescope with its square box-like tube.

(c) An engraving of the town of Linz (Holzwurm 1629) where KEPLER was a teacher from 1610, and during which time he worked on his planetary motion theory.



IOANNIS KEPLERI  
S<sup>z</sup>. C<sup>z</sup>. M<sup>us</sup>. M<sup>at</sup>HEMATICI  
DIOPTRICE

SEV

Demonstratio eorum quæ visui & visibilibus pro-  
pter Conspicillan non ita pridem inventa  
accidunt.

¶

*Premissa Epistole Galilei de ijs, quæ post editionem Nuncij siderij  
ope Perspicilli, nova & admiranda in cælo  
deprehensa sunt.*

Item

*Examen præfationis Ioannis Pene Galli in Optica Euclidis, de  
usu Optices in philosophia.*



AVGVSTAE VINDELICORVM,  
typis Davidis Franci,

*Cum privilegio Caesareo ad annos XV.*

M. DCXI.

Figure 119: (a) Title page of KEPLER's "Dioptrice" (Ausburg 1611).  
(b) Portrait of KEPLER represented as the discoverer of the laws governing planetary motion.



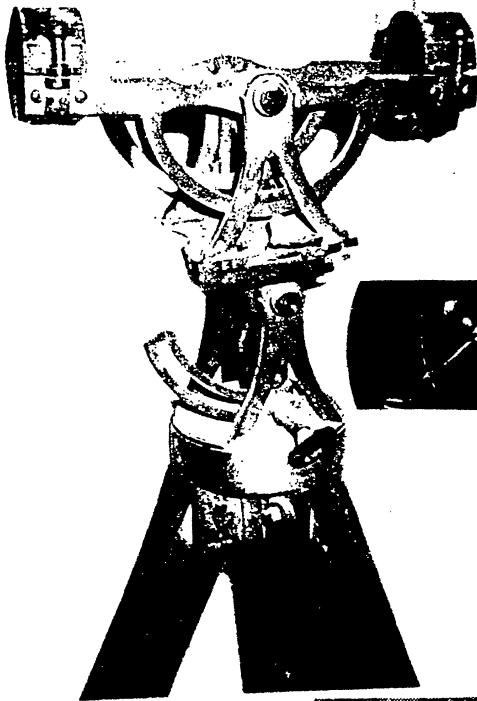
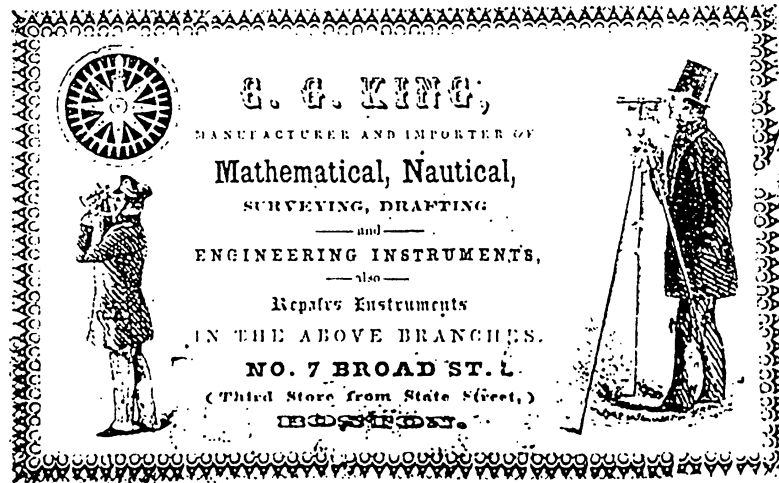
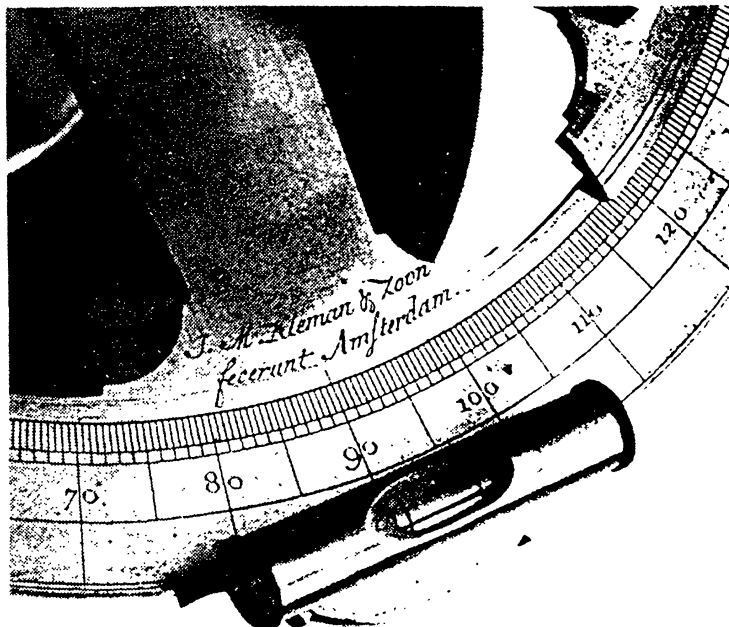
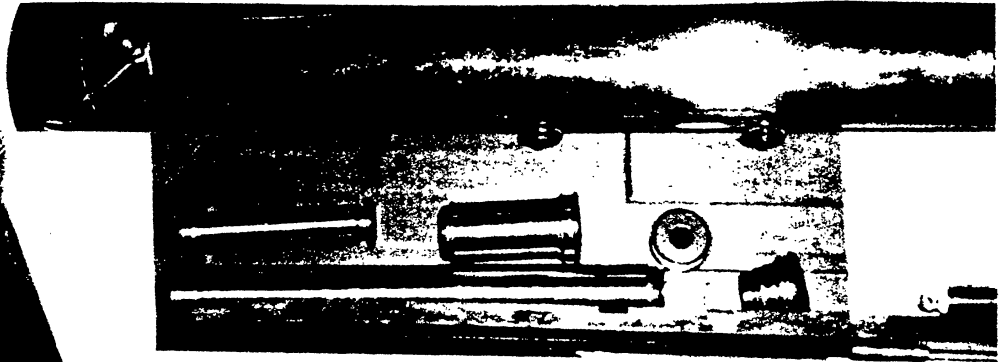


Figure 120: (a) Trade label from Charles G. KING, mathematical, nautical and surveying instrument maker, *Boston*, 19C.

(b) T. HARRIS telescope mount, and (c) HARRIS 3-inch telescope with a KITCHENER *pancratic* eyepiece.

(d) Detail of KLEMAN EN ZOON brass theodolite, *Amsterdam* 18/19C.



KINZELBACH - German instrument maker (telescopes), *Württemberg*, mid-19C. <sup>17</sup>

KIPP P.J - instrument maker, *Zn te Delft*, established 1864 over an existing firm. <sup>18</sup>

KIRKHAM - associated with DALL in optical designs.

KITCHINER William - a wealthy English medical practitioner, 1775-1827. He was author of *"The Economy of the Eyes"* (1825). A contemporary of TULLEY and SOUTH, he is associated with a *pancratic eyepiece* constructed by George DOLLOND which allowed varying magnification. <sup>19</sup>

KLAGES George - U.S., early 20C. He was mechanical engineer at the telescope workshop of BRASHEAR.

KLEMAN EN ZOON (J.M) - surveying instrument maker, 18/19C, *Amsterdam*. <sup>20</sup>

KLINGENSTIERNA S - Swedish pioneer of the achromatic and aplanatic lens theory, *Uppsala*, 1698-1765. <sup>21</sup>

KOLESCH and Co - surveying instrument maker, 19C, *New York*.

KOLLMORGAN H - German instrument maker, *Berlin*, (World War II binocular code fzp).

KONKOLY Miklós (=Nikolaus) Thege - eminent Hungarian astronomer. Studying in *Berlin* with the famous German astronomer, ENCKE, and for many years Director of the Observatory at *Ógyalla, north of the Danube*, KONKOLY employed many fine instruments by the most notable makers of the end of the 19C, e.g. by COOKE/MERZ and BROWNING. KONKOLY's workshop produced a fine 10in

refractor with MERZ optics, and a Comet Sweeper of his own design. The astronomer, J.GOTHARD earlier at *Herény*, was associated with KONKOLY using a 10in BROWNING reflector (1874), and astronomers at *Kalocsa, Haynald Observatory* also possessed a 7in MERZ /BROWNING refractor (See illustrations).

KUTZ E.A - surveying instrument maker, 19C, *New York*.

## L

LADD William - 19C mathematical and optical instrument maker, w.1839-72, dc.1884, *10 Cleaver St, Kennington, London* (1846-47), *29 Penton St* (1850-57), *31 Chancery Lane* (1858-60), *11/12 Beak St* (1861-76). LADD was noted for his demonstration apparatus, and made also barometers and thermometers. <sup>22</sup>

LAGNY - late 18C French optical instrument maker, one of the successors to LANGLOIS, another being LANGLOIS' nephew, CANIVET. <sup>23</sup>

LAMB Anthony - American instrument maker, *The Sign of Compass and Quadrant, New York*, early 18C. He possibly made a GODFREY-type version of the quadrant. <sup>24</sup>

LANCASTER James - English instrument retailer, *Birmingham* fl.c.1874. <sup>25</sup>

LANGLOIS Claude - notable French optical instrument maker, fl.1730-51 *Paris*. As Ingénieur aux Galleries du Louvre, he made an accurate 6ft quadrant and a 6ft sector for Paris Observatory. <sup>26</sup>

LAPLACE Pierre Simon (Marquis de) - notable French mathematician, astronomer and natural philosopher, 1749-1827. <sup>27</sup>

LARKINS William - amateur astronomer, fl.1760-1800.

LAROCHE - French optician, c.1790, associated with CAROCHÉ. He worked on the platinum mir-

<sup>17</sup>See Turner's Antiq. 120.

<sup>18</sup>Turner 19C 164, and Teyler's Museum.

<sup>19</sup>Sir John Herschel (1861) mentions (Hersch 60) regarding the DOLLOND "four-glass eyepiece" that if "divided into two, by separating the first pair of lenses from the last, and mounting the latter in a tube, sliding within that which carries the former, ..... we have the pancratic eyepiece." An example has recently come to light in Northern Ireland together with a 3-inch telescope by T.HARRIS with the inscription *Pancratic eyepiece, W.Kitchiner MD, Dollond, London. 100-400*. The figures refer to magnification, but x400 is extraordinarily high for the above 3-inch telescope. From this we suggest that this *pancratic eyepiece* was possibly originally constructed for a 4- to 5-inch refractor.

<sup>20</sup>See [CHRsep89], lot 244.

<sup>21</sup>Daumas 204. See also J.Meadows' Biography.

<sup>22</sup>SIMON and Handlist. See Turner 19C 148.

<sup>23</sup>King 106, 229, Bennett 87.

<sup>24</sup>See Bedini, and A Turner ESI 219.

<sup>25</sup>See Handlist.

<sup>26</sup>King 106, and many Refs. in Howse, Bennett 84-86.

<sup>27</sup>LAPLACE is noted for important contributions to lunar theory, tides, capillary action, probability and the undulatory theory of light. He also experimented with balloons.

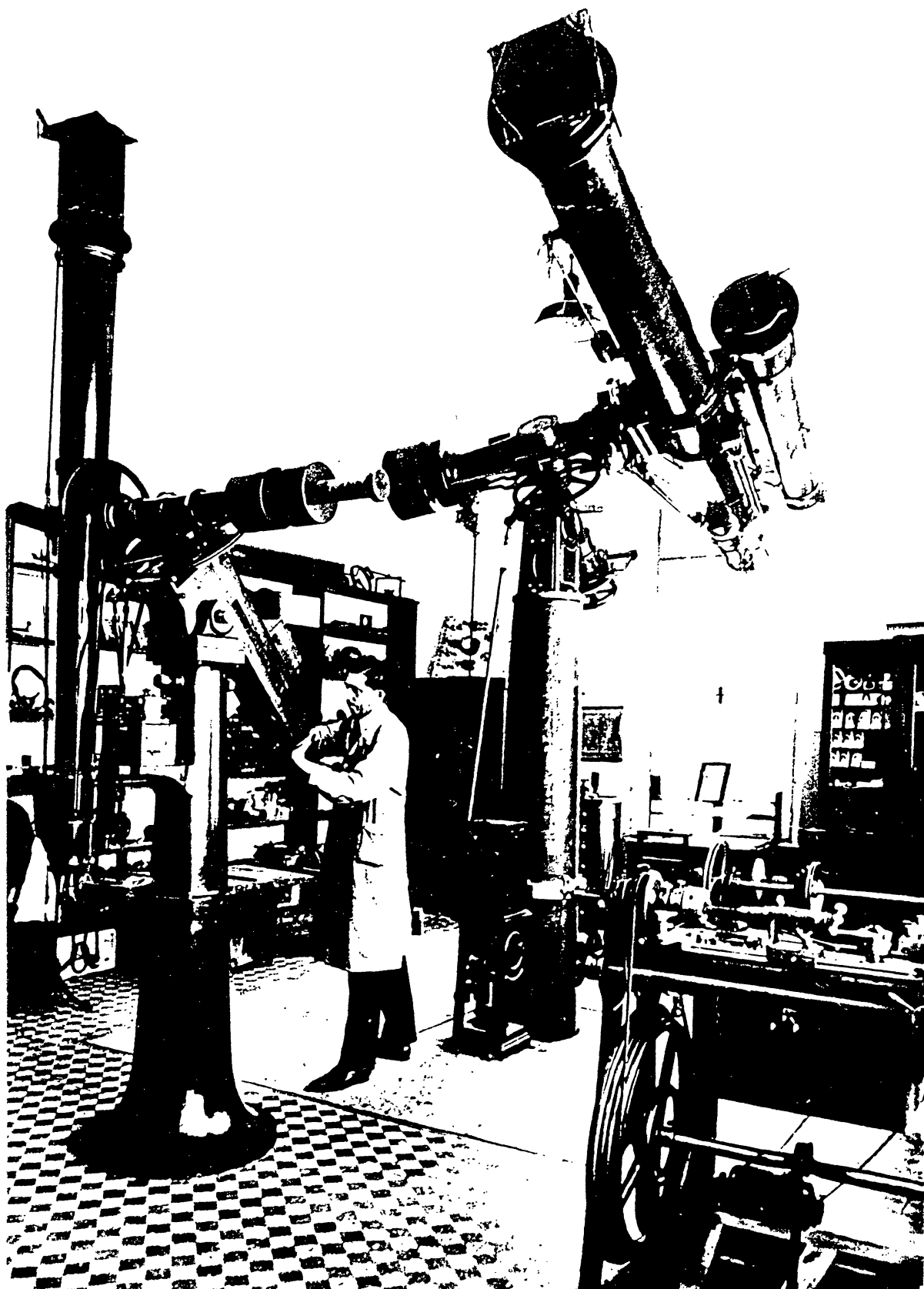


Figure 121: KONKOLY's workshop showing two fine telescopes. A 6-inch COOKE MERZ refractor (1882) is seen in the foreground. Many reputable instrument makers, MERZ, STEINHEIL, COOKE and BROWNING supplied telescopes and spectroscopes to Dr KONKOLY in Hungary. Modifications of instruments could readily be made in KONKOLY's excellent workshop, e.g. a 10-inch refractor was made by KONKOLY with MERZ optics, and a Comet sweeper was constructed of KONKOLY's design (Photo. Courtesy M. Vargha).



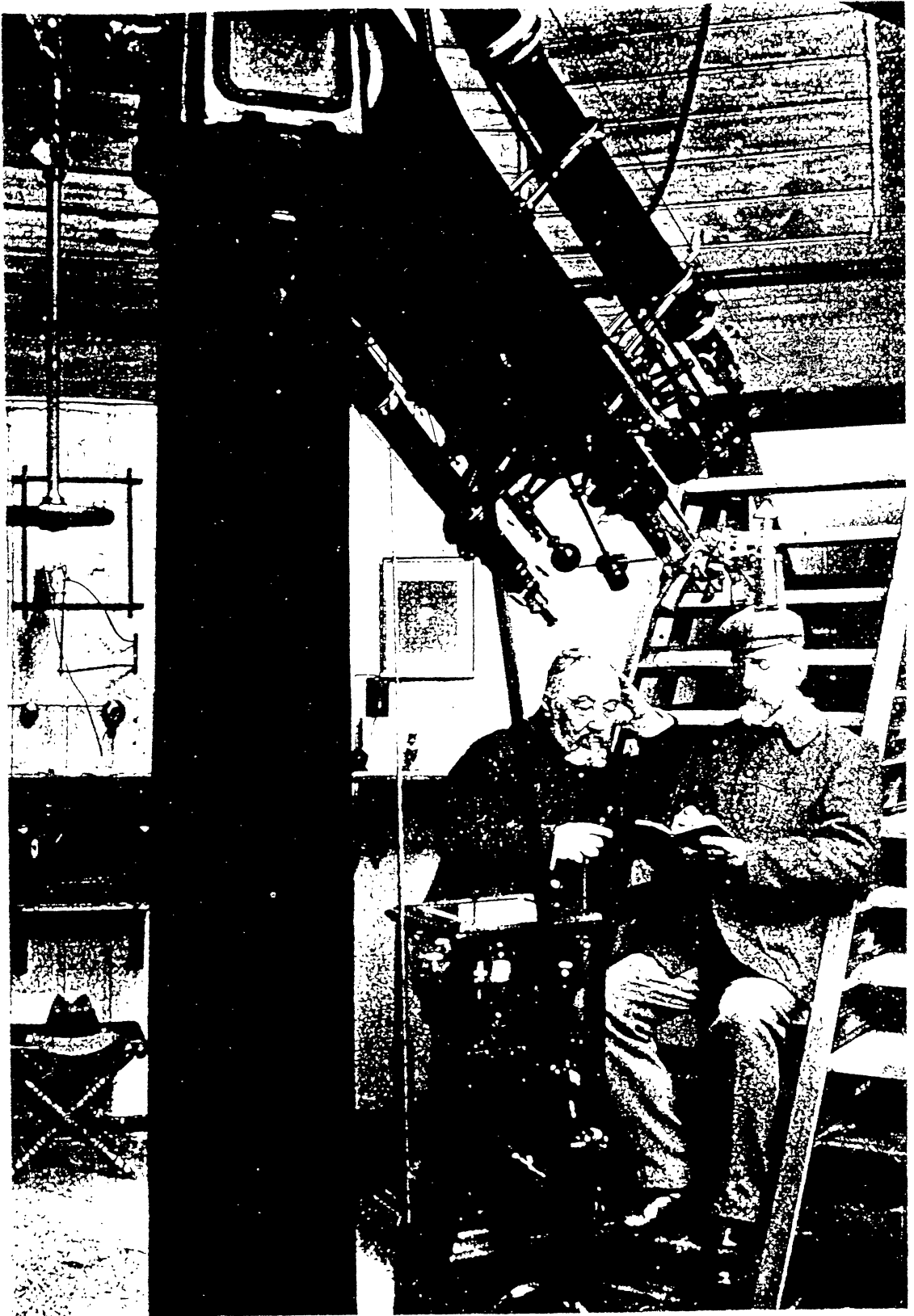


Figure 122: Dr KONKOLY (Director, *Ógyalla*, left) with Prof. HARTMANN (Director, Göttingen) at the 10-inch refractor. Together they observed Halley's comet (Photo. Courtesy M. Vargha).

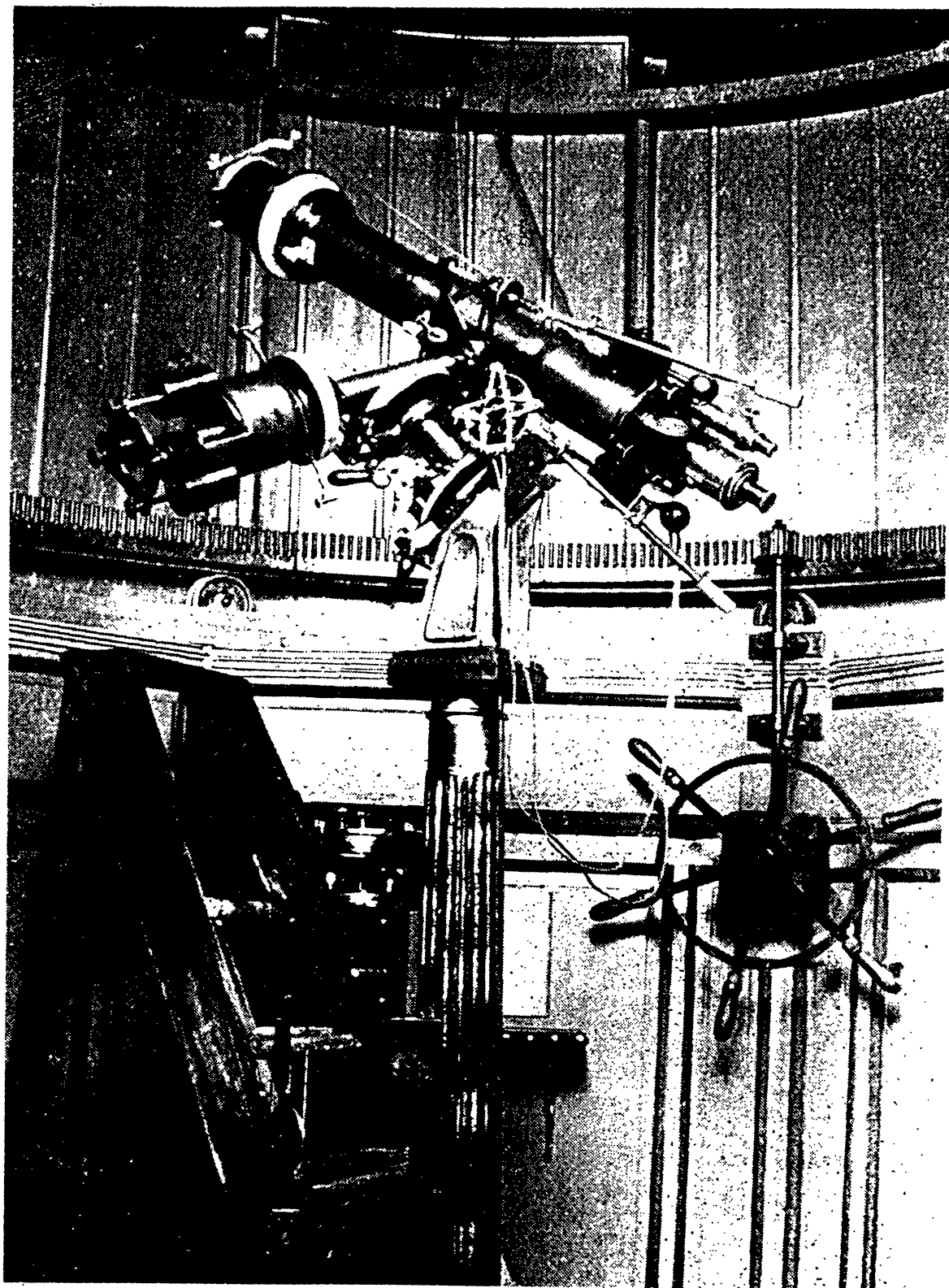


Figure 123: Small refractor at *Nagy-Taggyos*, 1871-1919 (Photo. Courtesy M. Vargha).

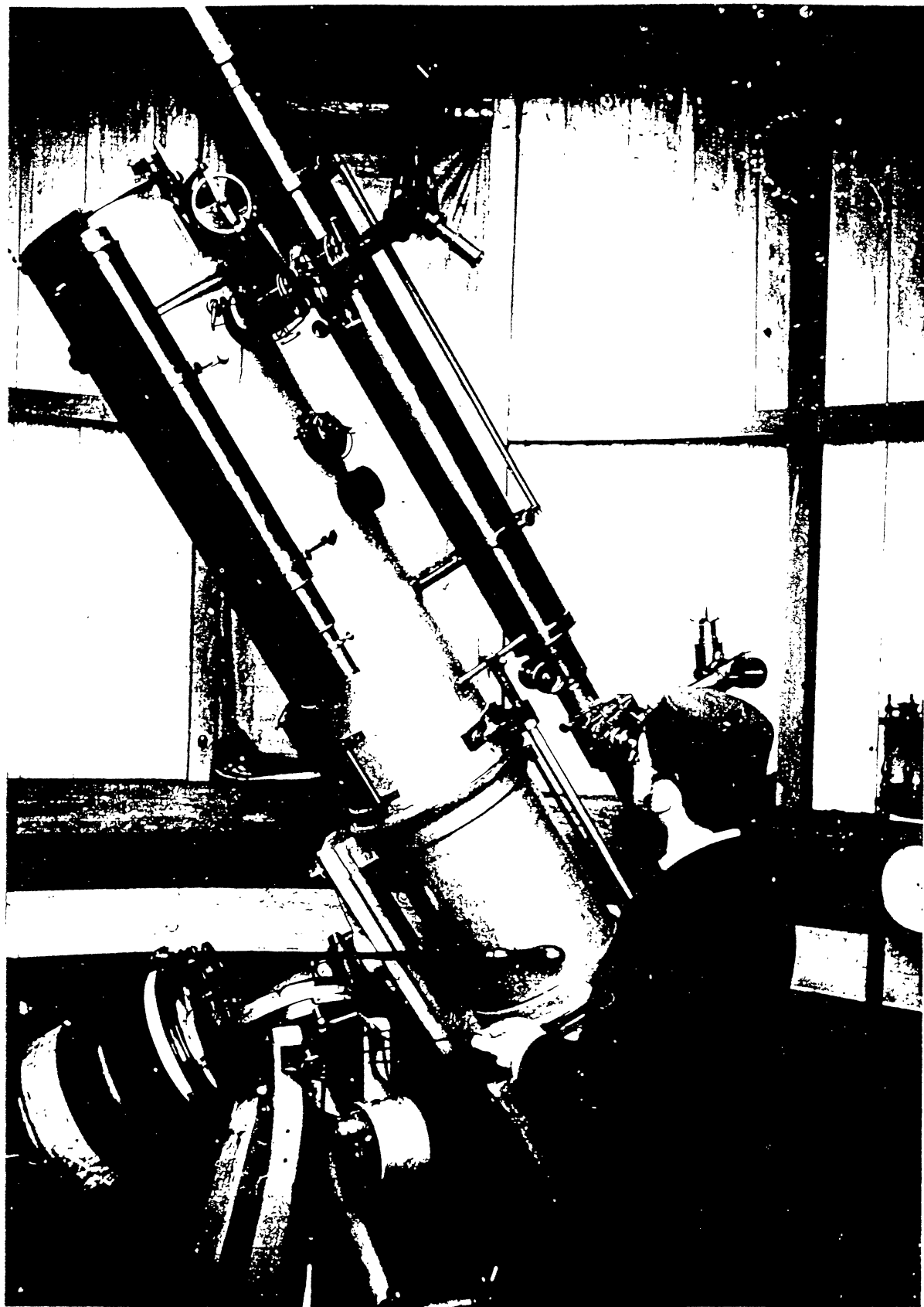


Figure 124: 10-inch BROWNING reflector (1874). Compare Fig.13b in *Cyclopaedia, Part I*. The astronomer shown is Jenő Gothard, who worked with KONKOLY at Ógyalla (Photo. Courtesy M. Vargha).



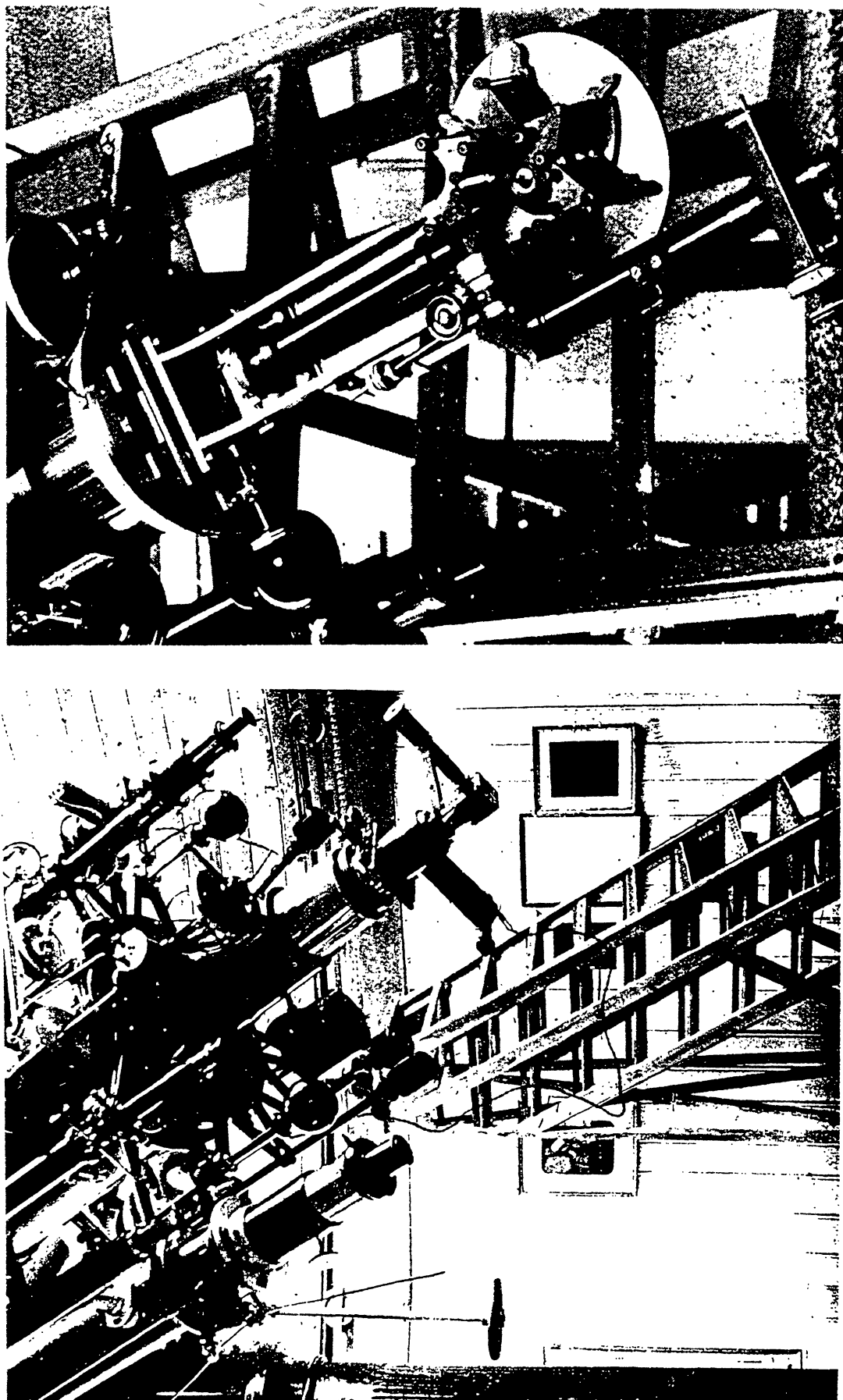


Figure 125: (a) Pointer ocular used by Gothard at Ógyalla, one of a multitude of accessories available to the Hungarian astronomers.

(b) BROWNING-TÖPFER six-prism spectroscope used to view solar prominences at Ógyalla, 1871-1919 (Photos. Courtesy M. Vargha).

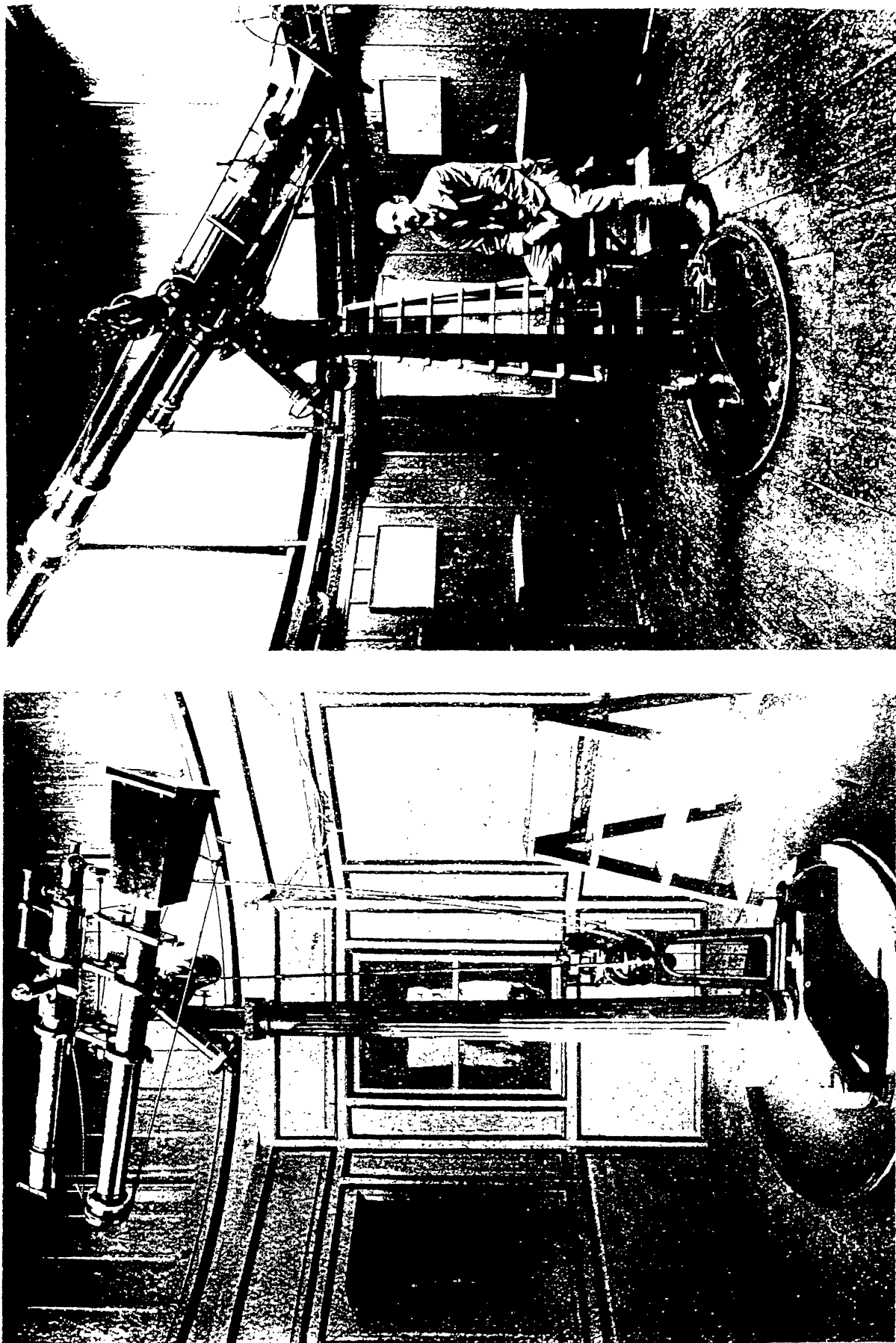


Figure 126: (a) Double photo-refractor, Ógyalla 1871-1919.  
 (b) Large photo-heliograph, possibly by STEINHEIL, used at Ógyalla, 1871-1919 (Photos. Courtesy M. Vargha).

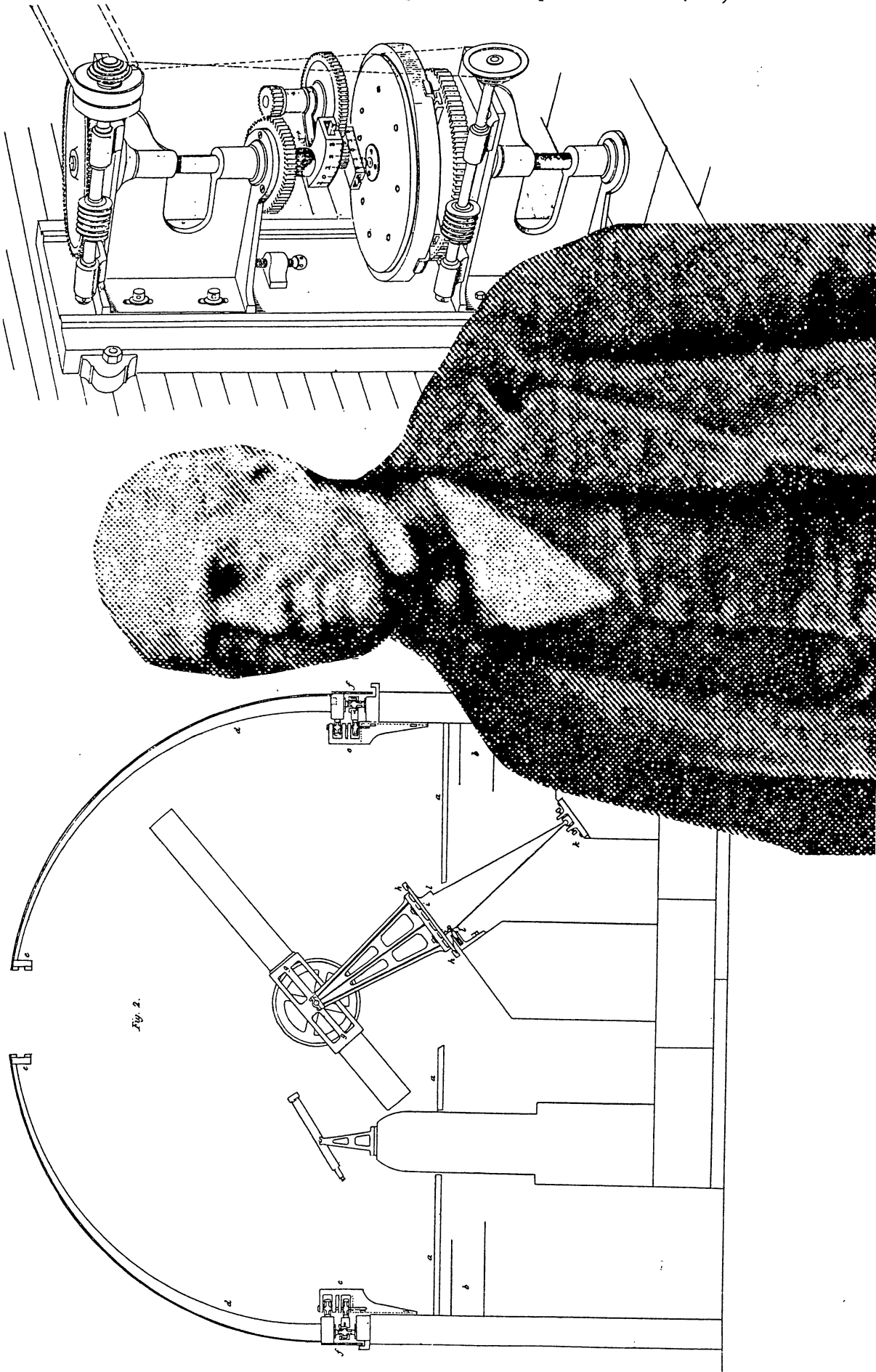


Figure 127: (a) LASSELL's observatory at *Starfield*, showing the 9-inch refractor on its conical polar axis and fork mount (*Mem. Roy. Ast. Soc. vol. 12, 1842*).  
 (b) The LASSELL-NASMYTH steam-driven polishing machine (*Mem. Roy. Ast. Soc. vol. 18, 1949*).  
 (c) William LASSELL (1799-1880)



ror project.<sup>28</sup> He made an achromatic telescope for MÉCHAIN and DELAMBRE, and his work was greatly admired by the chemist, LAVOISIER.<sup>29</sup>

**LASSEDAT** - French pioneer in astronomical photography, 19C, *École Polytechnique, Paris*. Contemporary with DRAPER and RUTHERFURD, he was responsible for significant innovative photographic instrumentation during the 1860s. He devised instruments for photographing solar eclipses and influenced the French plans to photograph the 1874 transit of Venus.

**LASSELL** William - English brewer and gentleman astronomer, 1799-1880, *Starfield, nr. Liverpool; Ray Lodge, Maidenhead, Berkshire* (on his retirement). With his own grinding machine, he constructed several telescopes,<sup>30</sup> the largest being a 48in aperture reflector, a fork-mounted equatorial telescope with open lattice tube, used by him in *Valetta, Malta* in 1861, following the success there of his 24in telescope (1844-64). His association with the engineer, NASMYTH, undoubtedly, contributed to his success.<sup>31</sup> He is known for several "shared" discoveries, Saturn's crepe ring (1850) with Bond and possibly Dawes, Saturn's satellite Hyperion (1848) with Bond, Neptune's satellite Triton (1846) and the illusory ring of Neptune (1849).<sup>32</sup> LASSELL's obituary reveals the remarkable energy of the man in his engineering and astronomical projects.<sup>33</sup>

**LAWSON** Henry - English spectacle maker, fr.1796, w.1810, *45 Gower St, London* (1817), *12 Chancery Lane* (1839).<sup>34</sup>

<sup>28</sup>See Chapin's article, "The persistent Ghost ..." 1971, and JHA vol.3, p.87, 1972.

<sup>29</sup>Daumas 374.

<sup>30</sup>LASSELL made 9in f/12.5 and 24in Newtonian telescopes at *Starfield*, the latter of which he used in *Malta* (1852-53). He is attributed as having been the first to apply a FRAUNHOFER-type equatorial mounting (like that of the Dorpat refractor) to reflectors.

<sup>31</sup>LASSELL was interested in solving the flexure problems in large mirrors using a pad support attached to a lever. See van Helden's article.

<sup>32</sup>See Chapman, *Vistas* vol.32, p.341 and his notes 120 and 121.

<sup>33</sup>See D and C 686 for an interesting mirror support compensator. See 1880 MNRAS p.190, and 1880 Observatory p.589. See also van Helden in JHA vol.14, p.30, 1983, with illustration of LASSELL's 48in aperture reflector.

<sup>34</sup>SIMON. There is a 1.8in telescope with 3 brass drawtubes in the D.Andrews collection with possibly his inscription. We record Johnson LAWSON, spectacle maker, fr.1796, w.1813, *11 Bedford St, Bedford Lane, London*. There is also a Henry LAWSON, medical practitioner /microscopist 1840-77. No connection between the two LAW-

SONS is established.

**LE BRUN** - See footnote.<sup>35</sup>

**LE COEUR** James (I) - spectacle maker, fr.1743, *Dean St, Fetter Lane, London* (1761).<sup>36</sup>

**LE COEUR** James (II) - spectacle maker, son of James (I), was apprenticed to Peter DOLLOND (1770).<sup>37</sup>

**LE COEUR (LE KEUX)** Richard - mathematical, optical and philosophical instrument maker, son of John, possibly not linked with the James', w.1778, *103 Wapping, nr. Execution Dock*, and at many addresses,<sup>38</sup> e.g. *137 Hermitage Bridge, Wapping* (1796-1817), *137 High St, Wapping* (1822-39).<sup>39</sup>

**LE CREUSOT** - French glass manufacturer, c.1811, producing flint glass.<sup>40</sup>

**LEE** John Fiott - English barrister and gentleman astronomer, *Hartwell House, Aylesbury*, 1783-1866.<sup>41</sup> He owned a 5.9in TULLEY instrument, focus 102in,<sup>42</sup> and was closely associated with SMYTH from whom he had acquired SOUTH's 5.9in object glass. The TULLEY telescope was actually put together using various parts from Greenwich and mounted on a SISSON-type equatorial mount at *Hartwell House*.<sup>43</sup>

**LEE H.W** - theoretical optician who designed a photographic triplet c.1919.<sup>44</sup>

**LEE** Philip - 17C English retailer of scientific instruments, at *Atlas and Hercules*, d.c.1700. His wife continued the business.<sup>45</sup>

**LEEUWENHOEK** Antoni van - Netherlands instrument maker, notably of single-lens microscopes,

SONs is established.

<sup>35</sup>Turner Antiq. 120.

<sup>36</sup>SIMON. Clay and Court gives 1722-66.

<sup>37</sup>SIMON.

<sup>38</sup>See SIMON.

<sup>39</sup>Spelling variants (SIMON), Le Keux, Lehuix, Lecour, Lecoux, Leheux, Lekeaux.

<sup>40</sup>See also SAINT-LOUIS and VONÈCHE.

<sup>41</sup>BG 197.

<sup>42</sup>Hersch 42.

<sup>43</sup>We note that HINDLE possibly made the suggestion of an English double-fork mount to SISSON. LEE's transit instrument was similar in many respects to the TROUGHTON transit at Armagh Observatory. We record Philip LEA or LEE, 17C mathematical instrument and globe maker (see SIMON) but assign no connection. See illustrations.

<sup>44</sup>D and C 261.

<sup>45</sup>Daumas 94.

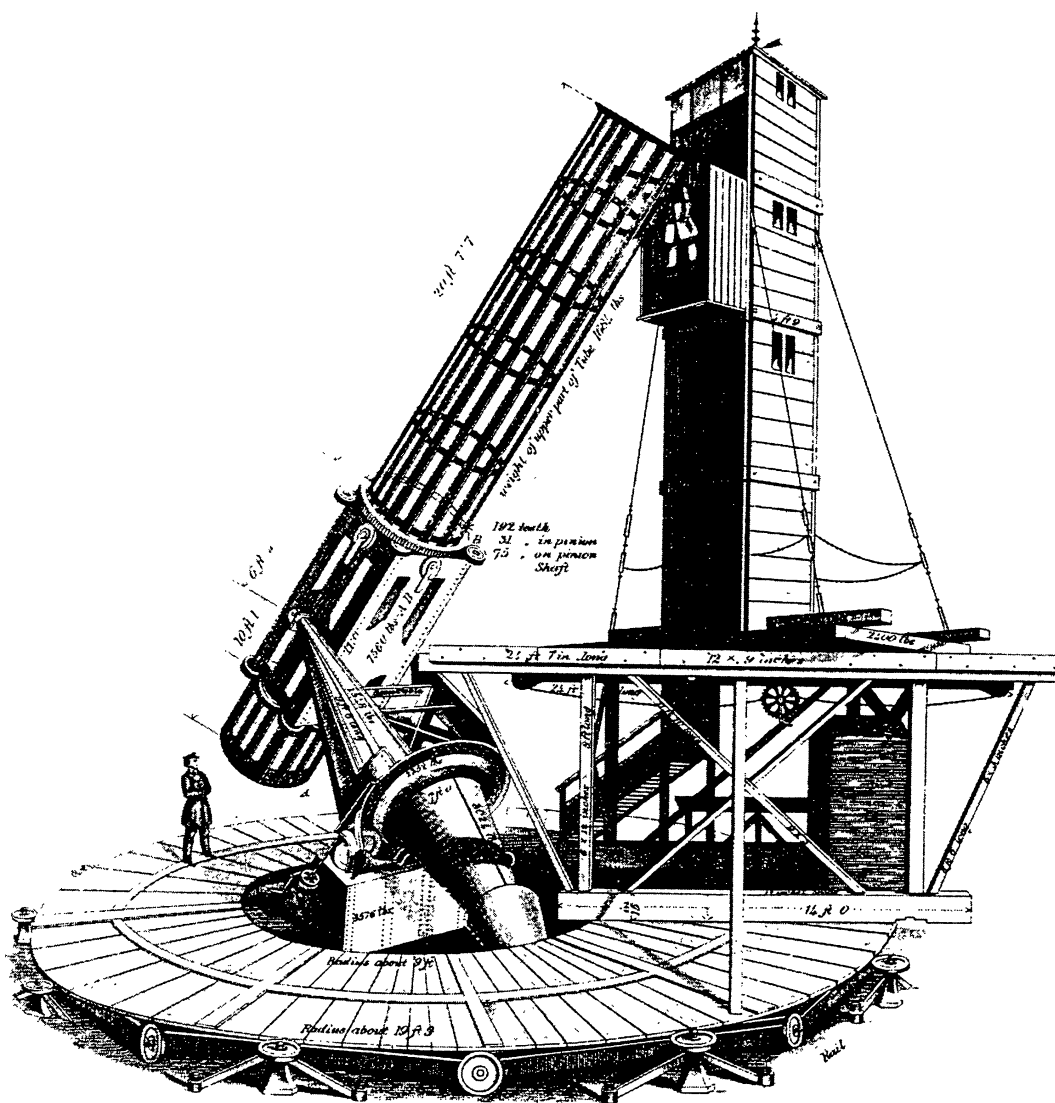
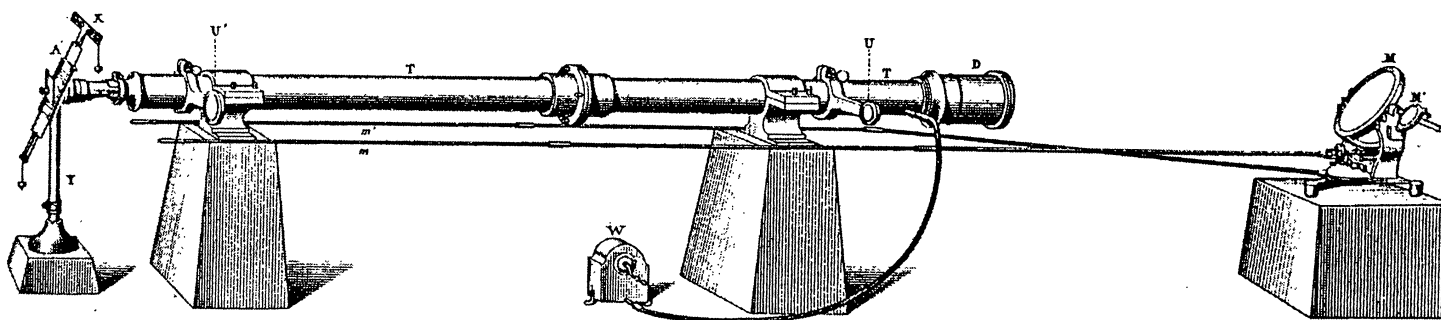


Figure 128: (a) LASSELL's 48-inch reflector in *Malta*.  
(b) Coelostat for solar eclipse photography by LAUSSEDAT (1860s).



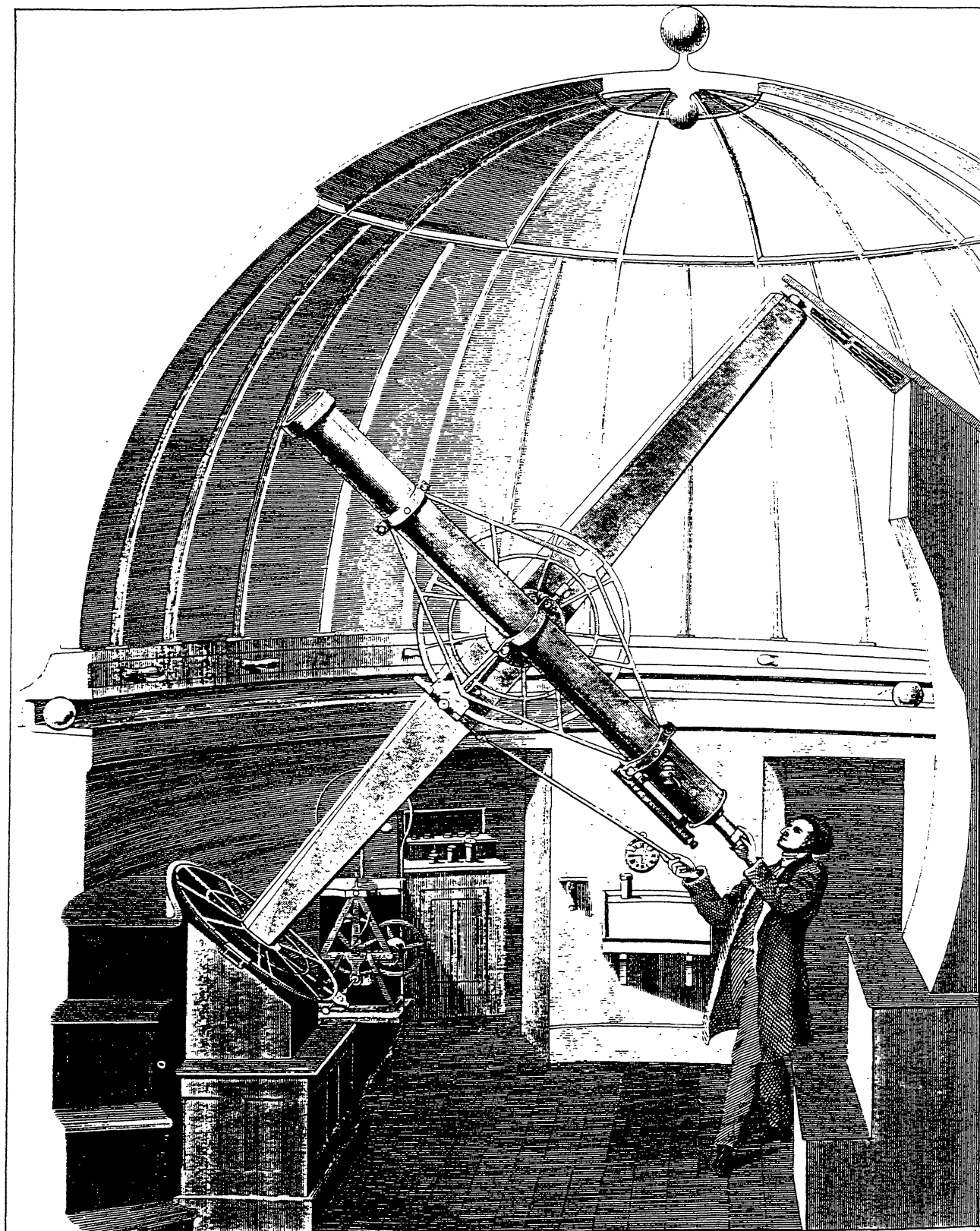


Figure 128: LEE's 5.9-inch telescope by TULLEY on English equatorial mounting (*Hartwell House* c.1850). The English-style of mounting was suggested by HINDLE to SISSON according to some authors.



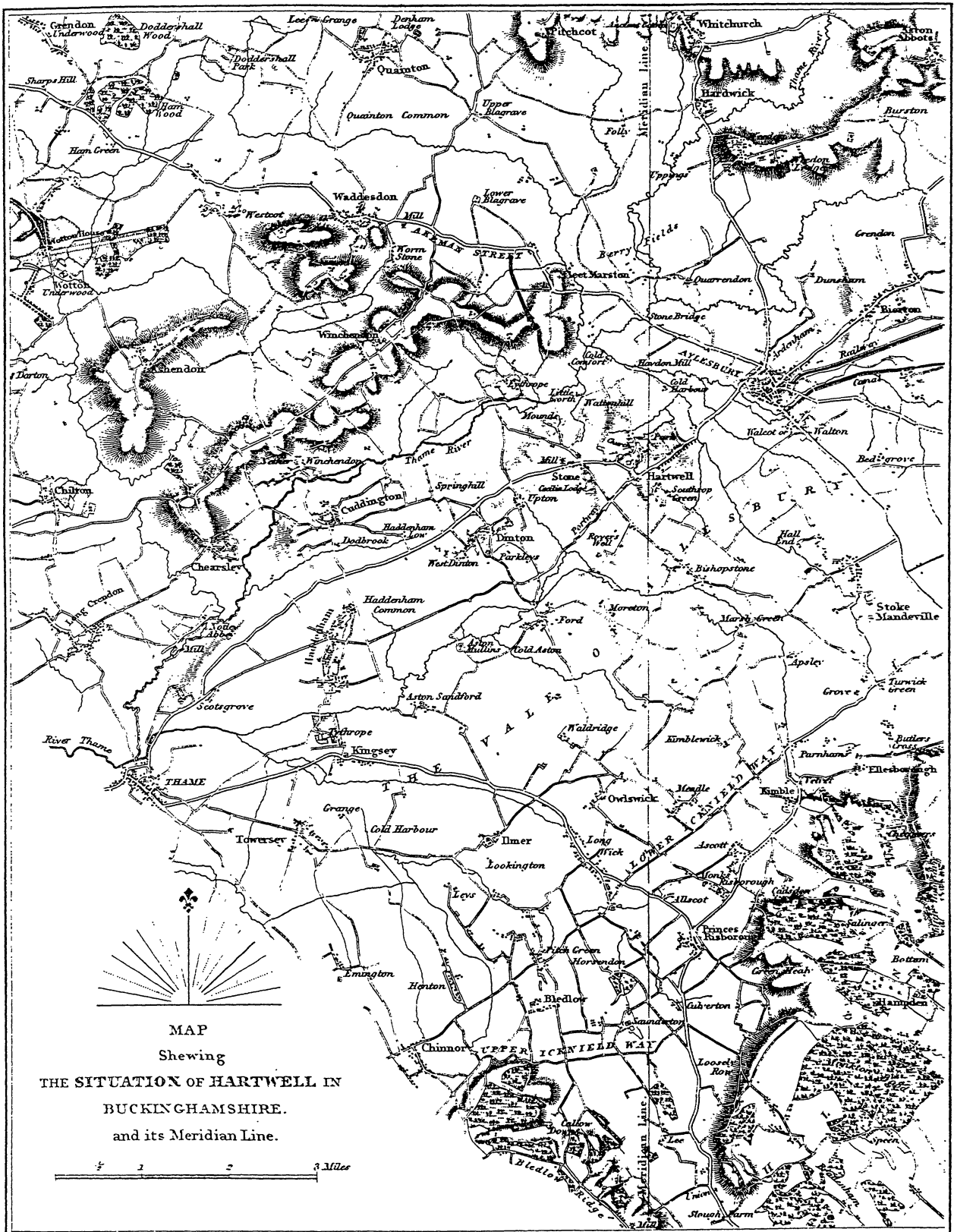


Figure 129: (a) Map showing location of LEE's residence, *Hartwell House*, near Aylesbury, Buckinghamshire. (b) Recent advertisement inviting guests to the present-day health spa at *Hartwell*.

**Hartwell House**, near Aylesbury, Buckinghamshire (0296-747444) was home to the exiled King Louis XVIII of France. You can fish for trout on the lake or stroll in its 80 acres of landscaped parkland.



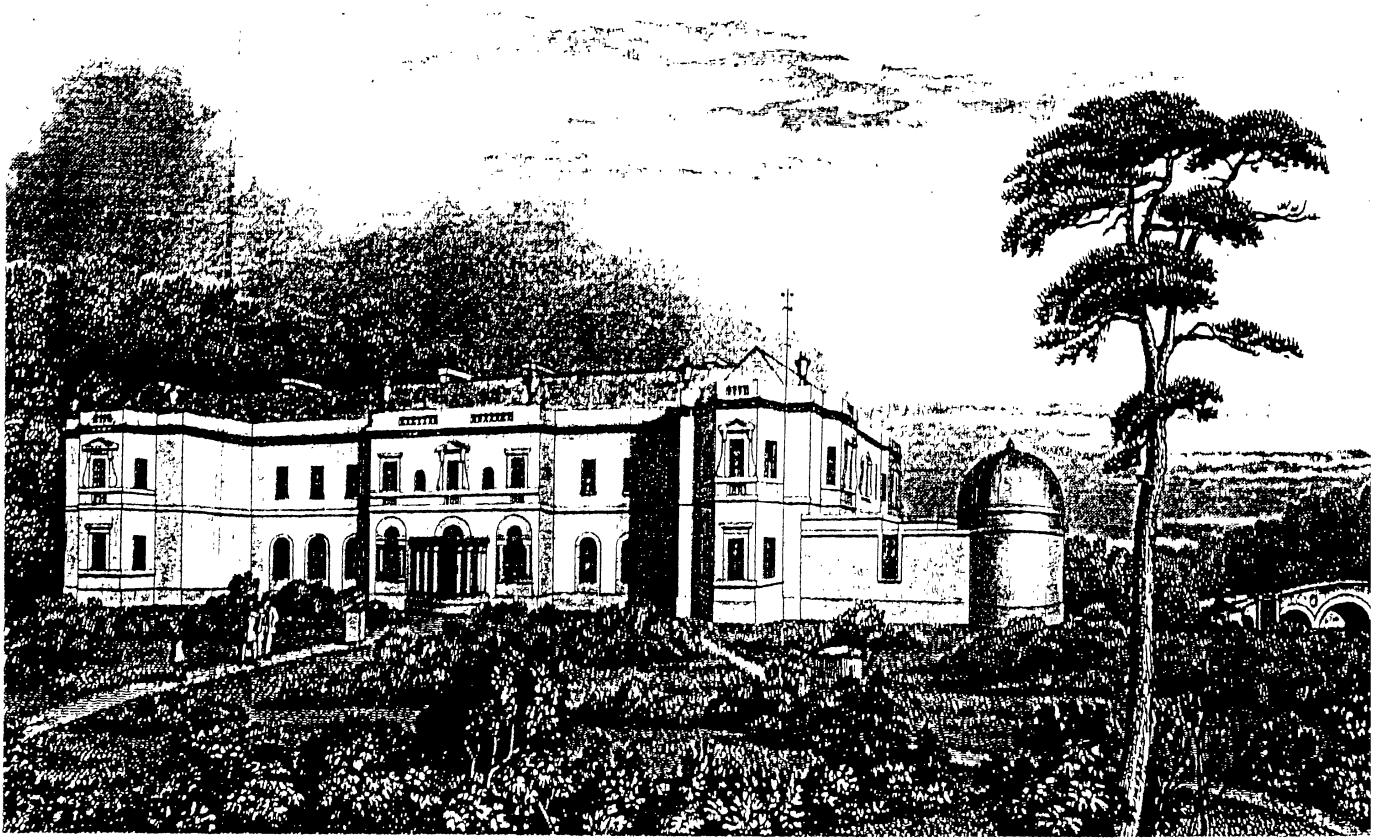


Figure 130: (a) Two views of *Hartwell House* (LEE's observatory c.1850).



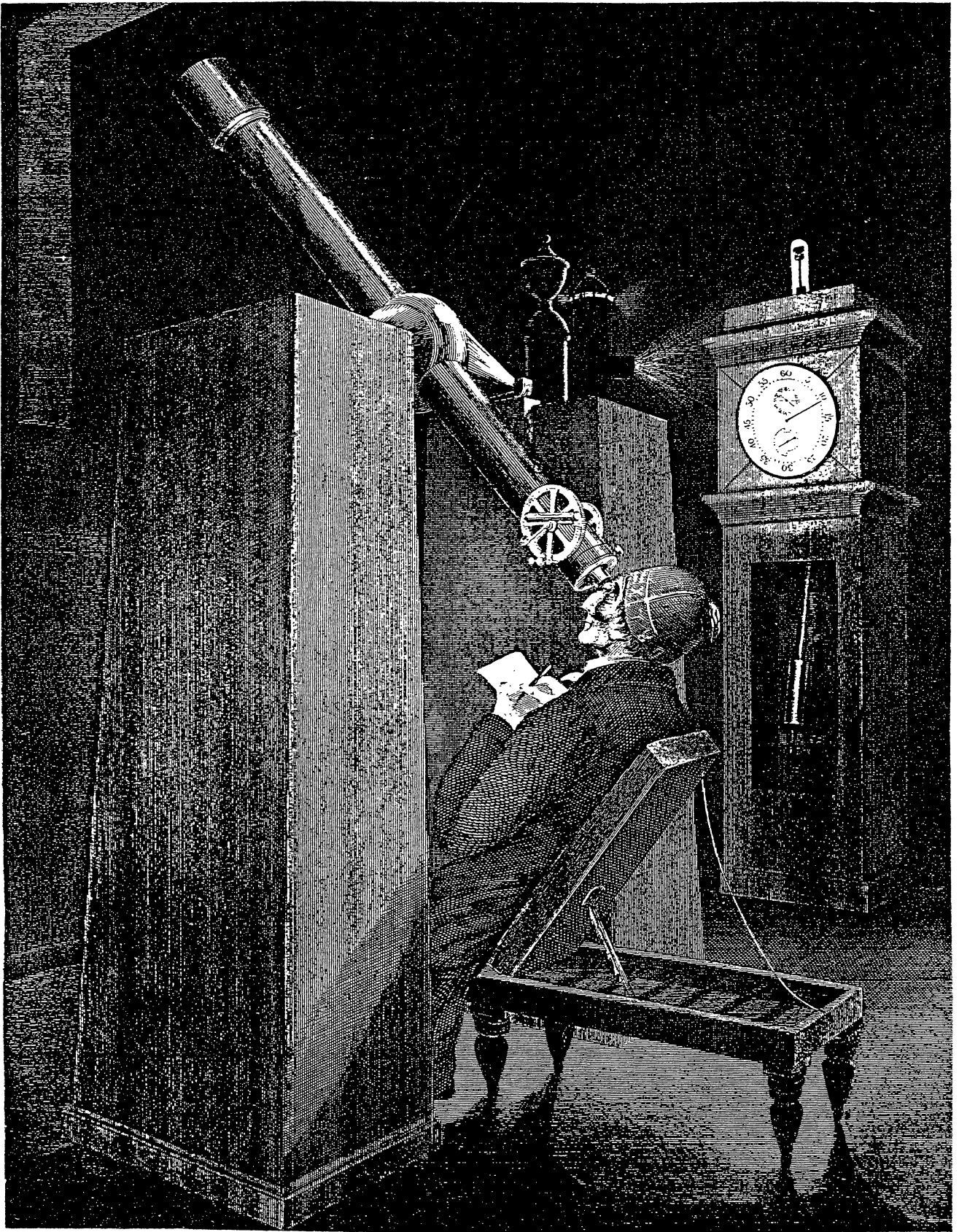


Figure 131: Transit telescope belonging to LEE at *Hartwell House*.



1632-1723.

LEISS Carl - German optical and mechanical instrument maker, *Steglitz, Berlin* (World War II binocular code jfp).

LEITZ Ernst - German optical instrument maker (mostly microscopes), c.1880 onwards, successor to C.KELLNER in *Wetzlar*. The firm manufactured petrological and metallographic microscopes and many accessories; also the *Wetzlar* binocular. <sup>46</sup>

LEMAIRE Jacques - French instrument maker, *Dubois aux Génies à Paris*, c.1700. He made an astronomical quadrant with an azimuthal sector and telescopes. <sup>47</sup>

LE MONNIER Pierre Charles - French astronomer and Professor of Physics, *Paris*, 1715-99. <sup>48</sup> He unwittingly saw Uranus ten times between 1764 and 1771 prior to its discovery by Sir William HERSCHEL. <sup>49</sup> He was author of "*Déscription et usage des principaux instruments d'astronomie*", *Paris* 1774. At his private observatory he had a 5ft quadrant by SISSON (1725) and one of 7.5ft by BIRD (1751).

LENNEL - French instrument maker, fl.1774-83. He was in the LANGLOIS and CANIVET tradition, and was noted for his quadrants and transit instruments. <sup>50</sup> There is a 4ft equatorial "device" by LENNEL *Paris* which was used at a private observatory at *rue Sainte Avoie* and which was moved to *rue de Paradis*. We find also a 3ft transit instrument at August DARQUIER's private observatory near *Palais de Justice, in rue Darquié*. <sup>51</sup>

LENNER - See note. <sup>52</sup>

LENNIE James - Scots instrument maker and retailer, *Edinburgh*, b.c.1817, the firm flourishing mid-1800s until early-1900s. <sup>53</sup>

<sup>46</sup>See Handlist for addresses of branches in *London*.

<sup>47</sup>Daumas *Fig.88*, telescope (1732). There was also N. LEMAIER c.1675, Pierre LEMAIER c.1739-60 (son of Jacques) and we also find LEMARIÉE (end of 17C). See Daumas 340 and A Turner ESI 145. A firm named BAILLE-LEMAIRE c.1890 produced fine binoculars (Turner 19C 165), and was probably founded in 1847. See also D and C 680.

<sup>48</sup>JHA vol.22.

<sup>49</sup>FLAMSTEED also unwittingly saw Uranus (1690), marking it as "34 Tauri" on his star charts.

<sup>50</sup>Bennett 87.

<sup>51</sup>Howse 20.

<sup>52</sup>Possibly confusion with LENNEL.

<sup>53</sup>BG 123, CHr Sept86 lot 176.

LENOIR Etienne - eminent French instrument maker, especially geodetic and navigational instruments, 1744-1832. <sup>54</sup> BELLET was his pupil.

LENOIR Paul Etienne Marie - son of Etienne LENOIR. He was an equally distinguished instrument maker, 1776-1827.

LEREBOURS Noël-Jean - French instrument maker, *151 bvd Aug-Blanqui, Paris XIIIe*, 1761-1840. He furnished LENOIR with achromatic telescopes with uncemented doublets for his navigational and geodetic instruments <sup>55</sup>. The firm of LEREBOURS was established at *quai de l'Horloge* in 1789 after working with LOUVEL. LEREBOURS supplied Napoléon with an 11cm telescope, <sup>56</sup> although he did make 19cm, 24cm and 38cm telescopes which were amongst the largest during his time. For example, LEREBOURS made the 38cm optics (f=8m) for *Paris Observatory*, and Gregorian reflectors magnifying 100 times for terrestrial use, and 300 times for astronomical use.

LEREBOURS Nicolas (or Noël) -Marie Paymel - French instrument maker, son of N-J. LEREBOURS, 1794-1855. He formed a firm partnership with SECRETAN in 1845 at *rue de l'Est 23, Paris*, and was found at *13 place du Pont-Neuf, Paris* in 1853. The "Maison" of LEREBOURS et SECRÉTAN was still advertising in 1885. <sup>57</sup>

LE ROY Duval - noted for his French translation (c.1767) of Robert Smith's "*A Compleat System of Opticks*", *Cambridge 1738*. <sup>58</sup>

LEWIS W - optical/turner, *2 Rose St, Covent Garden, London*, fl.1727. He supplied tubes for telescopes. <sup>59</sup>

LICHTENKNECKER Optics - present day optical firm, *Küringer Steenweg 44, B-3500 Hasselt, Bel-*

<sup>54</sup>See under LEREBOURS, and Daumas *Fig.107* and A.Turner's biography of LENOIR (main bibliog.), and also Bennett 87. We note that the 1805 repeating geodetic circle in Daumas *Fig.108* is similar to LENOIR's.

<sup>55</sup>Bennett 161.

<sup>56</sup>Roughly twice the size LEREBOURS generally produced.

<sup>57</sup>See Handlist.

<sup>58</sup>This important historical text was also translated into Spanish by Esprit Pesanz. A small 8-draw brass telescope with black decorated maintube inscribed *J.B. Le Roy, 15 Mulcaster St (?)*, *Jersey* was recently seen at *Odin Antiques, Brighton*. A connection with Duval Le ROY has not been established by the author.

<sup>59</sup>Tayl.

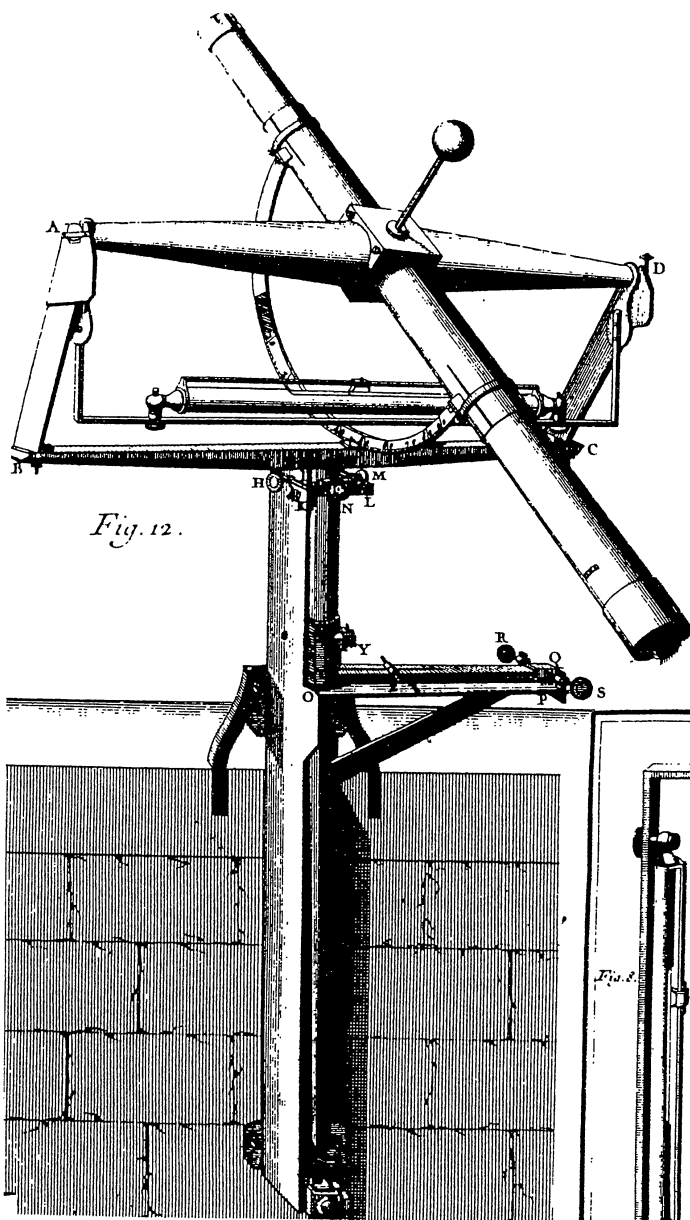
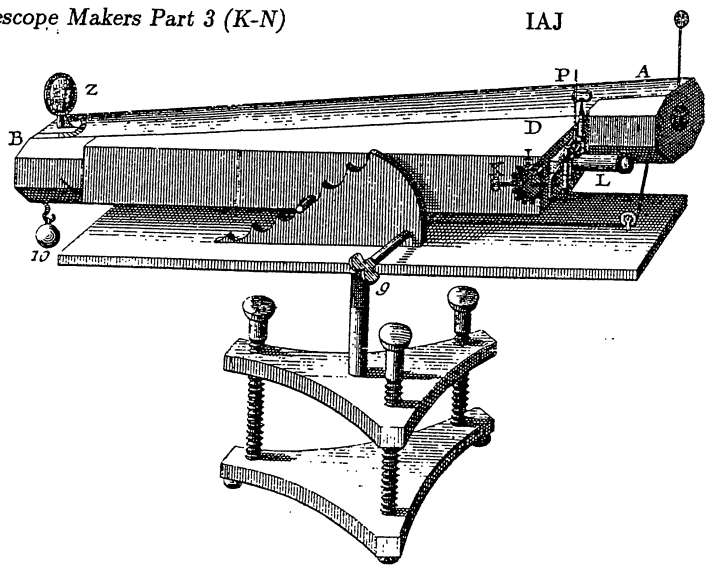
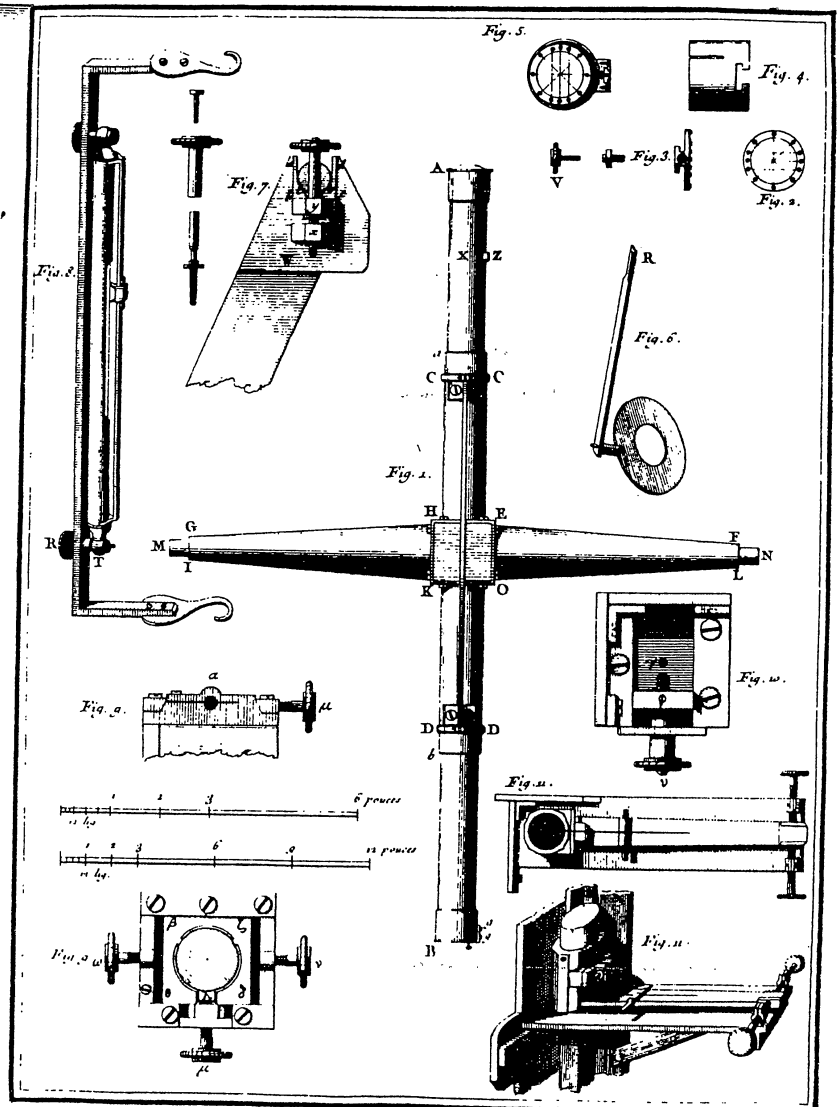


Fig. 12.

Figure 132: (a) LEMAIRE telescope (From *Machines et Inventions approuvée par l'Académie*, VI, 1732).

(b) LeMONNIER's transit instrument constructed by GRAHAM.

(c) Schematic diagrams of parts of LeMONNIER's instrument.





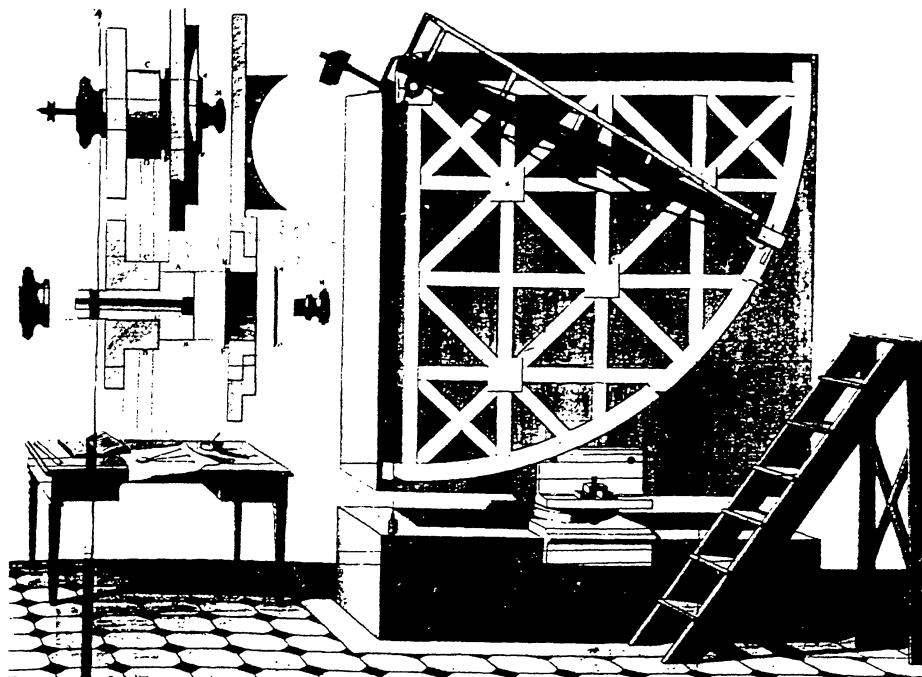
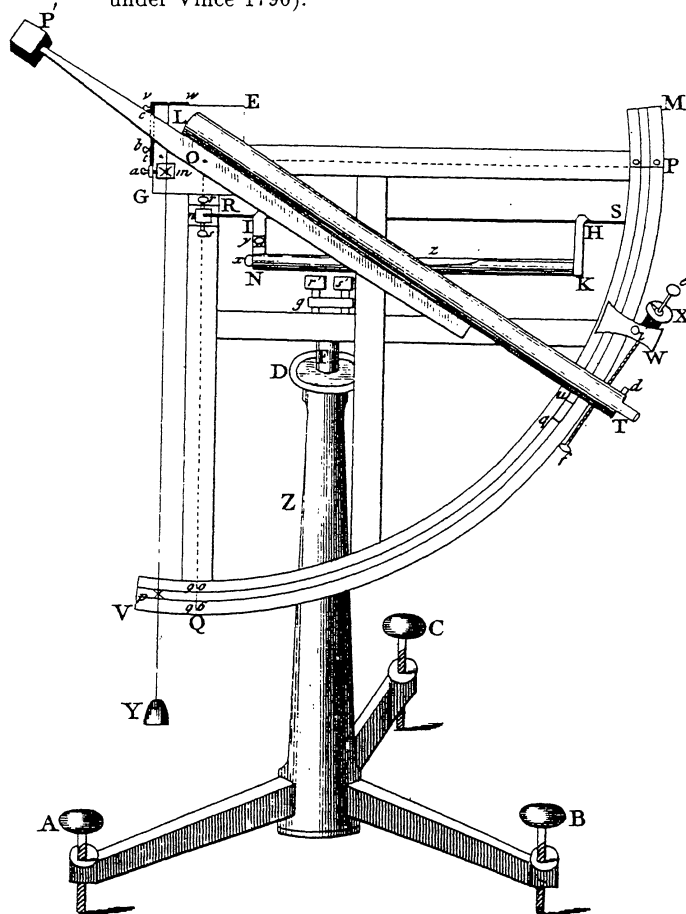
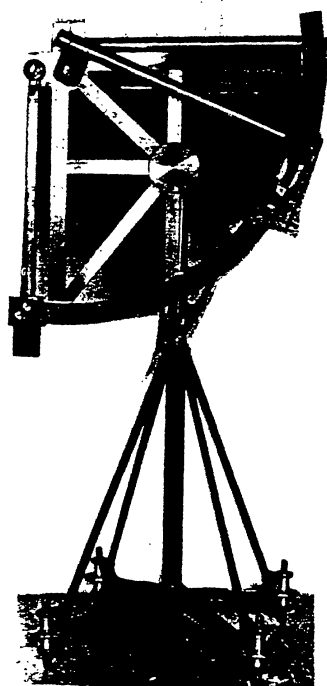


Figure 133: (a) LeMONNIER's invention for a 7.5-feet circle attached to a block of masonry and rotating upon another (*Description et usage des instruments d'astronomie*). Also shown are details of the alidade bearing.

(b) LENNEL's portable quadrant (c.1785). N.B. Four-leg support.

(c) 18C quadrant (See *Cyclopaedia Part I References and Sources*, under Vince 1790).



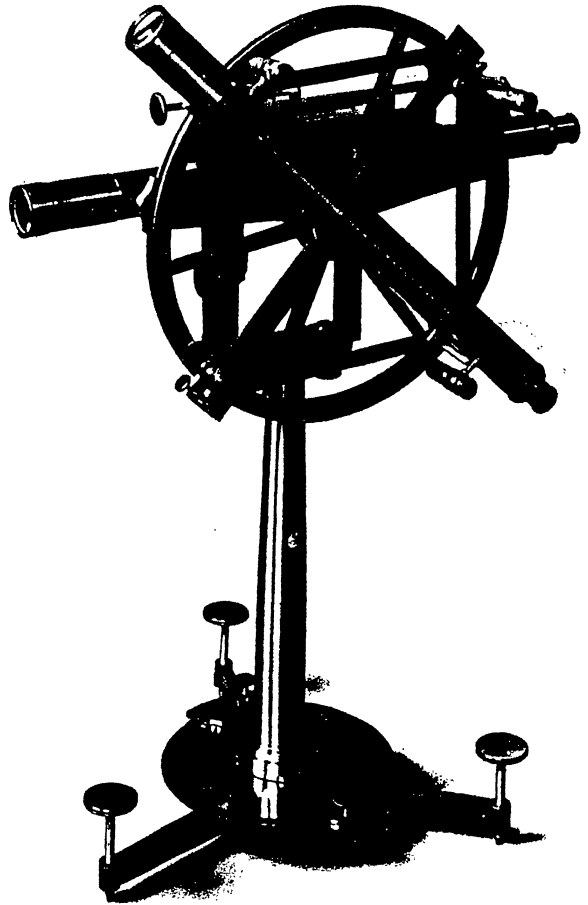
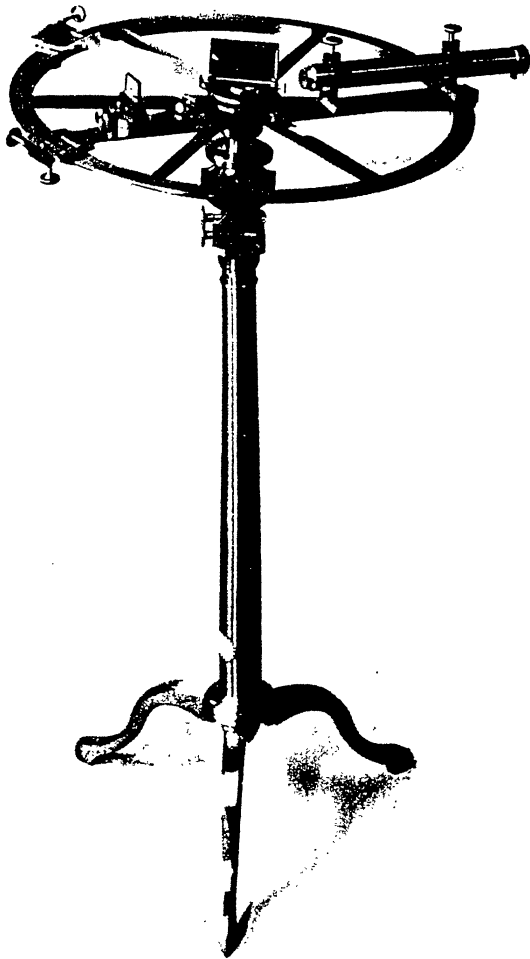


Figure 134: (a) de BORDA navigator's reflecting circle constructed by LENOIR. See *Cyclopaedia Part I, Fig.10c*.

(b) Surveyor's repeating circle by BELLET (1805) after a design by LENOIR.

(c) LOUVILLE's transit instrument (1719).

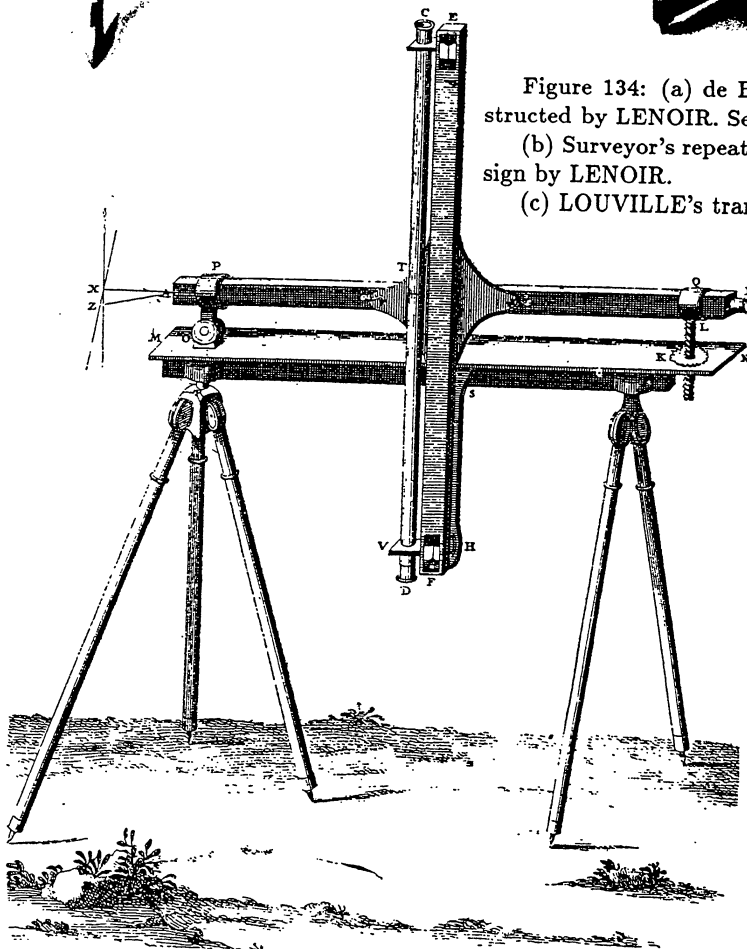
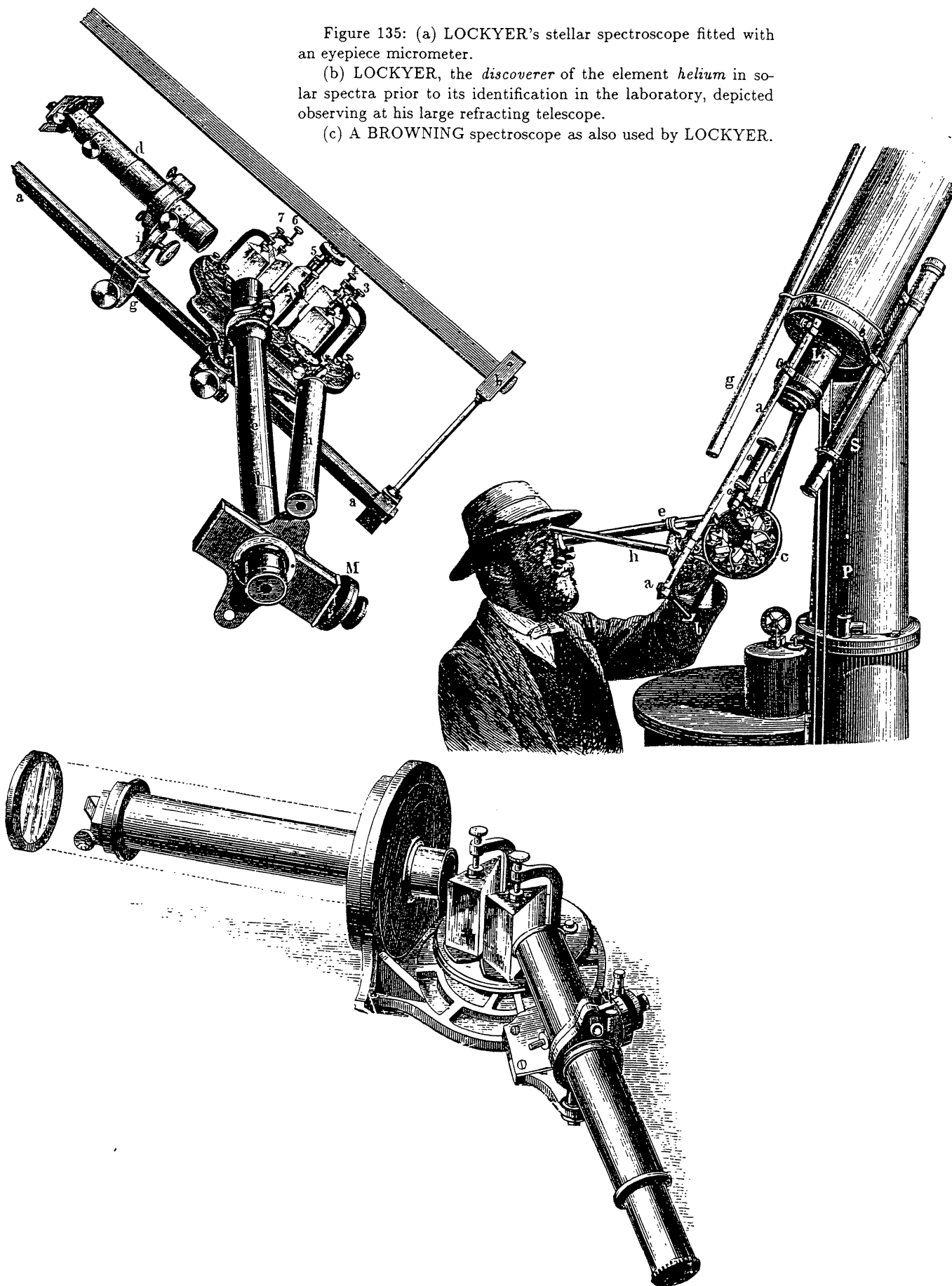


Figure 135: (a) LOCKYER's stellar spectroscope fitted with an eyepiece micrometer.

(b) LOCKYER, the *discoverer* of the element *helium* in solar spectra prior to its identification in the laboratory, depicted observing at his large refracting telescope.

(c) A BROWNING spectroscope as also used by LOCKYER.



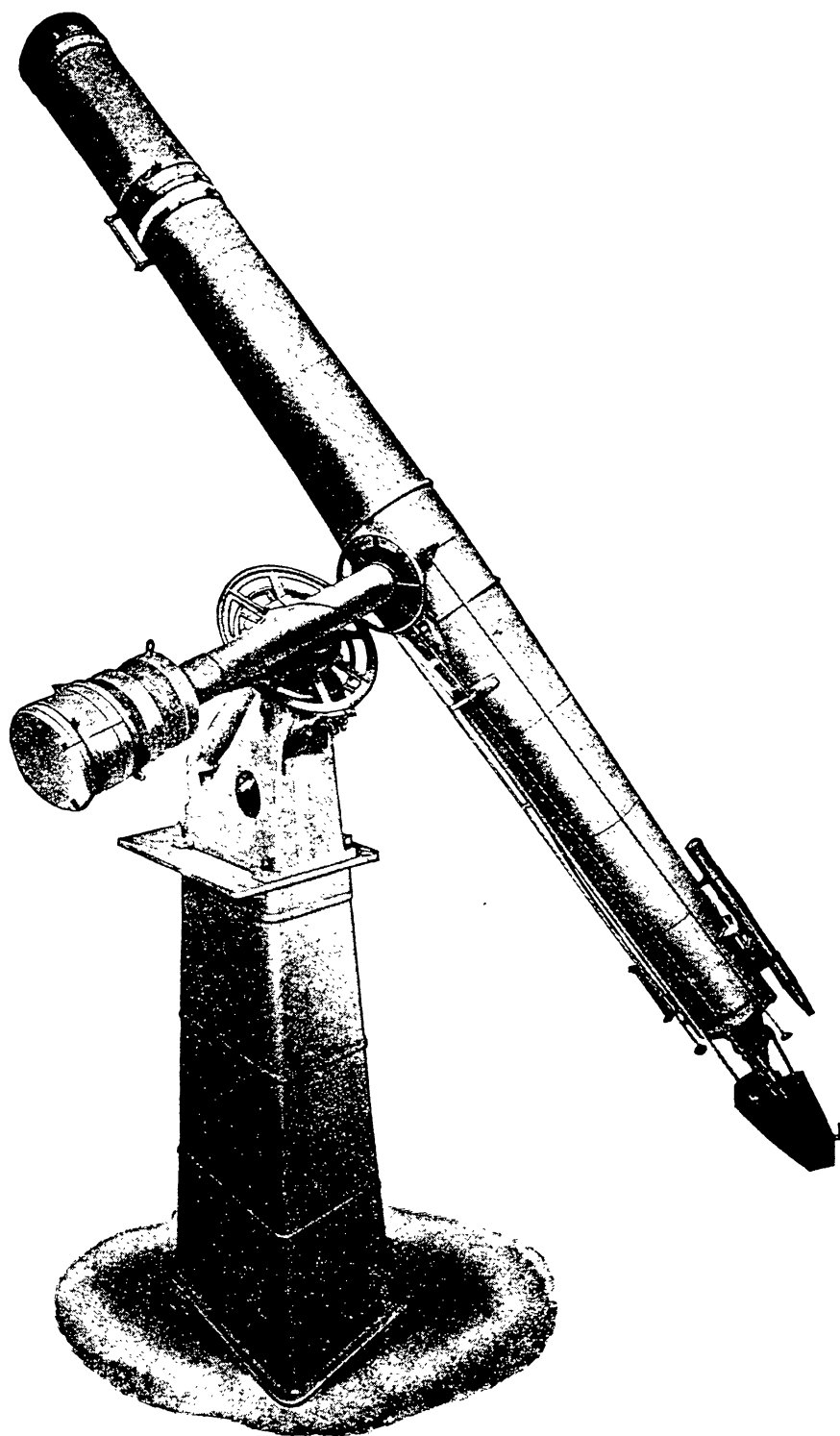


Figure 136: The LOWELL 24-inch refractor constructed by CLARK. The final figuring of the object glass was by LUNDINS.



*gium*. They produce the FFC 760mm f/4 Schmidt Cassegrain Flat-field Camera.

LIEBERKUHN Johann Nathanael - physician, *Berlin*, 1711-56. He designed anatomical microscopes working on aspheric lenses. <sup>60</sup>

LIEBHERR Joseph - eminent 19C German instrument maker, associated with REICHENBACH and UTZSCHNEIDER working in the FRAUNHOFER tradition, 1767-1840. There is a 14cm transit instrument (c.1811) by him in the *Bogenhausen* Observatory. <sup>61</sup>

LIEBIG Justus von - German organic chemist, 1803-73. He invented a silvering technique which was used by C.A.STEINHEIL and also by FOUCAULT.

LILLEY John and Son - instrument maker or retailer, *10 London St, EC*, c.1894.

LINCOLN Charles - optician, maker of astronomical telescopes and microscopes, fr.1762, d.1807, at *Sign of the Head of Newton, in Leadenhall, London* (1772), previously *32 and 38 Leadenhall* and *11 Cornhill, near Poultry* and lastly *62 Leadenhall St.* (1794-1805). <sup>62</sup>

LINDSAY James Ludovic (Lord LINDSAY, 26th Earl of CRAWFORD) - 1847-1913, Scots gentleman astronomer, founder of *Dun Echt Observatory*, employing the young David GILL as its first Director. The Observatory possessed 15in GRUBB and 6in COOKE equatorials, a 16in EICHENS/DALLMEYER siderostat and 4in REPSOLD heliometer. <sup>63</sup>

LINFOOT E.H. - theoretical and practical optician, *Cambridge, England*, 1905-82, He was noted for important advances in telescope optics. He designed the classical Cambridge Schmidt telescope which was built by GRUBB PARSONS, and was consultant for other major instruments. See the St Andrews University Observatory modified Schmidt telescope. <sup>64</sup>

LINNELL Joseph - optician, optical instrument maker, fr.1763, w.1775, *Ludgate St* (1764), and at *the Great Golden Spectacles, Quadrant, 33 Ludgate St, Saint Paul's, London*, (1774). <sup>65</sup>

LIPPERSHEY Jan - Dutch spectacle maker, *Middelburg, Zeeland*. He was a native of *Wassel*, and the invention of the refracting telescope has frequently been attributed to him, or to someone working in LIPPERSHEY's workshop.

LISTER Joseph Jackson - wine merchant and optical instrument designer, 1786-1869. He published an important paper in 1830 regarding the design of a microscope objective lens with improved resolution, correcting for spherical and chromatic aberration. <sup>66</sup> His design replaced LEEUWENHOEK's excellent simple microscopes and HOOKE's poor compound microscopes. LISTER's lenses were tested by the Pommeranian scientist, NOBERT. <sup>67</sup> LISTER was associated with both TULLEY and BECK who made lenses to his design.

LITTROW J.J. - optician and astronomer, *Vienna*, fl.1821-38. He made ultraviolet spectroscopy with quartz optics and Iceland spar prism for HUGGINS. He designed a doublet objective (1827). <sup>68</sup>

LIZARS John - instrument retailer *Glasgow*, b.c.1810. <sup>69</sup> There was a branch in *Belfast* at *73 Victoria St.* (1894-1900), as well at *8 Wellington Place* (1907-1921, now a photographic dealer), and at *46 Howard St.* as spectacle opticians and retailer. <sup>70</sup>

LÖBER A - German optician. He was Carl ZEISS' assistant in the early days of the firm, responsible for introducing interferometric methods into the testing of optical instruments.

LOCKYER Joseph Norman (Sir) - eminent English astronomer, 1836-1920, Director Solar Physics Ob-

<sup>65</sup>Notorious as one who opposed DOLLOND's claim (over HALL) concerning the achromatic object glass, LINNELL took over AYSCOUGH's business. We also record George LINNELL, instrument maker, late 18C (Christie's Cat.).

<sup>66</sup>Dict. Nat. Biogr. See also Phil.Trans.Roy.Soc. 1830. LISTER's design incorporated two achromatic lens combinations a certain distance apart to eliminate aberrations. He also experimented with diamond and sapphire lenses in microscope designs.

<sup>67</sup>Turner Mic 141. LISTER's son, Joseph, a famous surgeon, became Lord LISTER. See SIMON and Cartwright.

<sup>68</sup>See D and C 227. We find also Karl von LITTROW in King 191, 330, fl. early 19C, Sedg 98. See PLÖSSL.

<sup>69</sup>See BG.

<sup>70</sup>See Vulg Mech, CHrApr88.

<sup>60</sup>King 146.

<sup>61</sup>Private communication, R.Häfner.

<sup>62</sup>SIMON. See CHrApr88. We find another LINCOLN associated with the firm, Newman and Guardia, manufacturers of cameras (1890).

<sup>63</sup>Vistas vol.28, p.147.

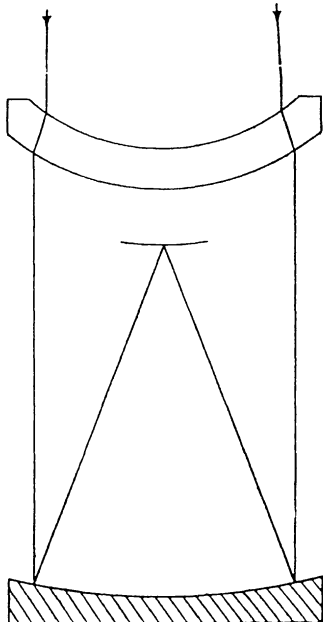
<sup>64</sup>Obituary in Quart. Journ. Roy.Astr.Soc. vol.25, p.219. See King 374.

# R. MAILHAT

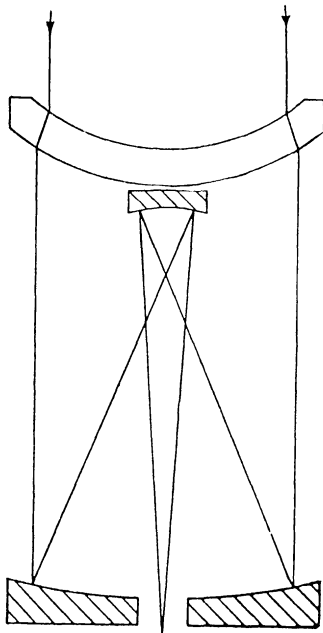
## Grand prix à l'Exposition Universelle de 1900

41-43, Boulevard Saint-Jacques, à Paris (Près l'Observatoire)  
(Ci-devant : 30, Faubourg Saint-Jacques)

FOURNISSEUR DE L'OBSERVATOIRE DE PARIS, DE LA FACULTÉ DES SCIENCES, DU BUREAU DES LONGITUDES,  
DE L'OBSERVATOIRE DE JUVISY, DE LA SOCIÉTÉ ASTRONOMIQUE DE FRANCE, DES MINISTÈRES  
ET DE PLUSIEURS OBSERVATOIRES FRANÇAIS ET ÉTRANGERS, ETC., ETC.



Basic type



Long-focus Gregorian



Fig. 1

Inventeur et seul constructeur du **Pied de lunette à inclinaison variable** (fig. 1), recommandé par M. C. Flammarion dans son Annuaire astronomique pour 1897, et du **Dipleidoscope à latitude variable** (fig. 2).

La lunette avec pied à inclinaison variable est munie d'un chercheur ; elle permet de suivre un astre comme avec l'équatorial sans perdre aucun de ses avantages terrestres.

Le Dipleidoscope à latitude variable permet d'obtenir l'heure à l'aide du soleil ou des étoiles à une fraction de seconde près.

Les deux instruments s'installent sous toutes les latitudes et forment ensemble les éléments indispensables d'un petit observatoire portable d'amateur.

Ces instruments sont livrés en boîte chêne très solide. Une instruction pour la mise en station les accompagne.

Dipleidoscope à latitude variable : petit modèle, 190 fr. ; grand modèle, 250 fr.

LUNETTES AVEC PIED A INCLINAISON VARIABLE (FIG. 1)

Diamètre de l'Objectif	Distance Focale	Grossissements des oculaires fournis avec l'instrument		PRIX	Augmentation pour les cercles divisés	Augmentation pour une manivelle de mouvement lent
		Terrestres	Célestes			
61 m/m	90 m/m	40	120	240 <sup>fr</sup> »	45 <sup>fr</sup> »	40 <sup>fr</sup> »
68	100	45	140	270 »	45 »	40 »
75	110	50	75-160	320 »	45 »	40 »
81	120	55	85-180	400 »	45 »	40 »
88	130	60	90-200	530 »	50 »	60 »
95	140	65	80-150-225	590 »	50 »	60 »
102	150	70	90-180-250	680 »	50 »	60 »
109	160	75	60-120-200-280	780 »	50 »	60 »

**Lunettes Astronomiques et Terrestres**, modèle spécial pour les personnes commençant l'étude du ciel.

Lunette en cuivre à double tirage, dont un à crémaillère, pour la mise au point précise, chercheur mouvement vertical et horizontal, colonne et trépied pour poser sur une table et pied en chêne à six branches très solide pour observer debout.

La lunette et ses accessoires en boîte chêne à poignée et serrure.

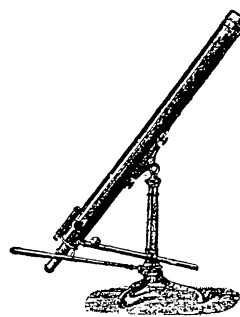


Fig. 3

Toutes les lunettes ont, avec les oculaires, un verre noir pour le soleil.

Les Oculaires étant, comme nos Objectifs, exécutés à la main et leur forme étant le résultat d'un calcul rigoureux, nous pouvons en changer le grossissement ou le foyer au gré de l'acheteur.

La Maison argente ou reargente les miroirs de verre de télescopes.

Diamètre des Objectifs en m/m	Longueur Focale	Grossissements des oculaires fournis avec la lunette		PRIX	Avec mouvement lent vertical (FIG. 3)	Avec mouvement lent vertical et horizontal (FIG. 3)
		Terrestres	Célestes			
57	80	35	70-110	135 <sup>fr</sup> »	17 <sup>fr</sup> »	330 <sup>fr</sup> »
61	90	40	80-130	175 »	215 »	350 »
68	100	45	7 - 100-150	200 »	250 »	380 »
75	110	50	75-120-160	225 »	275 »	420 »
81	120	55	80-130-180	310 »	360 »	520 »
88	130	60	90-150-200	360 »	410 »	610 »
95	140	65	95-160-220	410 »	460 »	700 »
102	150	70	100-170-230	510 »	560 »	950 »
109	160	75	110-190-260	600 »	650 »	1 050 »

Pour les Instruments Astronomiques en général, demander le Catalogue

Figure 137: (a) MAILHAT advertisement (turn of 19C/20C).  
(b) Two examples of MAKSTOV optical systems, the basic type and the long-focus Gregorian with elliptical secondary mirror.

## Optique et Mécanique de Précision

**M. MANENT**

Constructeur breveté S. G. D. G.

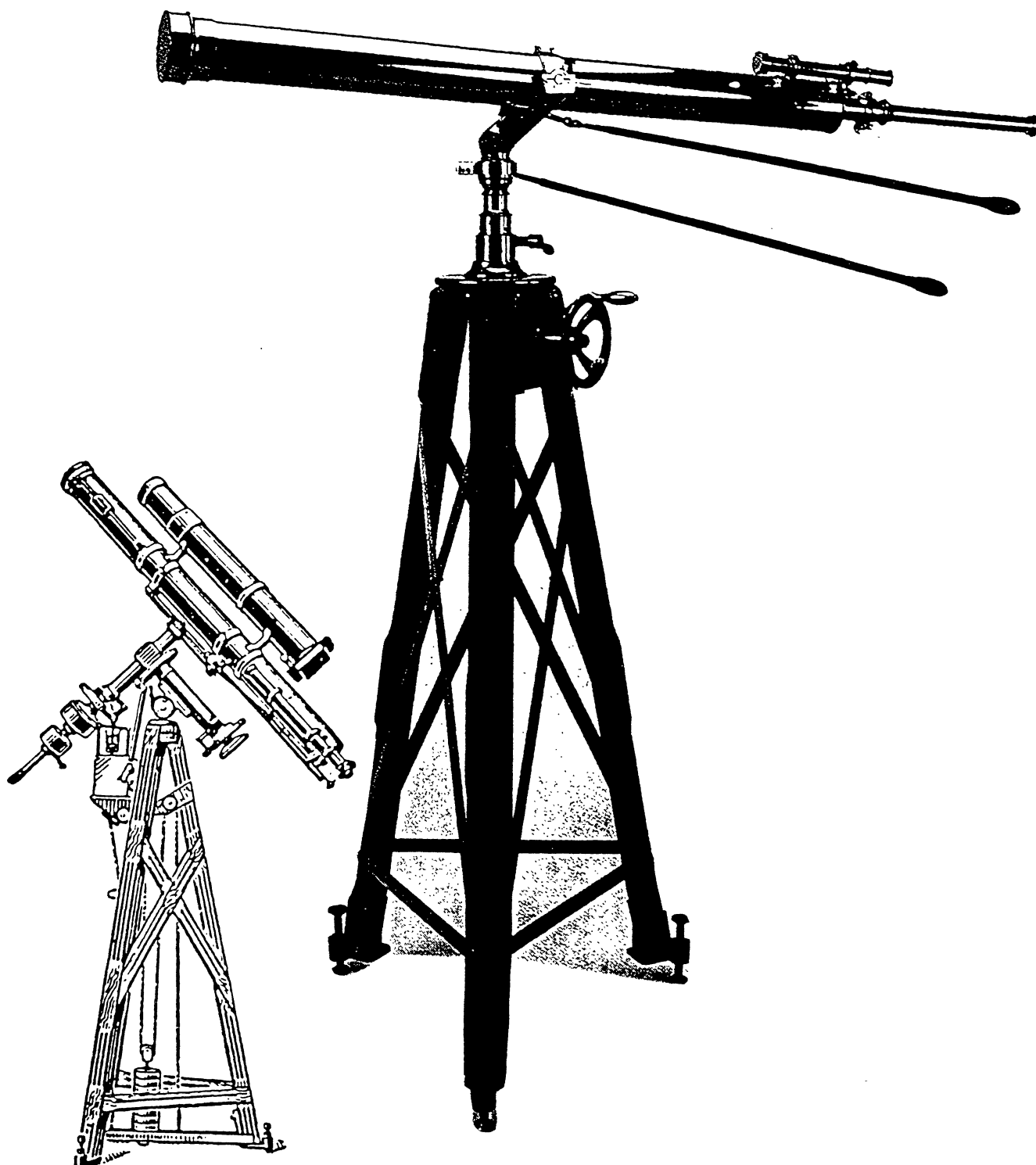
*Rue du Parc — CROIX DE BERNY (Seine)*

Figure 138: Altazimuth- and equatorially-mounted MANENT refracting telescopes.

Instruments d'Astronomie - M. MANENT, Constructeur Breveté S. G. D. G.  
Rue du Parc, 44, La CROIX-DE-BERNY (Seine)

## Lunette Astronomique Équatoriale

Monture Équatoriale à latitude variable sur pied en chêne très solide, axes en acier et coussinets bronze avec cercles divisés donnant suivant ceux demandés les 5' ou les 30" en A R et 30' ou 30" en déclinaison. Dans le premier cas les cercles de 120<sup>m</sup> sont à index, dans le second les cercles de 200<sup>m</sup> avec doubles verniers à rappel peuvent être divisés à la demande et donner depuis les 5" en A R et 30" d'arc. Pince et rappel en déclinaison, cercle denté en creux avec vis tangente, commande par manette ou flexible au choix. Un contre-poids fixe et un mobile sur l'extrémité de l'axe de déclinaison permettent l'équilibrage de la lunette avec tous ses accessoires.

Sur ce pied est montée la lunette complète avec chercheur et contre-poids.

Ce modèle a été construit sur la demande de lycées et grandes écoles ; il a toujours donné la plus entière satisfaction.

Diamètre de l'objectif	Foyer	PRIX DE BASE				Hausse	Baisse
		Avec lunette		Pied seul			
		Cercles de 120 <sup>m</sup>	Cercles de 200 <sup>m</sup>	Cercles de 120 <sup>m</sup>	Cercles de 200 <sup>m</sup>		
81 <sup>m</sup> <sub>m</sub>	1 <sup>m</sup> , 25	2.900 »	3.300 »	2.050 »	2.450 »		
95 <sup>m</sup> <sub>m</sub>	1 <sup>m</sup> , 45	3.500 »	3.900 »	2.300 »	2.700 »		
110 <sup>m</sup> <sub>m</sub>	1 <sup>m</sup> , 60	4.500 »	4.950 »	2.500 »	2.950 »		

Ce mouvement peut être placé sur pied chêne avec croisillons, monté sur roulettes et vis calantes. Supplément . . . . . 800 »

Jeu de 3 crapaudines dont une à rappel . . . . . 200 »

Figure 139: MANENT advertisements (turn of 19C/20C) for 3- to 4-inch refractors. Fine clock-drives with FOUCAULT regulator were supplied for 5- to 6-inch telescopes.

## Lunette Équatoriale à Latitude fixe se plaçant sur Socle en maçonnerie

Bâti en fonte de fer avec double semelle pour le réglage de l'azimut avec 3 vis calantes et vis de fixation, axes en acier montés sur billes, cercles de 25 cm. de diamètre donnant la " de temps et 20" d'arc, avec doubles verniers à rappel, pince et rappel en déclinaison, mouvement d'horlogerie à régulateur Foucault avec rappel dans les deux sens. Un système de chaîne permet la remonte des poids pendant la marche sans variation dans celle-ci.

On peut adjoindre sur ces modèles tous les accessoires, chambre photographique, micromètre à une ou deux vis, spectroscopie, spectrographe, éclairage des cercles.

Ce modèle peut être livré sans mouvement d'horlogerie et se monte avec lunette 135 × 160 × 200, etc. ; on peut également remplacer le socle en maçonnerie par un bâti rectangulaire en fonte de fer.



servatory, *South Kensington*. His private addresses were *St John's Wood*, *Wimbledon* (early 1860's); *West Hampstead* (1865); *Westgate on sea*; *Sidmouth (private observatory)* (retirement, 1913). <sup>71</sup> He is noted for his important researches in spectroscopy and for suggesting that there was an unknown element (*helium*) which gave rise to lines in the solar spectrum. <sup>72</sup>

LOEWY M - staff member of *Paris Observatory*. He devised the equatorial coudé telescope (1882) which was constructed by the HENRYs, and also a double mirror prism astrolabe. <sup>73</sup>

LOFT Matthew - English optical instrument maker, *Golden Spectacles behind the Royal Exchange, London*, w.1724, d.1747. LOFT was bound to Thomas GAY (1791) whom he succeeded. LOFT had apprentices, James TOMLINSON (1725), Richard WATTS (1725), James LECOUR (1736), and Edward NAIRNE (1741/2). <sup>74</sup>

LONG James - optician and optical, mathematical and philosophical instrument maker, *Northgate, Royal Exchange, London*, and *4 Threadneedle St* and *4 Back of the Royal Exchange* (1805), 1769-1811. The firm became LONG and JOHNSON (1785). <sup>75</sup>

LONGLAND William - instrument maker, *The Ship, Cornhill, London*, dc.1722. He was apprenticed to Joseph HOWE, fr.1674. There is a small decorated telescope by him. <sup>76</sup>

LOSMANDY Scott - US manufacturer and telescope maker, present day, originally operating under *Hollywood General Machining Co., now LOSMANDY ENGINEERING (LA.USA)*. The firm which started in 1981 supplies telescope mounts for companies like CELESTRON and MEADE, and constructs telescope accessories. We record the LOSMANDY equatorial mount (Model GM100). <sup>77</sup>

LOUVILLE - early 18C French. <sup>78</sup>

LOWDON George - Scots scientific, optical and philosophical instrument maker *25 Union St, Dundee* (1850-61), *1 Reform St* (1864-74), *23 Nethergate, 60 Reform St*, w.1850 and 1900. <sup>79</sup>

LOWELL Percival - eminent American astronomer, 1855-1916. Starting as a wealthy amateur astronomer, LOWELL, with an 18in telescope, is noted for his fine observations of Mars and the search for trans-Neptunian Planet X (at that time, Pluto). LOWELL founded the Observatory at *Flagstaff* and equipped it with a fine 24in CLARK/LUNDINS refractor (1896), later used by V.M. Slipher for the observation of the radial velocities of galaxies. <sup>80</sup>

LOWRY Wilson - supplied many fine engravings of 19C telescopes.

LUDLAM William - English mathematics teacher, *St John's College, Cambridge*, 1717-88. He wrote on BIRD's method of dividing on astronomical instruments. <sup>81</sup>

LUDWIG Ernst - German optical works, *Weizdorf* (World War II binocular code jve).

LUNDINS Carl Axel Robert - Swedish/American telescope maker, d.1915. He joined CLARK in 1874. <sup>82</sup> He took over from Alvan Graham CLARK and continued until 1958, although the name was SPRAGUE -HATHAWAY from 1933; from 1941, PERKIN ELMER acted as their optical and design consultants. The firm was dissolved in 1958.

LYOT Bernard - eminent French astronomer. He designed the solar monochromator for viewing the corona outside a solar eclipse at the *Pic du Midi Observatory, in the Pyrenées*. <sup>83</sup>

## M

MACCLESFIELD George Parker ( 2nd Earl of ) - English gentleman astronomer 1697-1764. He owned a 120ft and a 210ft HUYGENS aerial telescope <sup>84</sup> at *Shirburn Castle, near Oxford*, <sup>85</sup> and

<sup>71</sup>JBA vol.82, p.6 (1972).

<sup>72</sup>Laboratory identification of helium was by William RAMSAY.

<sup>73</sup>Howard GRUBB also devised an equatorial coudé. See Bell 124, D and C 446.

<sup>74</sup>SIMON.

<sup>75</sup>SIMON. Clay and Court.

<sup>76</sup>Turner Mic 81.

<sup>77</sup>See e.g. advertisements in *Sky and Telescope*, and Broadhurst, Clarkson and Fuller Ltd. Catalogue 1992.

<sup>78</sup>See *Mémoires de l'Académie des Sciences, Paris* (1719).

<sup>79</sup>SIMON. BG 146.

<sup>80</sup>There were two brothers at Lowell Observatory, Earl C. Slipher and Vesto M. Slipher.

<sup>81</sup>Dict.Nat.Biogr.

<sup>82</sup>King 370, Bell 74.

<sup>83</sup>Ann. d'Astroph. vol.7, p.31 and MNRAS vol.99, p.580.

<sup>84</sup>Howse 80.

<sup>85</sup>The 1st Earl of MACCLESFIELD was president of the Royal Society in 1752. His great grand-son, also a mem-

# Lunettes Astronomiques d'Amateurs

En cuivre poli verni avec chercheur, objectif réglable, contre-poids pour l'équilibre avec tous les accessoires, mise au point rapide avec pince d'arrêt et lente par crémaillère, sur pied chêne, à colonne montante en cuivre avec pince de fixation circulaire.

Mouvements lents à fourche, commande par manettes rigides ou flexibles au choix.

Modèle existant le plus complet.

Diamètre de l'objectif	Foyer	Grossissement	PRIX DE BASE Mouvements prompts	Hausse %	Baisse %
75	1 <sup>m</sup> , 05	45×110×150	1.400 »		
81	1 <sup>m</sup> , 25	60 <140>×200	1.600 »		
95	1 <sup>m</sup> , 45	60×150×250	2.000 »		
110	1 <sup>m</sup> , 60	70×190×300	2.900 »		
135	1 <sup>m</sup> , 90	90×210×350	4.400 »		

Instruments de Précision  
M. MANENT  
Constructeur Breveté S. G. D. G.  
44, Rue du Parc  
LA-CROIX-DE-BERNY (Seine)

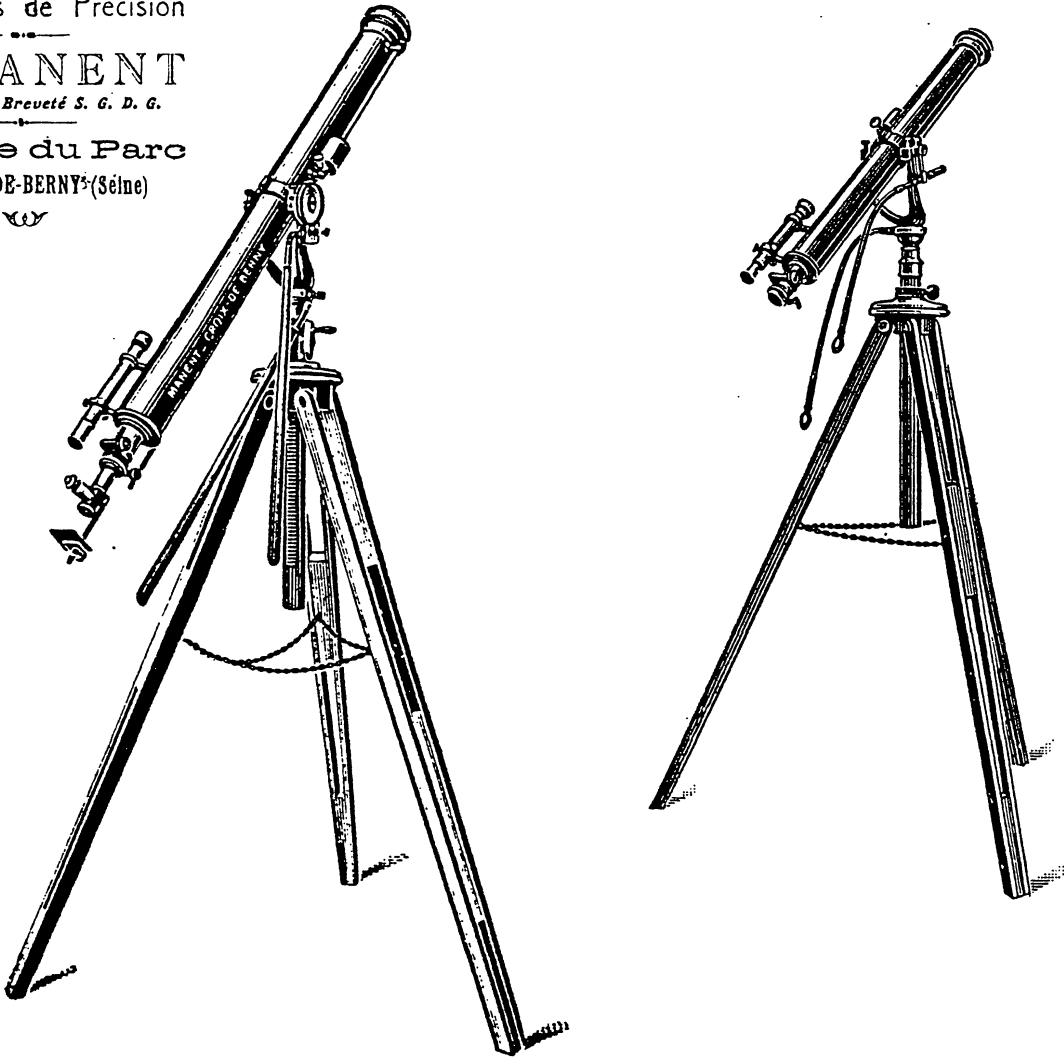
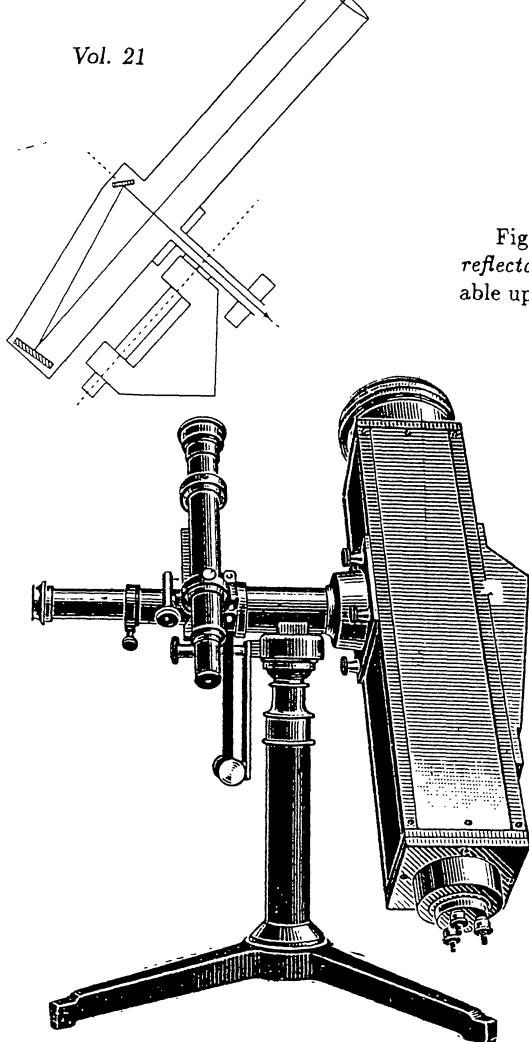


Figure 140: Further MANENT advertisements showing two different designs for altazimuth-mounted telescopes.

Figure 141: (a) Illustration of the MANENT 4.3-inch *refracto reflector*. This telescope, with NASMYTH-type focus, was available up to 6.3-inch aperture. See also schematic diagram.



## RÉFRACTO RÉFLECTEUR à vision horizontale

L'encombrement et le maniement difficile des lunettes de puissance moyenne sont, pour les amateurs ne disposant pas d'un emplacement suffisant, un empêchement à toute observation sérieuse et complète.

Le Réfracto Réflecteur à vision horizontale vous permettra, dans un espace réduit, d'utiliser des instruments puissants en observant toujours assis confortablement dans toutes les positions.

Construit d'une façon parfaite en bronze et aluminium, la lunette elle-même en tubes d'acier sur lesquels sont maintenus tous les organes, forme un ensemble rigide et indérégable; la mise au point se fait par double tirage dont un à crémaillère; les mouvements lents placés à la portée de la main permettent de suivre sans difficulté l'astre observé.

Diamètre	Foyer	Grossissement	Prix	Hausse	Baisse
95 $\frac{m}{m}$	1 m. 45	60 $\times$ 150 $\times$ 250	3.100		
110 $\frac{m}{m}$	1 m. 60	70 $\times$ 190 $\times$ 300	4.000		
135 $\frac{m}{m}$	1 m. 90	90 $\times$ 210 $\times$ 350	5.600		
160 $\frac{m}{m}$	2 m. 25	100 $\times$ 200 $\times$ 300 $\times$ 400	8.000		

Le nombre des oculaires peut être augmenté et leur grossissement changé au gré des acquéreurs.

L'instrument peut se monter sur un pied de jardin.

Supplément

150 »

Le chercheur peut être muni d'un oculaire coudé spécial permettant l'observation en ligne ou zénithale

95 »

**Prisme** redresseur permettant l'usage des oculaires astronomiques pour les observations terrestres, remplace dans tous les instruments modernes les oculaires terrestres à 4 verres.

**Prisme** redresseur avec revolver monté et 3 oculaires. Grossissement au choix. (Fig. 7).

Prix . . . . . 490 »

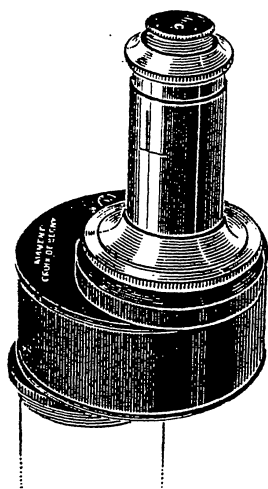


Fig. 5

**Prisme** redresseur composé de 3 prismes en bloc placés dans une boîte aluminium se montant sur le coulant de la lunette, se fait pour tous les diamètres d'oculaires et sur tous les calibres des instruments. (Fig. 5). Prix. 200 »

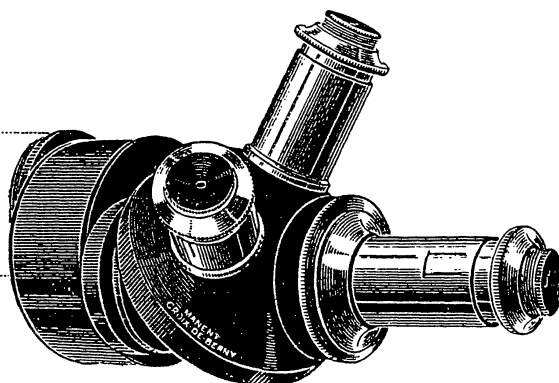


Fig. 7

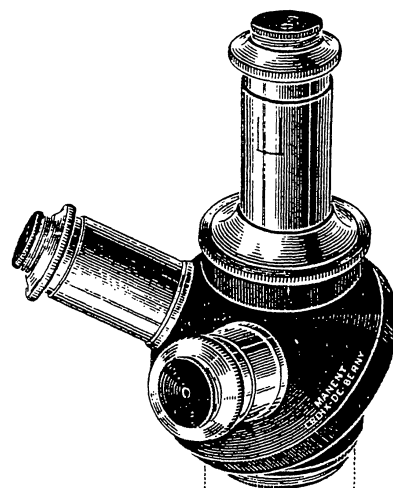


Fig. 6

**Revolver** à 3 oculaires pour lunette astronomique et terrestre. Peut se placer sur le prisme redresseur et facilite le passage rapide d'un grossissement à un autre. (Fig. 6).

Prix sans oculaire. 185 »

Instruments d'Astronomie - M. MANENT, Constructeur Breveté S. G. D. G.  
Rue du Parc, 44, La CROIX-DE-BERNY (Seine)

## Lunette astronomique démontable

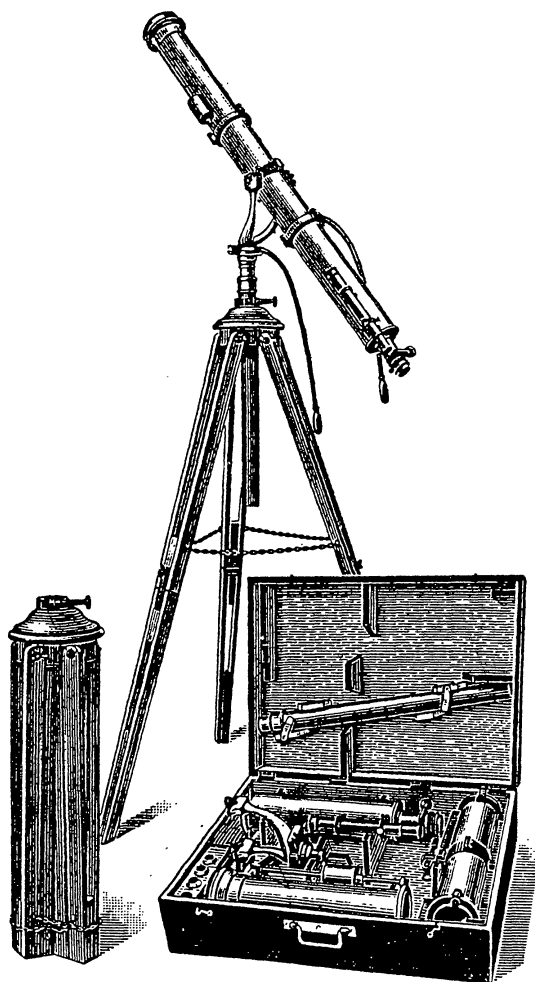
En cuivre ou aluminium poli verni avec chercheur, objectif réglable, contre-poids pour l'équilibre avec tous les accessoires, mise au point rapide avec pince d'arrêt et lente par crémaillère, sur pied en chêne à colonne montante avec pince circulaire de fixation.

Mouvements prompts ou lents à fourche.

Les commandes de mouvements peuvent se faire par flexibles ou manettes rigides au choix.

La construction de cette lunette permet un centrage rigoureux de toute la partie optique.

La lunette est livrée en boîte avec pied pliant.



Diamètre de l'objectif	Foyer	Grossissement	PRIX DE BASE		Hausse	Baisse
			Mouvements prompts	Mouvements lents		
75 $\frac{m}{m}$	1 m, 05	45 × 110 × 150	1.400	1.800		
81 $\frac{m}{m}$	1 m, 25	60 × 140 × 200	1.650	2.050		
95 $\frac{m}{m}$	1 m, 45	60 × 150 × 250	2.130	2.530		
110 $\frac{m}{m}$	1 m, 60	70 × 190 × 300	3.150	3.650		

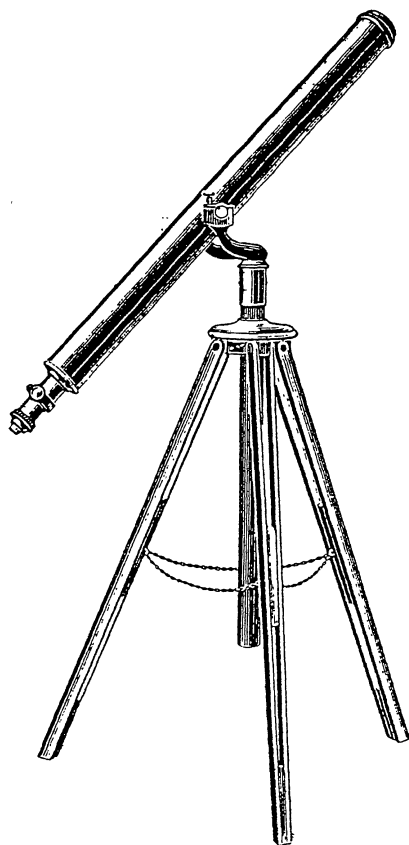
Figure 142: Further advertisements from MANENT for the connoisseur's (a) portable astronomical telescope, and another specially for the members of the Astronomical Society of France, a low-cost 3- to 4-inch refractor, (b) the amateur's instrument.

## LUNETTE ASTRONOMIQUE

de construction simple, fabriquée spécialement à l'intention des membres de la Société Astronomique de France et ceux de Sociétés étrangères dont le but est l'étude du Ciel.

Lunette sans chercheur, monture dite à tête rentrante, mise au point rapide et lente par crémaillère, sur pied en chêne, 6 branches, à colonne montante en bois et mouvements prompts à fourche. Livrée avec 1 seul oculaire céleste, grossissement au choix.

Il peut y être ajouté un chercheur ainsi que tous les accessoires et oculaires de grossissements variés. (Voir le tableau spécial).



Diamètre de l'objectif	Foyer	Grossissement maximum	PRIX DE BASE	Hausse	Baisse
				%	%
75 $\frac{m}{m}$	1 m, 05	170	495 »		
95 $\frac{m}{m}$	1 m, 45	330	1.300 »		
110 $\frac{m}{m}$	1 m, 60	370	1.800 »		

La Maison exécute toutes les dimensions et tous les modèles fixes ou transportables avec ou sans mouvement d'horlogerie ainsi que les réparations et transformations des Instruments de Marques Françaises ou étrangères. Tous les Instruments portant la marque M. MANENT sont garantis de tout 1<sup>er</sup> ordre.



Instruments d'Astronomie - M. MANENT, Constructeur Breveté S. G. D. G. - Rue du Parc, 44, La CROIX-DE-BERNY (Seine)

## ACCESSOIRES DIVERS pour l'ASTRONOMIE

Pour obtenir le grossissement d'un oculaire, il suffit de diviser le foyer de l'objectif par celui de l'oculaire.

Le diamètre des oculaires s'ajustant à frottement est de 27 millimètres.

### Oculaires célestes d'Huyghens

(Fig. 2). Foyers en millim. 30

26,25 - 22,5 - 21 - 19,5 - 17,25

15 - 13,5 - 12 - 10,5 - 9 - 7,5

6,75. Pièce . . . . . 35 »

Foyers 37,5 - 40 - 45 - 50 - 6 - 5,25 - 4,5. Pièce . . . . . 45 »

Oculaires Orthoscopiques, Foyers 15 - 12 - 9 - 7 - 5 . . . . . 70 »

Oculaires Terrestres à 4 verres, tous grossissements . . . . . 65 »

Oculaire d'Herschell, pour l'observation du Soleil . . . . . 100 »

Oculaire Zénithal à prisme (Fig. 3) . . . . . 95 »

Hélioscope à teinte graduée pour l'observation du Soleil . . . . . 70 »

Bonnette à verre de couleur démontable (Fig. 1) . . . . . 11 »

Dynamètre de Ramsden pour la mesure du grossissement . . . . . 70 »

Écran à coulisse pour l'étude des taches solaires . . . . . 115 »

Disques Moreux pour les relevés solaires, diamètre / 10 cm. 20 »

/ 20 cm. 40 »

### Oculaire spectroscopique stellaire de Zollner (Fig. 4)

fourni avec 3 lentilles cylindriques / 10 / 20 - 10. . . . . 110 »

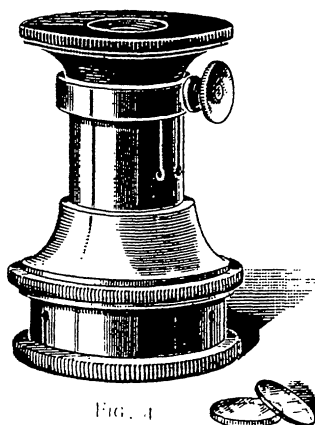


Fig. 1

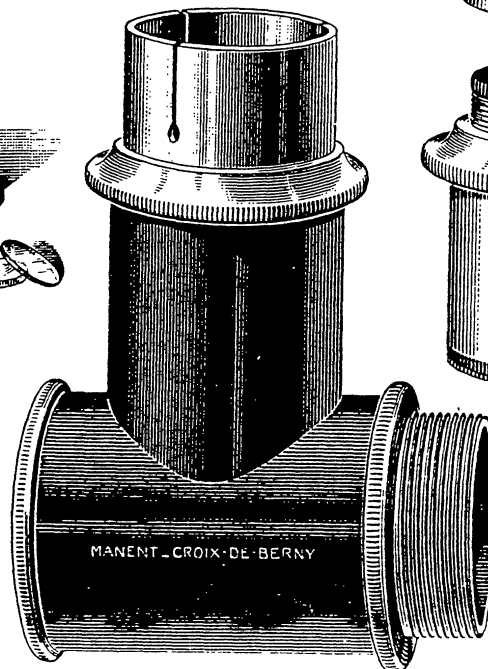


Fig. 3

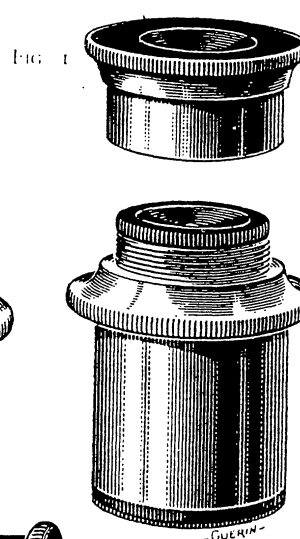


Fig. 2

Figure 143: Illustrations of some of MANENT's accessories (HERSCHEL solar diagonal etc), and advertisements for a RAMSDEN dynameter (to measure magnification), a ZOLLNER stellar spectroscope, etc.

### À mes Clients,

Depuis la fondation de la Maison, en 1911, vous m'avez apporté, avec vos ordres, les encouragements nécessaires à la création d'une spécialité qui demande beaucoup d'efforts! Je me suis consacré depuis le début et ai toujours donné tous mes soins à la fabrication ainsi qu'à la qualité des Instruments portant la marque M. MANENT. Je pense avoir réussi à faire de cette marque celle préférée et estimée de vous tous.

Jusqu'à ce jour je n'avais pas voulu, afin de ne pas augmenter mes frais généraux, publier un catalogue complet; je m'y suis résolu sur vos demandes et vos conseils. Mais, afin de ne pas être dans l'obligation de faire subir à mes prix que vous savez être les plus avantageux, une nouvelle majoration, ce catalogue sera expédié sur demande, contre la somme de 3 francs en France et Colonies; 4 fr. 50 à l'Étranger, remboursée à la première commande.

J'espère qu'en le compulsant vous apprécierez la bonne conception de ma fabrication et, si vous le désirez, vous pourrez vous en rendre compte par vous-même dans mes ateliers au cours de l'exécution de vos ordres.

La confiance que vous m'avez toujours accordée est pour moi la meilleure récompense de mes efforts. Aussi je suis persuadé qu'elle contribuera à faire de la maison M. MANENT, celle que vous recommanderez à vos amis et amateurs des observations célestes.

Avec mes remerciements, je vous prie de me croire mes chers Clients,

Votre tout dévoué  
M. MANENT

P. S. - Plus de deux mille Instruments de tous diamètres en service dans le monde entier, est pour eux la meilleure des références.

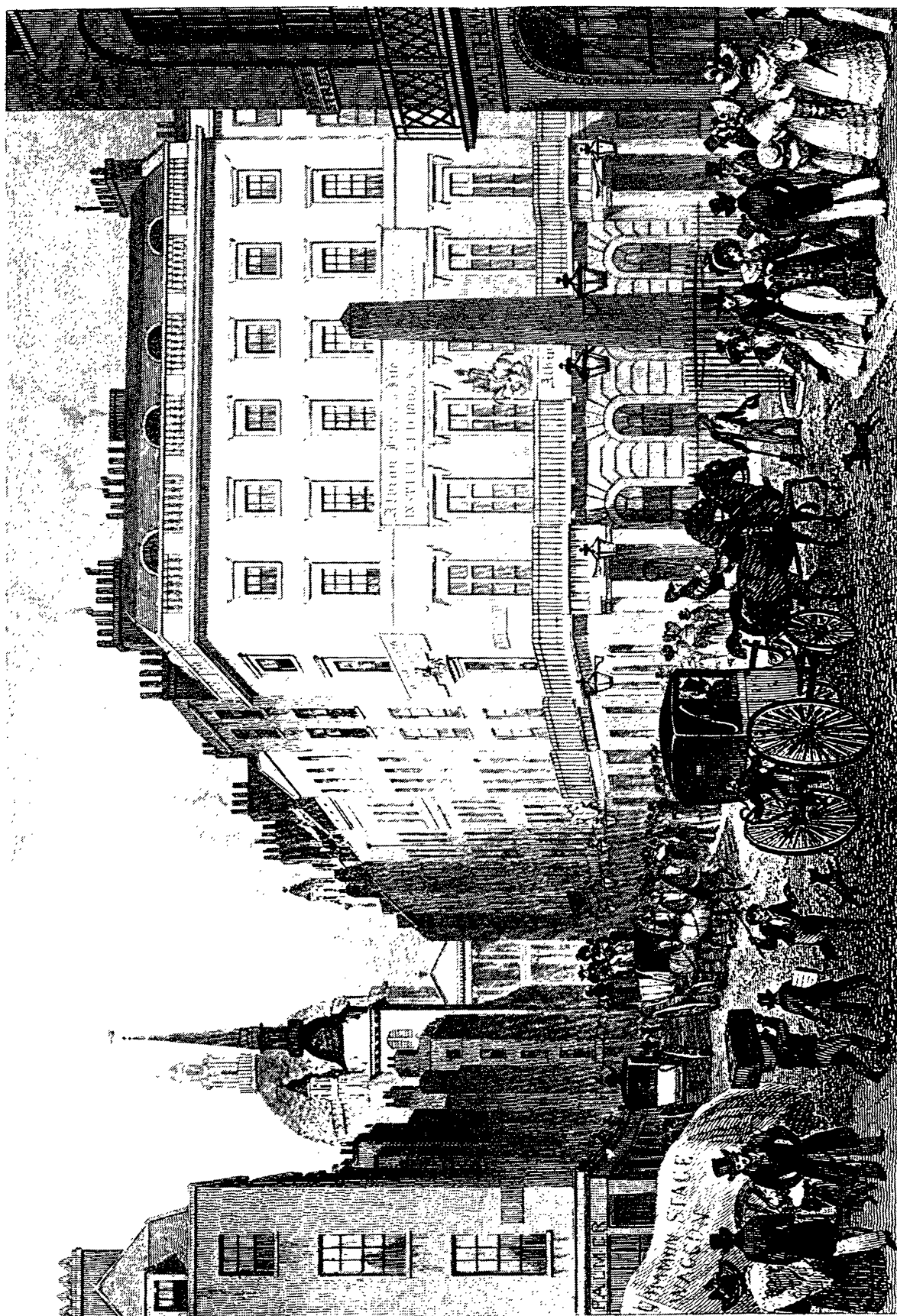


Figure 144: Engraving of *Ludgate Hill, from Fleet St* (c.1800, Shepherd 1819). Many instrument makers flourished nearby from the 17C to recent times. MARSHALL had his thriving business opposite the west end of *St.Paul's* near the end of the 17C.

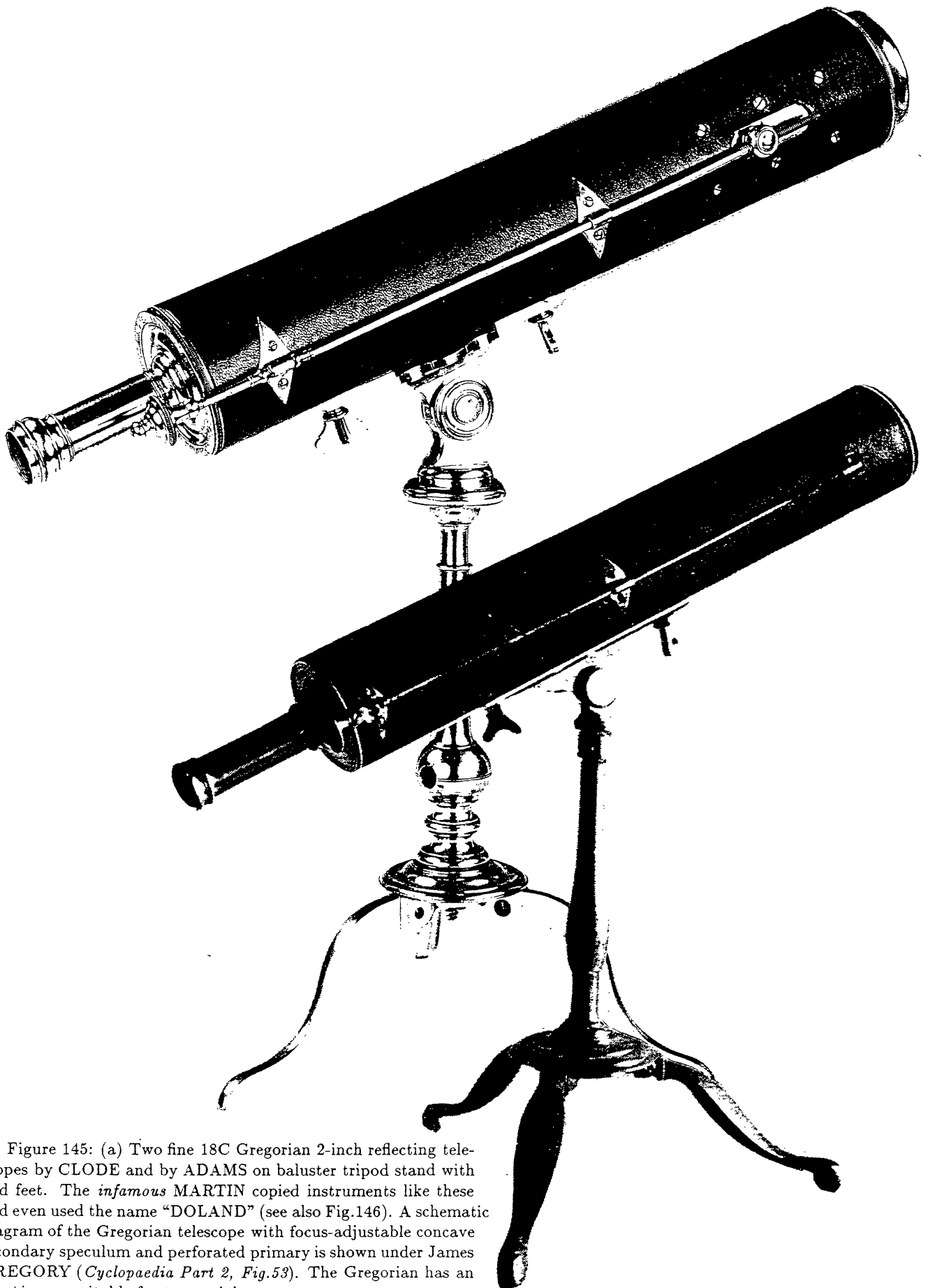
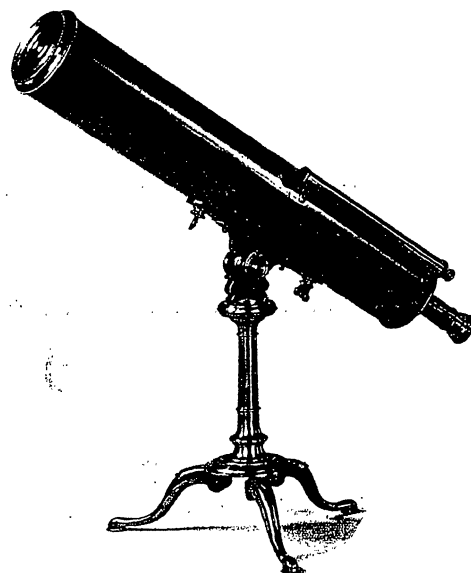
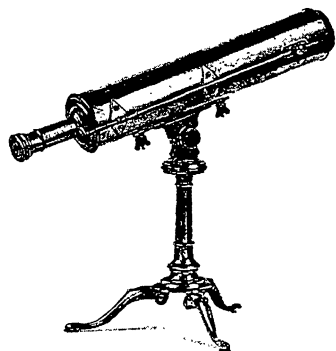


Figure 145: (a) Two fine 18C Gregorian 2-inch reflecting telescopes by CLODE and by ADAMS on baluster tripod stand with pad feet. The *infamous* MARTIN copied instruments like these and even used the name "DOLAND" (see also Fig.146). A schematic diagram of the Gregorian telescope with focus-adjustable concave secondary speculum and perforated primary is shown under James GREGORY (*Cyclopaedia Part 2, Fig.53*). The Gregorian has an *erect* image suitable for terrestrial use.



Figure 146: (a) MARTIN 2-inch brass telescope (14in long) with screw-rod focussing, tapered turned column on folding tripod stand, cabriole legs and pad feet (Christie's March 1991, valued at £1200-1500).

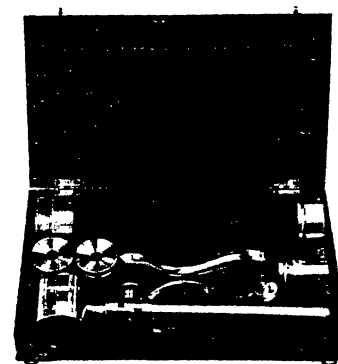
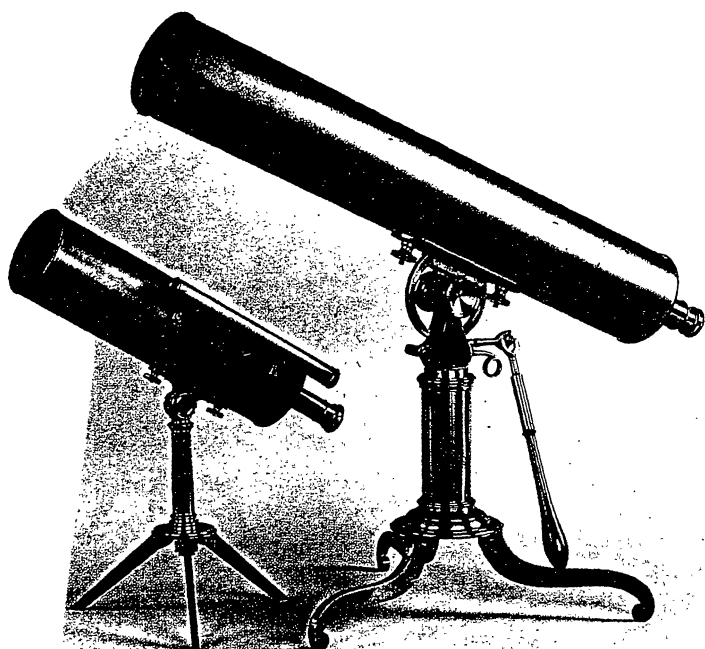
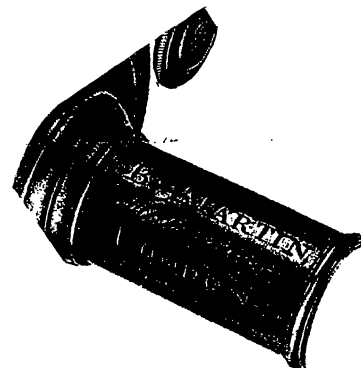


(b) Detail of inscription on eyepiece tube of a MARTIN 4-inch reflecting telescope, B.MARTIN *Fleet Street, London*. The primary speculum is also stamped BM. This telescope is 25in long, and very similar to that of ADAMS (c.f. Fig.145. Christie's June 1992, lot 114, valued at £3000-4000).

(c) BATE 4.25-inch reflecting telescope with folding tripod (Christie's June 1992, lot 117, valued at £600-1000).

(d) Anonymous 19C 4.75-inch reflecting telescope. Note the inswept feet and elaborate mount with altitude slow motion rod, and universal joint azimuthal motion (Christie's June 1992, lot 118, valued at £2000-3000).

(e) 2-inch brass 4-draw refracting telescope, inscribed James MANN. Exquisitely presented in a mahogany case with accessories (case about 12in wide) and with an inset plaque inscribed *John Harvey* (Christie's Sept. 1989, lot 163, sold for £770).





was frequently visited by BRADLEY.<sup>86</sup>

MACKNEIL - instrument maker, apprenticed to the famous RAMSDEN.<sup>87</sup>

McCULLOCH Kenneth - compass maker, w.1777 and 1802, at *Prescot St, London*, and *3 Queen St, Bartholomew Close, London* (1777), *38 Minoris, London* (1783-93), *28 Minoris* (1788).<sup>88</sup>

MAGELLAN Jean Hyacinthe de - Portugese agent, 1723-90.<sup>89</sup> He was commissioned to purchase telescopes and quadrants etc. for Spain and Portugal. His manuscripts contain invaluable descriptions of SISSON, ADAMS, NAIRNE and BLUNT instruments.<sup>90</sup>

MAHLER Franz Joseph - d.1845, business partner with MERZ (See *Fig.156*).

MAIER V - American amateur designer who built a 36in diameter ribbed-Pyrex mirror for the Goethe Link Observatory in collaboration with HERMAN.<sup>91</sup>

MAILHAT R - notable French instrument maker, late 19C, *41-43 bvd Saint Jacques, Paris (près l'Observatoire)*. He was a pupil of P.GAUTIER and ex-workshop director to SECRÉTAN. See illustrative advertisements.

MAKSUTOV D.D - optical designer, State Optical Institute, *Moscow*, 20C, known for the MAKSUTOV family of instruments utilizing a spherical primary and a steeply curved meniscus corrector lens.<sup>92</sup> Modifications were suggested by WALAND in 1961. Many other catadioptric systems are in use today.

MANENT M - French precision instrument maker,

ber of the (Royal) Astronomical Society died around time of death of T.TULLEY (c.1830?) as shown in TULLY's short obituary (Roy.Astr.Soc.)

<sup>86</sup>BRADLEY required a more stable observing base to pursue his interest in the proper motions of stars and visited POUND's observatory where he could measure near-zenith stars more accurately. In fact, BRADLEY proceeded to discover the aberration of light.

<sup>87</sup>See CHRNov93.

<sup>88</sup>SIMON.

<sup>89</sup>Not to be confused with Ferdinand MAGELLAN 1480-1521 who circum-navigated the world.

<sup>90</sup>Vistas vol.20, Turner 179.

<sup>91</sup>This Goethe Link instrument is associated with the University of Indiana. See King 422.

<sup>92</sup>See *Fig.137b*, and Journ. Opt. Soc. Amer. vol.34, p.270, 1944, also BOUWERS, King 360, MACP 28, 27.

founded 1911, *rue du Parc 44, La Croix-de-Bermy, Seine*. MANENT is well documented with regard to his astronomical instruments through his advertising and his supply to many amateur astronomers.<sup>93</sup>

MANN James (I) - English optician, instrument maker, fr.1682, *Archimedes and Two Pairs of Golden Spectacles, nr. St.Paul's, London*, and *Angel St* (1695), *Spectacles, nr. Christchurch, Butcher Hall Lane, London* (1697), and *Fleet St* (1718).<sup>94</sup> He was apprenticed to Thomas KING in 1674, and became master of the Spectacle Makers Company in 1717. His son and grandson (John) continued the business.<sup>95</sup>

MANN James (II) - English instrument maker, *Archimedes and Two Pairs of Golden Spectacles, Fleet St, London*, and *Sir Isaac Newton and Two Pairs of Golden Spectacles, nr. West end of St Paul's*.<sup>97</sup> MANN continued the family's association with AYSCOUGH who set up a partnership at *Ludgate St*, from 1743-47.<sup>98</sup>

MANN John - English instrument maker, son of James MANN (II).

MANTOIS - see PARRA.

MANVILLE George E - general manager with the famous firm of Howard GRUBB PARSONS, mid-20C, during the era of the construction of the 98in Isaac Newton Telescope.<sup>99</sup>

MARGAS (or MARGES) John - fl.1763-67.<sup>100</sup>

MARINONI Johann von - instrument maker, 1676-1755.<sup>101</sup>

<sup>93</sup>See some of MANENT's instruments in *Figs.138-143*, and [CHRsep91], lot 100.

<sup>94</sup>Turner Mic 27.

<sup>95</sup>Two well-known instrument makers, Samuel SCATLIFF (1725) and James AYSCOUGH (1732) were apprenticed to him,<sup>96</sup> the latter being later established at *Friar Bacon's Head, on the corner of St Michael's Alley* and later at *St Paul's churchyard*.

<sup>97</sup>SIMON. King 144, Dumas 301, 302. and Turner Mic 27.

<sup>98</sup>We also find a James MANN at *Norwich*, 19C (See CHRsep89). Possibly another MANN (also James) is that apprenticed to Matthew COOBEROW in 1699, taking John CUFF as apprentice in 1722, flourishing until c.1737.

<sup>99</sup>See "*Two fathers and two sons*", Parsons Journal vol.11, p.144, 1967.

<sup>100</sup>Associated with N. ADAMS.

<sup>101</sup>See REPSOLD in main bibliography.



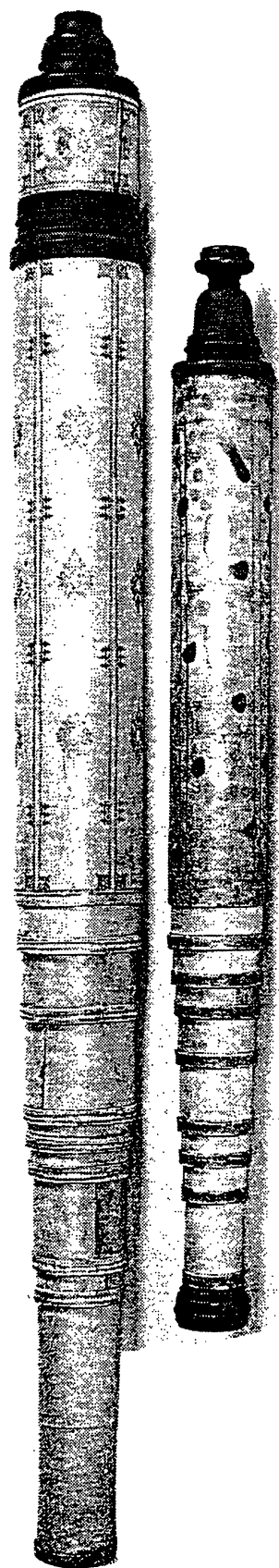
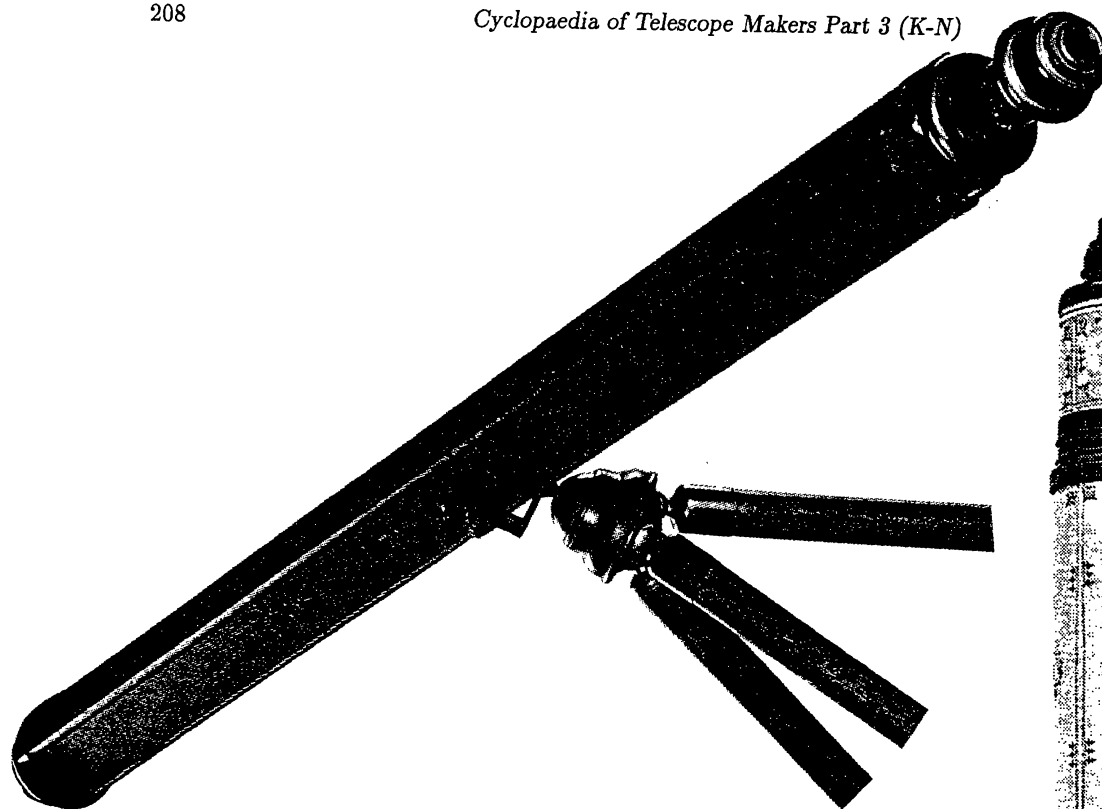
Figure 147: (a) Dutch engraving depicting the spectacle trade satirizing the growing use of spectacles. The importance of the early Dutch spectacle lens-grinders and polishers is to be stressed in relation to the availability of fine optics for telescopes.

(b) Two rare gold-stamped vellum telescopes in cardboard tubes with lignum lens mounts (recorded by Gunther).

Left: Nine-draw telescope with *compound eyepiece* (length closed 30in).

Right: Nine-draw telescope with *biconvex eyepiece* by John MARSHALL (length closed 25.5in, tube diameter 3.25in, focal length 8ft).

(c) A very early anonymous wooden telescope on tripod.



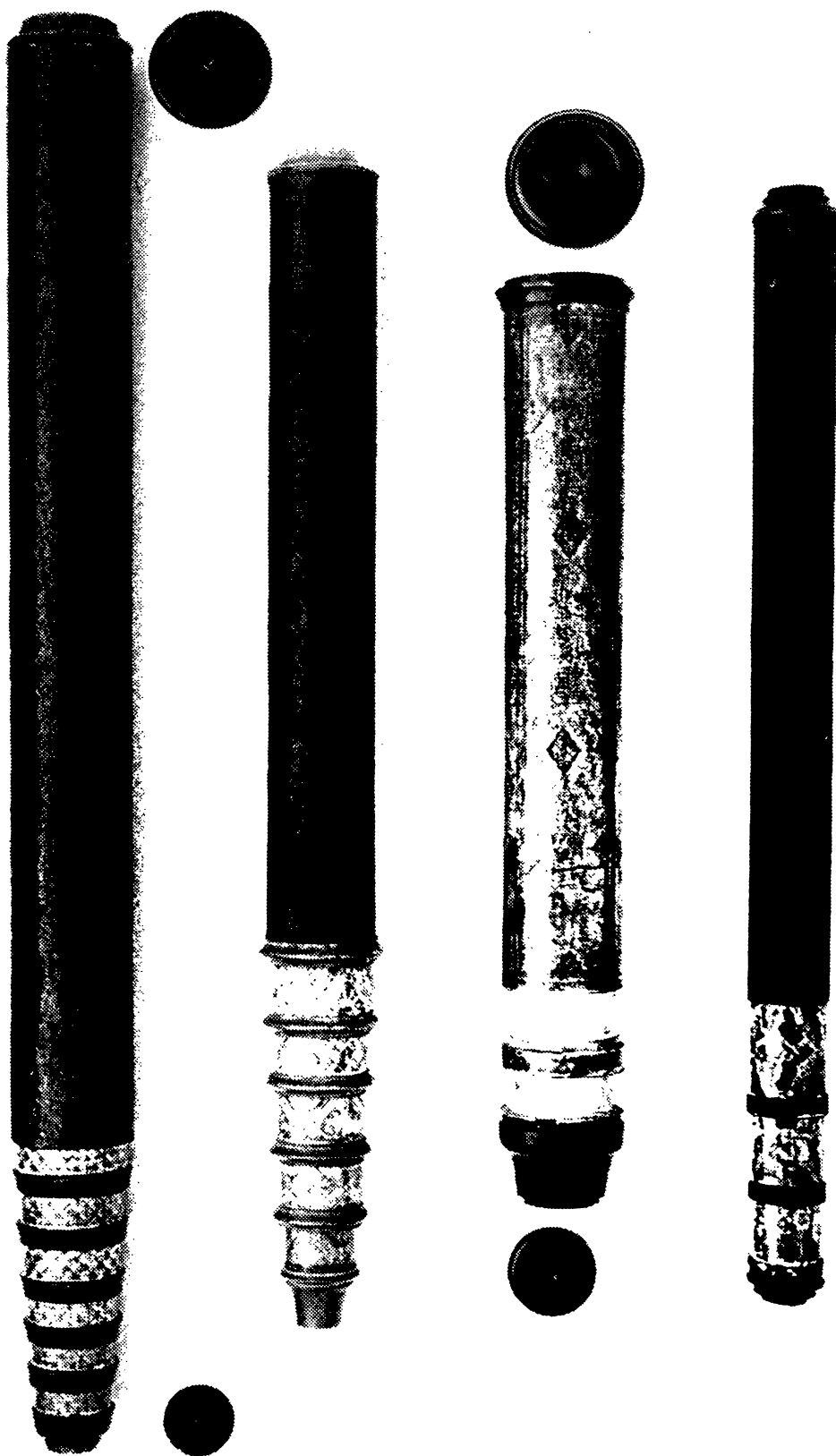


Figure 148: Left to right: (a) An unsigned 1-inch 18C telescope. (b) An unsigned 1.25-inch early 18C telescope. (c) An unsigned 2.5-inch late-17C telescope in vellum, card and lignum vitae. (d) An unsigned 18C telescope in vellum and card.

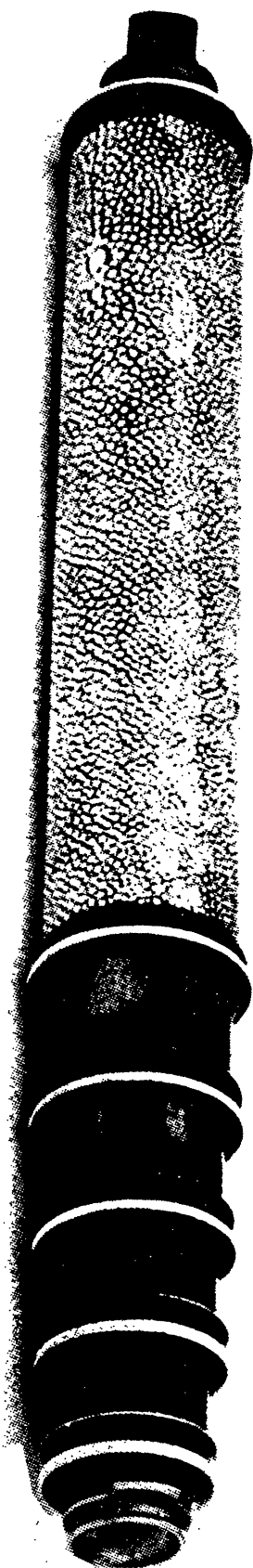


Figure 149: (a) An excellent early 4-draw telescope (Christie's April 1992, lot 56).

(b) Two late-18C (unsigned) 1.5-inch reflecting telescopes (tubes 6.9in and 7.5in long), with similar focussing rods and fishskin covered wooden carrying cases. The tube of the shorter one is shagreen covered brass with lacquered fittings (Christie's April 1992, lots 54 and 55, valued at £1200-1500 and £700-800).



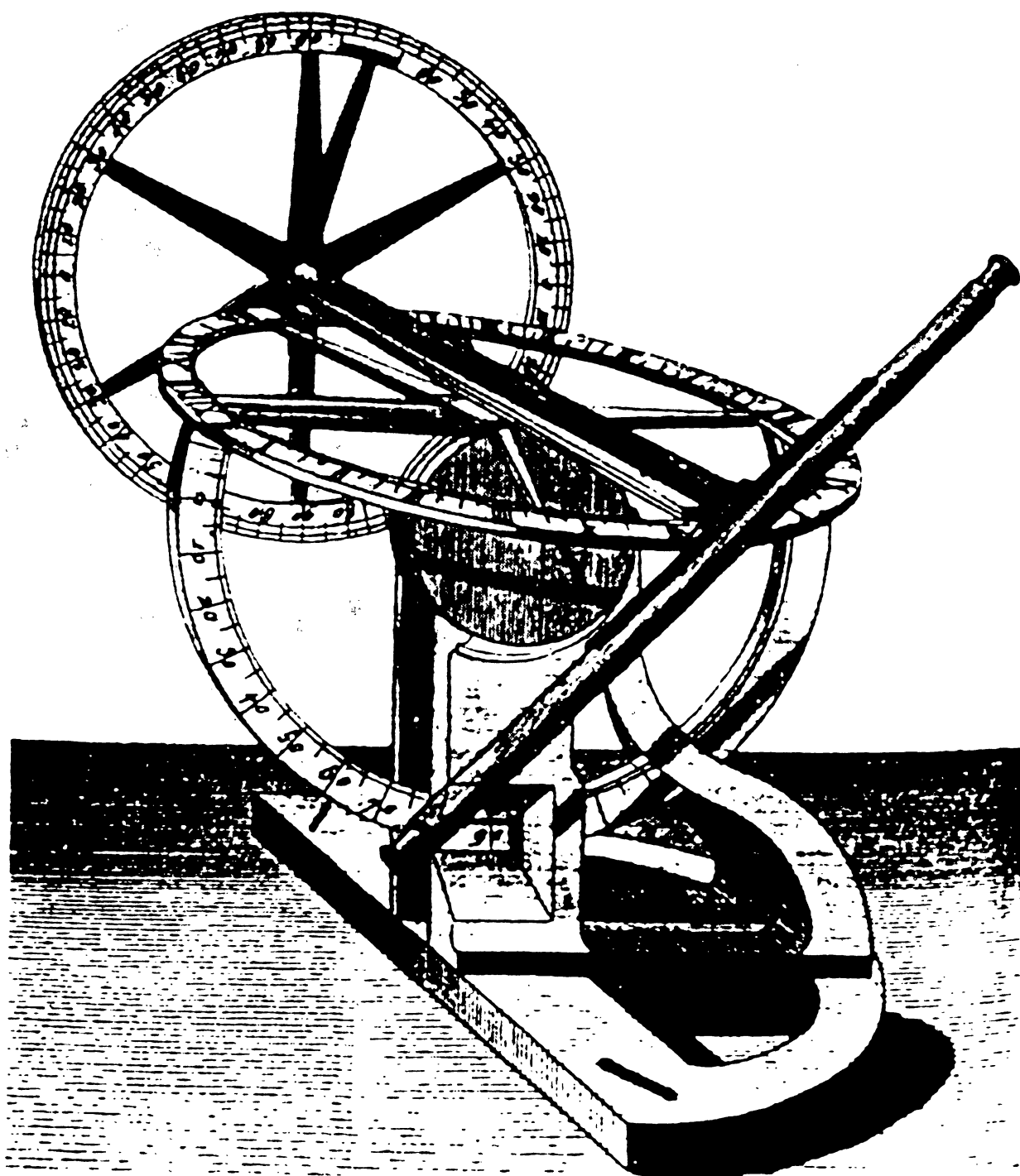


Figure 150: Equatorial telescope constructed by MÉGNIÉ (1780).

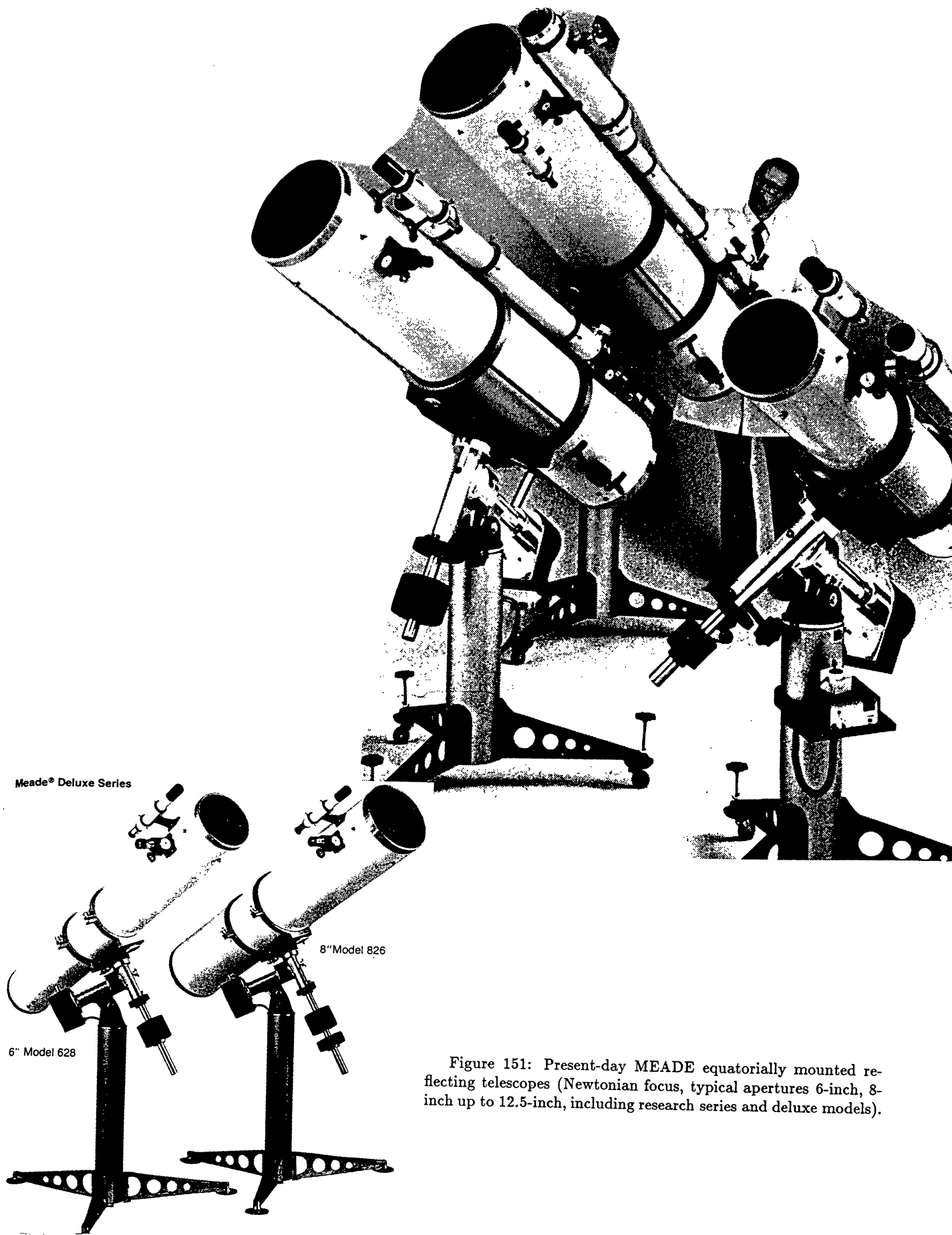


Figure 151: Present-day MEADE equatorially mounted reflecting telescopes (Newtonian focus, typical apertures 6-inch, 8-inch up to 12.5-inch, including research series and deluxe models).

MARIUS Simon - 1570-1624. He was probably one of the first to apply telescopes to astronomy.

MARLBOROUGH (George Spencer, 4th Duke of) - English gentleman astronomer, 1739-1817. He owned a private observatory at *Blenheim Palace*, and possessed a RAMSDEN astronomical quadrant and many other instruments well-preserved today.

MARSHALL John - English instrument maker, w.1687, d.1724, *Two Golden Prospects, Ludgate St, London, Archimedes and Two Golden Prospects, Ludgate, the second Spectacle shop within the Gate on the left, The Three Keys, Ivy Lane, London* (1688), *The Gun, Ludgate St* (1688), *Archimedes and Spectacles in Ludgate, opp. West End of St Paul's* (1690-93). MARSHALL was bound to John DUNNELL, and he, himself, apprenticed Francis HAUKS BEE (1703) and John SMITH (1709), who became his son-in-law and successor. <sup>102</sup>

MARTENS - maker of daguerreo type heads. <sup>103</sup>

MARTIN Benjamin - English optical, mathematical and philosophical instrument maker, retailer, lecturer and author, 1705-82. MARTIN is recorded in *Chichester* (1736-40), at *Hadleys Quadrant and Visual Glasses, nr. Crane Court, Fleet St* (1756), opposite George ADAMS' business. Later, he had premises at *171 Fleet St, near Crane Court and the Royal Society* (1759-74), next door to John CUFF. The story is that CUFF immediately moved. Joshua L. MARTIN, his son, joined the business, patenting "*a new invented art of drawing tubes ....*" (1782 Brit.Pat.1316), and plated brass drawtubes in small telescopes <sup>104</sup> His son, Joshua Lover MARTIN, was bound to him (1758), and also John KIMBELL (1763). The family firm went bankrupt. MARTIN used name of DOLAND, very close to that of the famous DOLLOND. <sup>105</sup> The business was bought out by the highly successful instrument maker, Charles TULLEY. <sup>106</sup>

<sup>102</sup>SIMON. Ref. to DUNNELL/DUNNETT and SMITH in *Vistas* vol.28, p.357.

<sup>103</sup>See Handlist.

<sup>104</sup>Patent probably bought by Peter DOLLOND c.1783.

<sup>105</sup>See King 150, 174, *Dict.Nat.Biogr. and Trans. Opt. Soc.* vol.30, p.229, 1929. See also, late-18C [CHrMar91], and MARTIN and Son, London, CHrApr88 microscope.

<sup>106</sup>Pearson tells us (in Ree's *Cyclopaedia* 1819) that a certain MARTIN (which one we have not identified) used a method of grinding and polishing several glasses to the same radius of curvature and then comparing their focal lengths when held up to the sun. This was before FRAUNHOFER's concept of *refractive index*, the basis for modern design, had become known in England. See *Mon.Not.R.Astr.Soc.* vol.19, p.357, 1859; King 194.

MARTIN L.C - Professor of Physics and Head of Applied Optics at *Imperial College, London*. He wrote several textbooks (c.1920-50).

MARTIN A - inventor of silvering technique using nitrate of ammonia. <sup>107</sup>

MARTINS Carl Otto Albrecht - instrument maker, 1816-71, *Berlin*. He was apprenticed in 1833 to the eminent PISTOR, <sup>108</sup> and was later in partnership with him. PISTOR and MARTINS in the 19C manufactured important meridian circles for major German observatories and also for Leiden, Palermo, Washington, etc.

MASKELYNE Nevil (Rev) - Doctor of Divinity, English astronomer, 1732-1811. He was Astronomer Royal from 1765-1810, instigating the *Nautical Almanac* (1767). MASKELYNE was a frequent adviser on the design of telescopes, e.g. to the TROUGHTONS concerning instruments at Greenwich and Armagh Observatories.

MASON S and T - optical instrument retailers, *Dublin*, fl.1836-40.

MATHIS Thomas - US telescope maker, present. <sup>109</sup>

MAUDSLAY - English retailer, *London*. He was in business with FIELD.

MAY Charles - English engineer in the RANSOME agricultural engineering firm, *Ipswich, England*. He constructed AIRY's 8in transit instrument (c.1848) which had optics by SIMMS, and many of the larger mechanical parts of other telescopes of the time. <sup>110</sup>

MAYER Tobias - astronomer, 1723-62. He constructed a reflecting circle (1752) along lines suggested earlier although not perfected by HADLEY. See BORDA.

McALLISTER T.H. - retailer of optical and mechanical goods (fl. 1878-87). We find also W.M. (1873) and W.Y. McALLISTER (1865-78), and

<sup>107</sup>c.f. LIEBIG's and BRASHEAR's silvering technique. See King 274.

<sup>108</sup>K.P.H. PISTOR (1778-1847) was earlier associated with K.T.N. MENDELSSOHN, founding his own company in 1813.

<sup>109</sup>MACP 38.

<sup>110</sup>Roy. Greenwich Obs. Appendices 1867, i. See also King 240.

# MEADE®

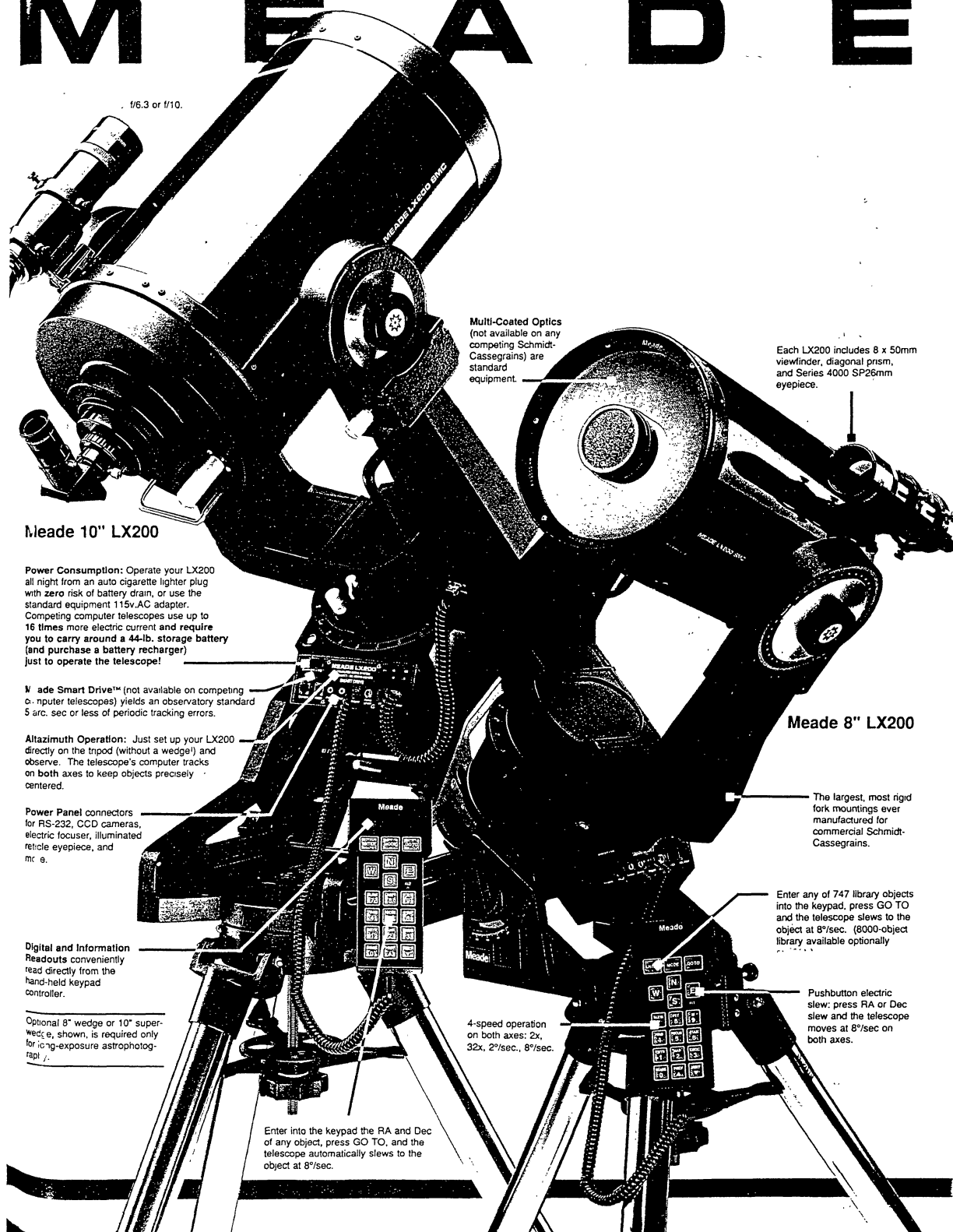


Figure 152: Schmidt-Cassegrain (SC) telescopes by MEADE (the LX series) available with digital and information readouts. These instruments, together with those produced by US companies, CELESTRON, DYNAMAX and others, epitomize the commercial explosion of the latter half of the 20C. See *Cyclopaedia Part I, Fig.17*.



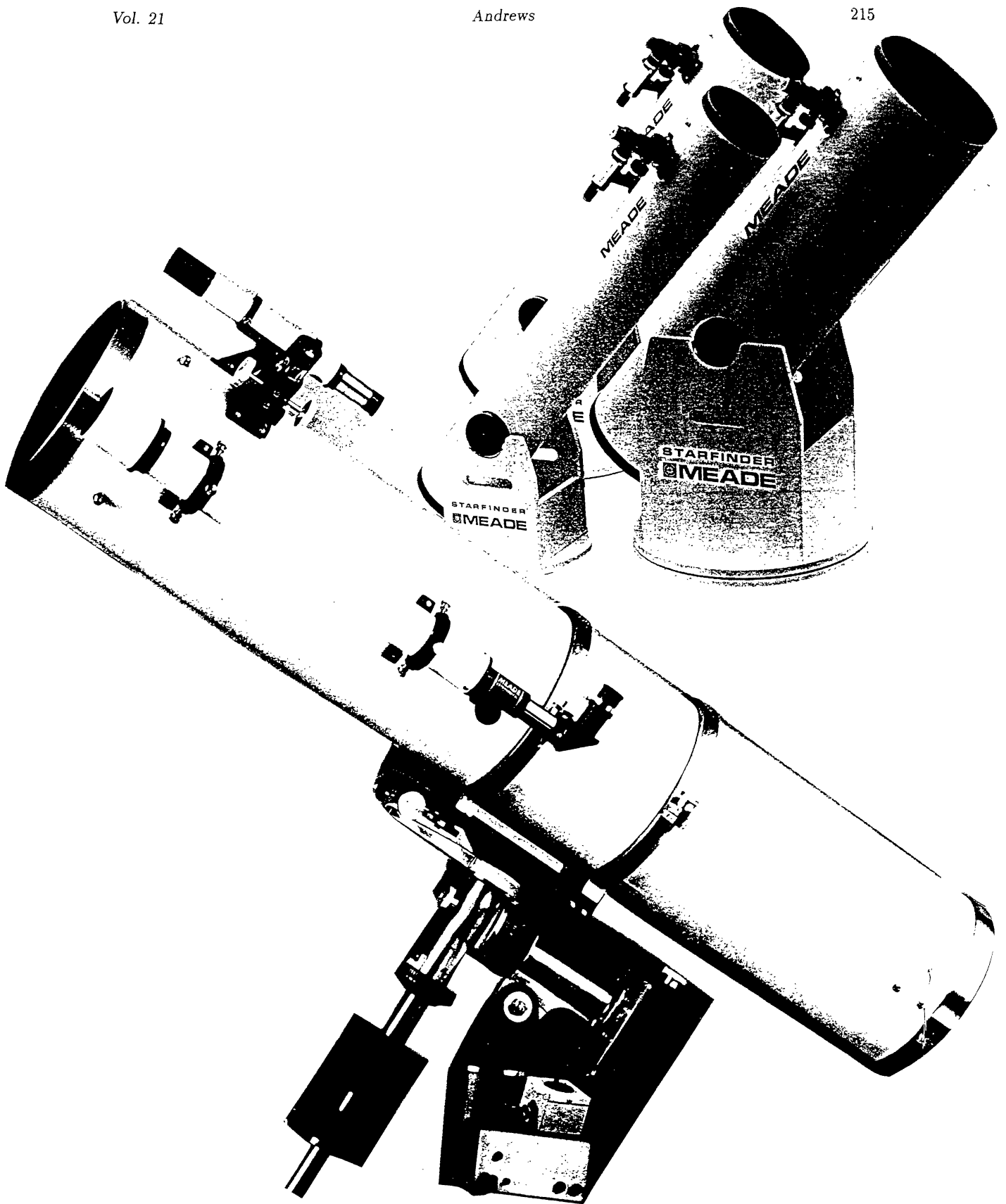
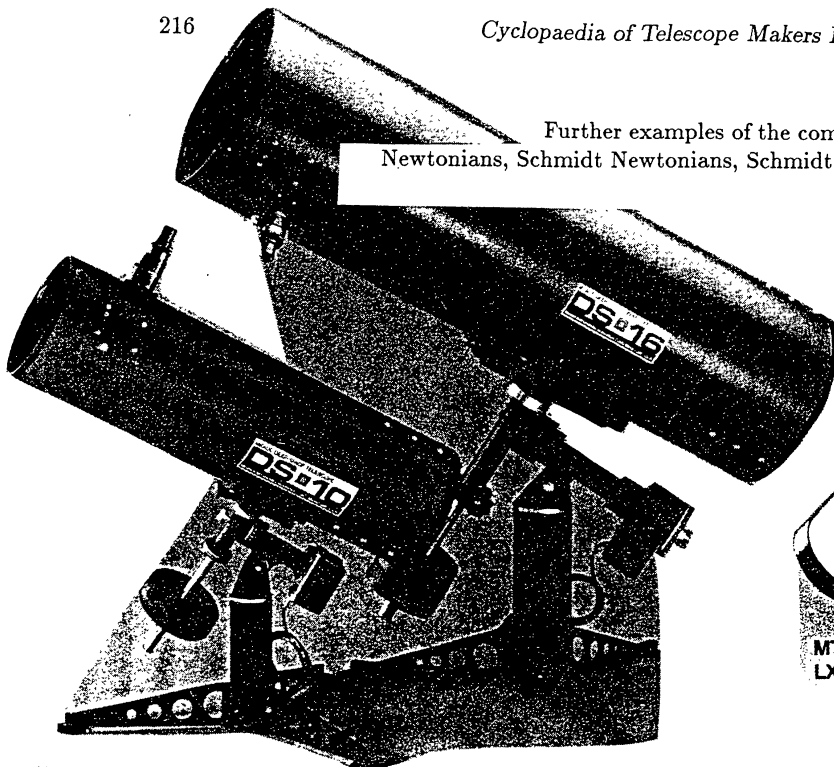
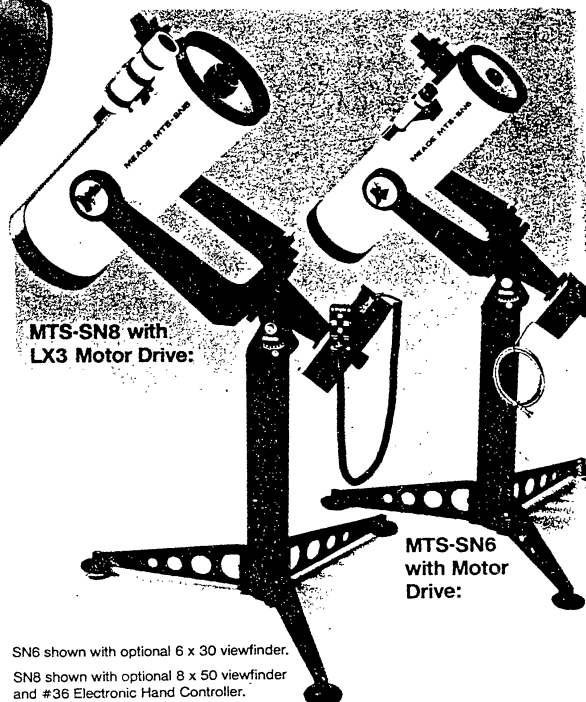


Figure 153: Simply mounted altazimuth, large aperture, Dobsonian telescopes by MEADE (Starfinder). Compare the standard equatorially mounted instrument below. See under DOBSON (*Cyclopaedia Part I*).

Further examples of the commercial explosion: illustrations of MEADE telescopes, Newtonians, Schmidt Newtonians, Schmidt Cassegrains (also available, Maksutov Cassegrains).

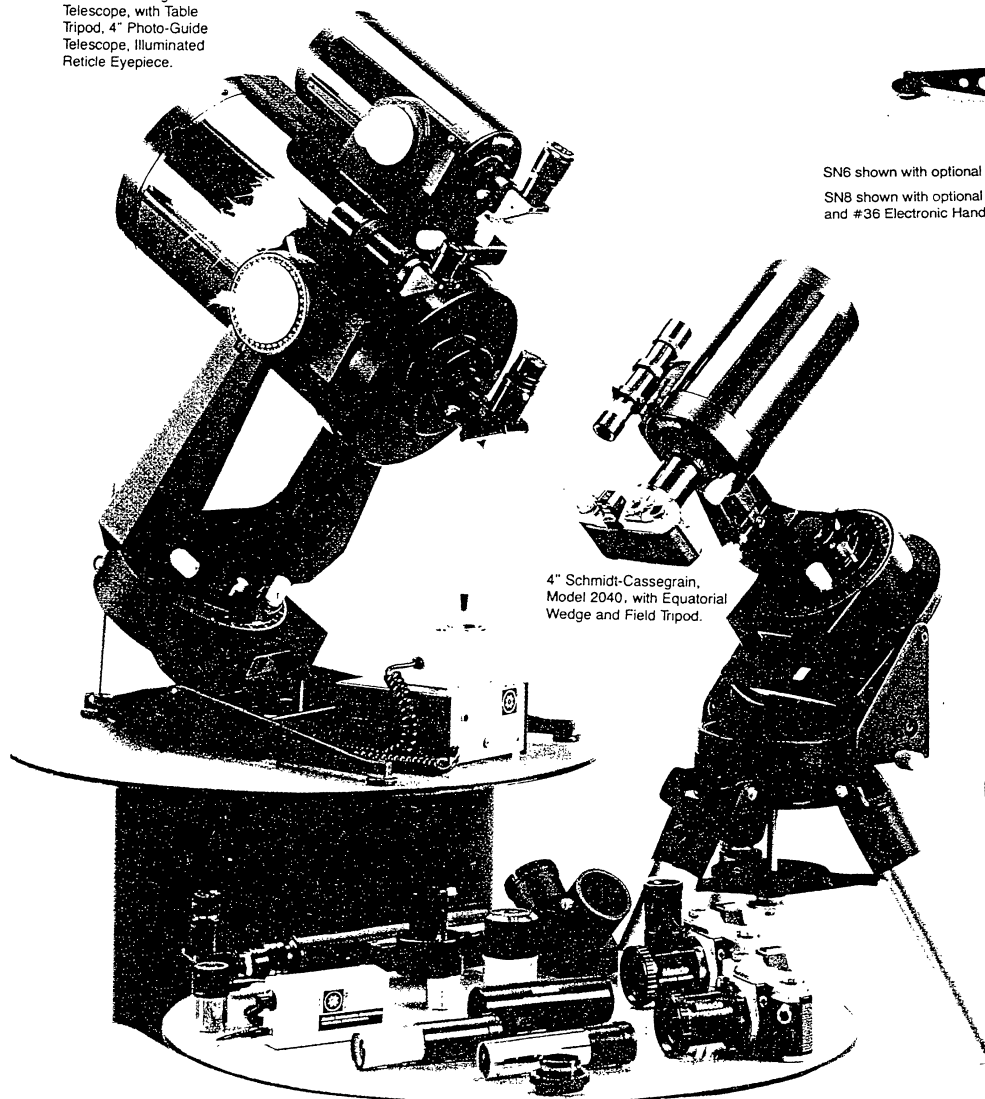


Model 2080: 8" Schmidt-Cassegrain Telescope, with Table Tripod, 4" Photo-Guide Telescope, Illuminated Reticle Eyepiece.



SN6 shown with optional 6 x 30 viewfinder.

SN8 shown with optional 8 x 50 viewfinder and #36 Electronic Hand Controller.



4" Schmidt-Cassegrain, Model 2040, with Equatorial Wedge and Field Tripod.

Model 1020: 1000mm f/10 Telephoto Lens. Attaches to any standard camera tripod. Shown with optional Meade Photo Tripod.



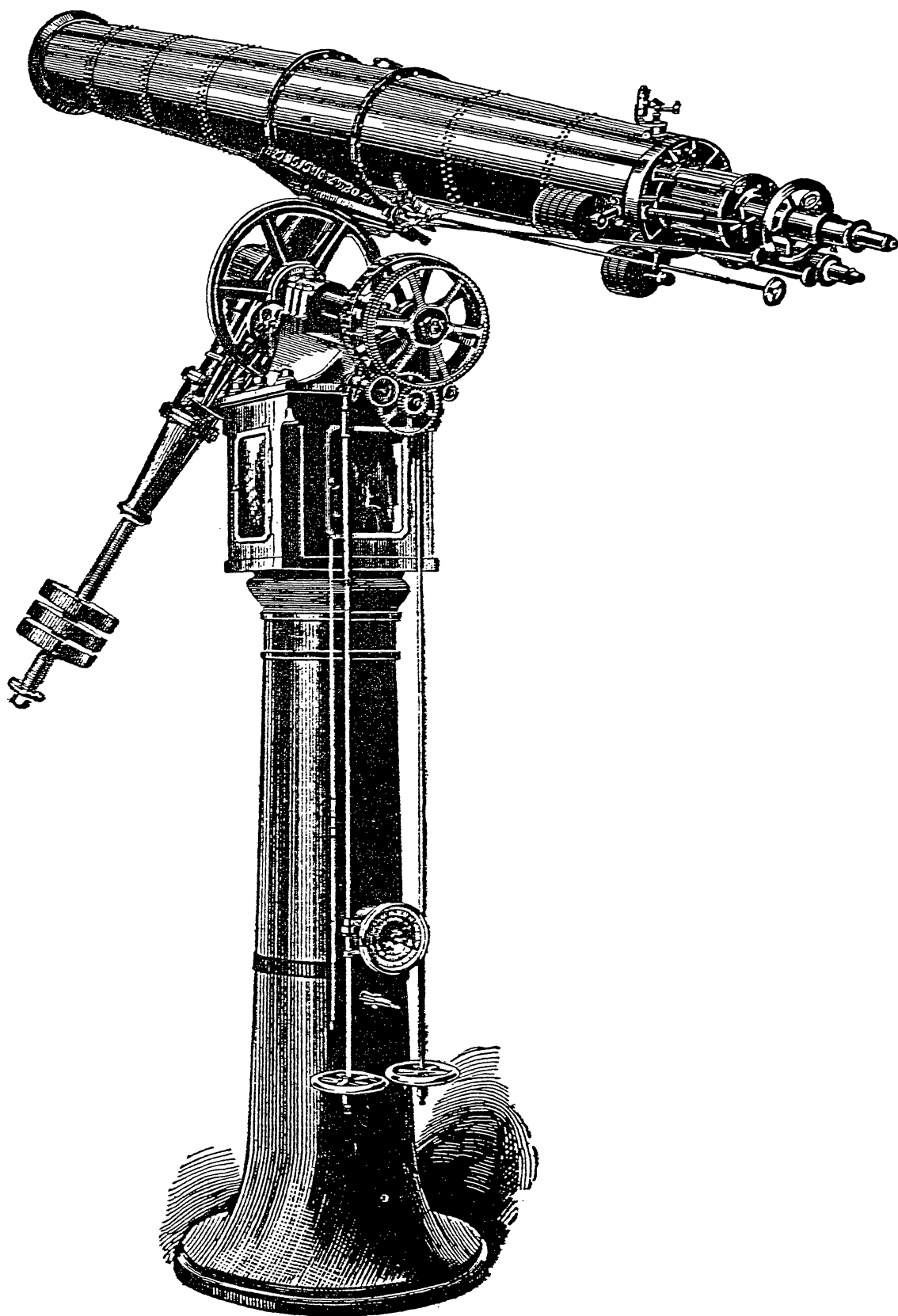


Figure 155: MERZ/SAEGMULLER 20-inch refractor (c.1893) installed at *Manila Observatory, Philippine Islands*. Similar MERZ objectives were in use at *Strassburg* and in *Milan*, the latter utilized by the famous astronomer, Schiaparelli. See the early journal, *Astronomy and Astrophysics*, vol.13, p.85, 1894.

Figure 154: MEADE refracting telescopes.

**Model 102ED**  
\$2195.

Meade ED super multi-coated objective lenses yield ultra high resolution, high contrast images, virtually free of any false color.

**5" Model 127ED**  
\$2795.

LXD 650 (4", 5") and LXD 750 (6", 7") equatorial mounts, new for 1994, virtually eliminate gear backlash, resulting in the most rigid, flexure-free mounts available.

**6" Model 152ED**  
\$4495.

**7" Model 178ED**  
\$5495.

Standard Field Tripod (4", 5") and Giant Field Tripod (6", 7") provide rock-solid support for the telescope assembly.


Standard accessories include 8 x 50mm viewfinder, 2" diagonal mirror, Super Plössl 26mm eyepiece.

Optional #1697 Computer Drive System includes 4 drive speeds on both axes (2x, 32x, 2"/sec., 8"/sec.); Smart Drive™ periodic error corrector; keypad hand controller with digital readouts; automatic GO TO capability from any input RA and Dec or from 747-object library—\$695. 8000-object CNGC library (a 2-minute plug-in) available separately at \$99.

Prices listed are for complete ED Apochromatic Refractors, including optical tube assembly with #684 giant 2.7" focuser; 8 x 50mm viewfinder; #930 2" diagonal mirror with 1.25" adapter; Super Plössl 26mm eyepiece; 4" and 5" models include the LXD 650 equatorial mount and standard field tripod; 6" and 7" models include the LXD 750 equatorial mount and giant field tripod; each mount is provided with manual slow-motion controls, analog setting circles, and locks on both axes.

To order, contact your Meade Advanced Products dealer. Packing and shipping in the 48 states: 4"—\$105; 5"—\$125; 6"—\$185; 7"—\$215.

\*All prices shown are suggested USA mail-order retail prices, exclusive of sales taxes or credit card charges, if applicable.



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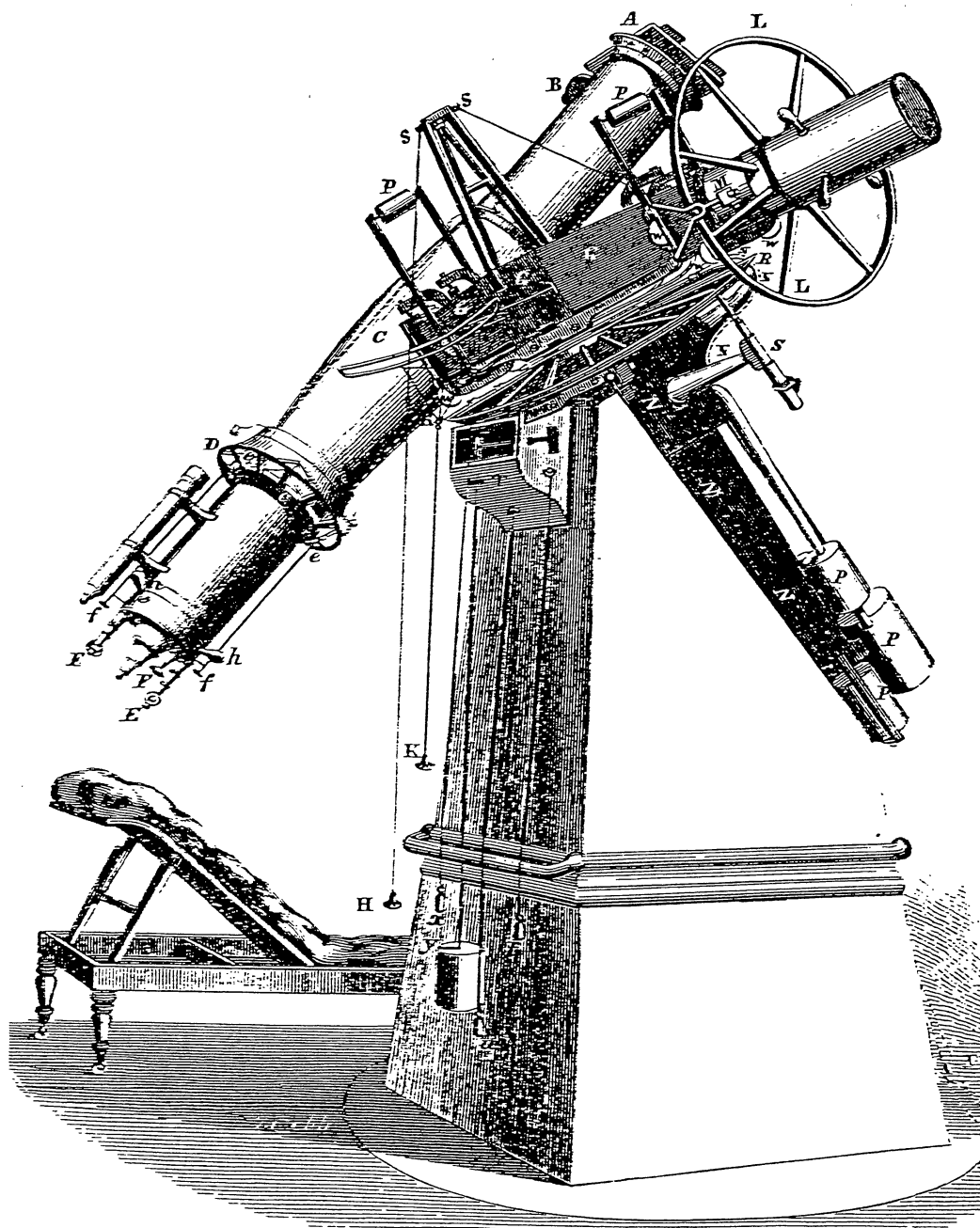


Figure 157: MERZ/REPSOLD 7.5-inch heliometer (focus 126in) for *Radcliffe Observatory, Oxford* (1849). FRAUNHOFER and UTZSCHNEIDER had made, at least, four such heliometers which possess bisected (cut and adjustable) object glasses with micrometer eyepieces to measure angular distances e.g. between stars.

The heliometer with its cut object glass stemmed from an idea by SAVARY followed up by DOLLOND (1754). Many eminent makers and scientists suggested modifications of the principle, RAMSDEN (dividing primary specula), BREWSTER (dividing secondary specula), STEINHEIL (dividing the ocular), although GILL considered these all failures.

REPSOLD made three instruments with bisected 4-inch object glass (focus 60in) for the Russian Government (e.g. for the great STRUVE in *Pulkova*) and also one, actually mounted by COOKE, for Lord LINDSAY in *Scotland*. The astronomers, F.W. BESSEL (1784-1840) and AUWERS in *Königsberg, Prussia*, measured the parallax (and hence distance) of the nearby star, 61 Cygni, using a 6.5-inch (focus 102in). Heliometers could be found at many major observatories, *Bonn, Göttingen, Hamburg, Pulkova, Warsaw, Breslau and Helsinki*.

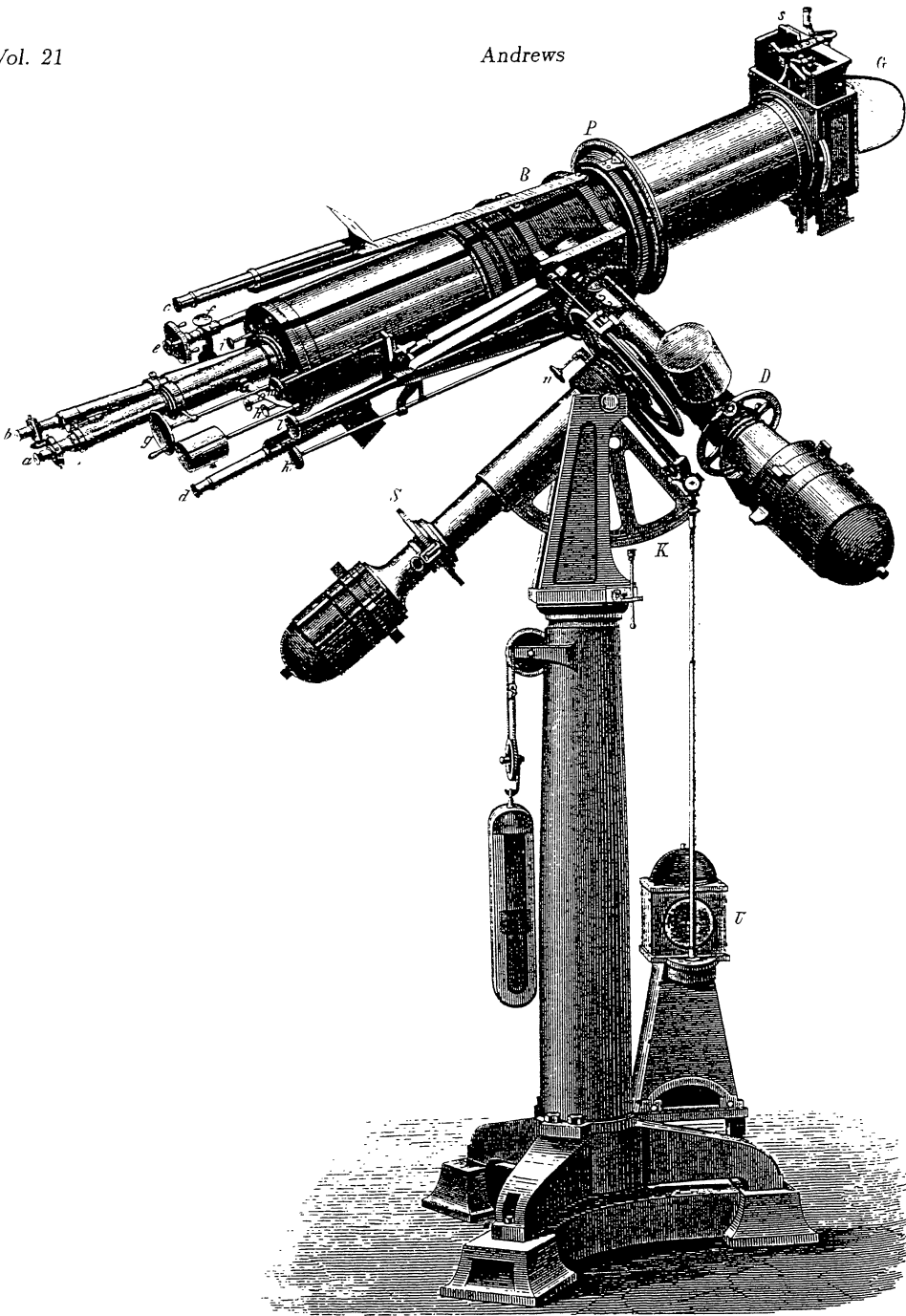


Figure 158: REPSOLD heliometer, a 6-inch (focus 98in), at Yale College, New Haven, US. Compare the *Cape Observatory* heliometer (*Cyclopaedia Part II, Fig.48*) and those at *Oxford* and elsewhere. MERZ supplied object glasses to firms such as REPSOLD. See also *Fig.160*.

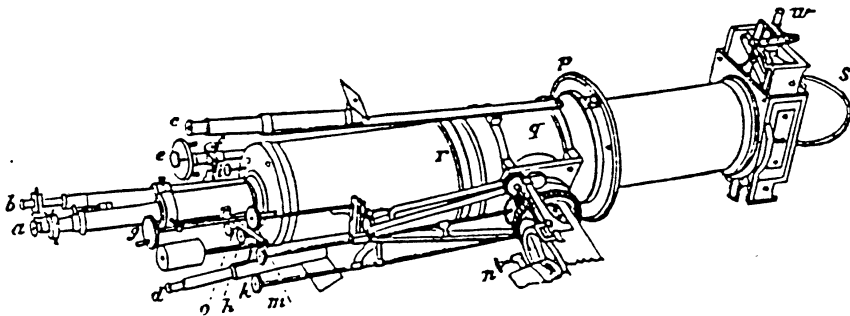


Figure 159: Schematic diagram of the REPSOLD heliometer from GILL's article in *Encyclopaedia Britannica*, vol.16, p.254, 9th Edition 1878. The various parts of the instrument are therein described.

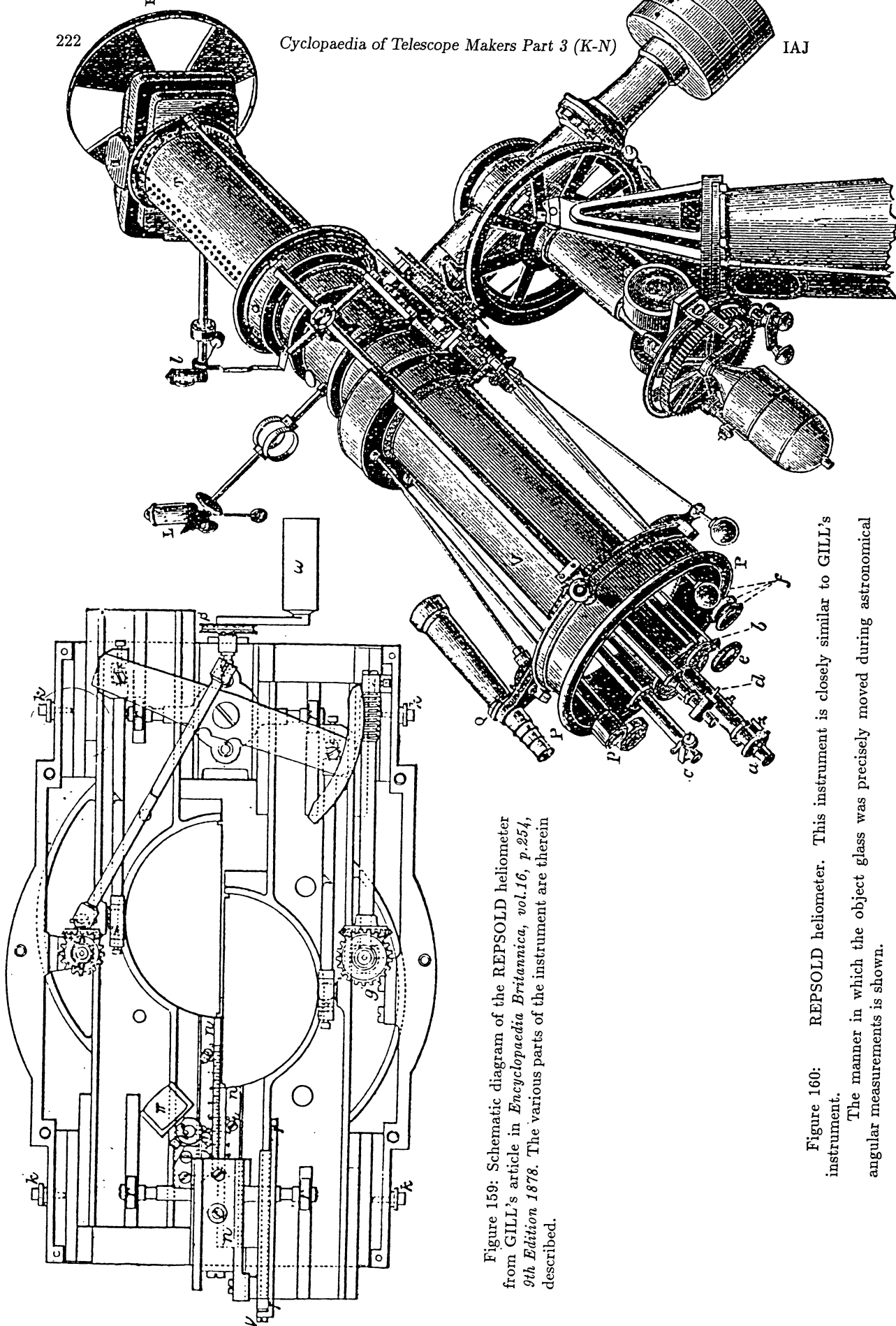


Figure 159: Schematic diagram of the REPSOLD heliometer from GILL's article in *Encyclopaedia Britannica*, vol.16, p.254, 9th Edition 1878. The various parts of the instrument are therein described.

Figure 160: REPSOLD heliometer. This instrument is closely similar to GILL's instrument.

The manner in which the object glass was precisely moved during astronomical angular measurements is shown.

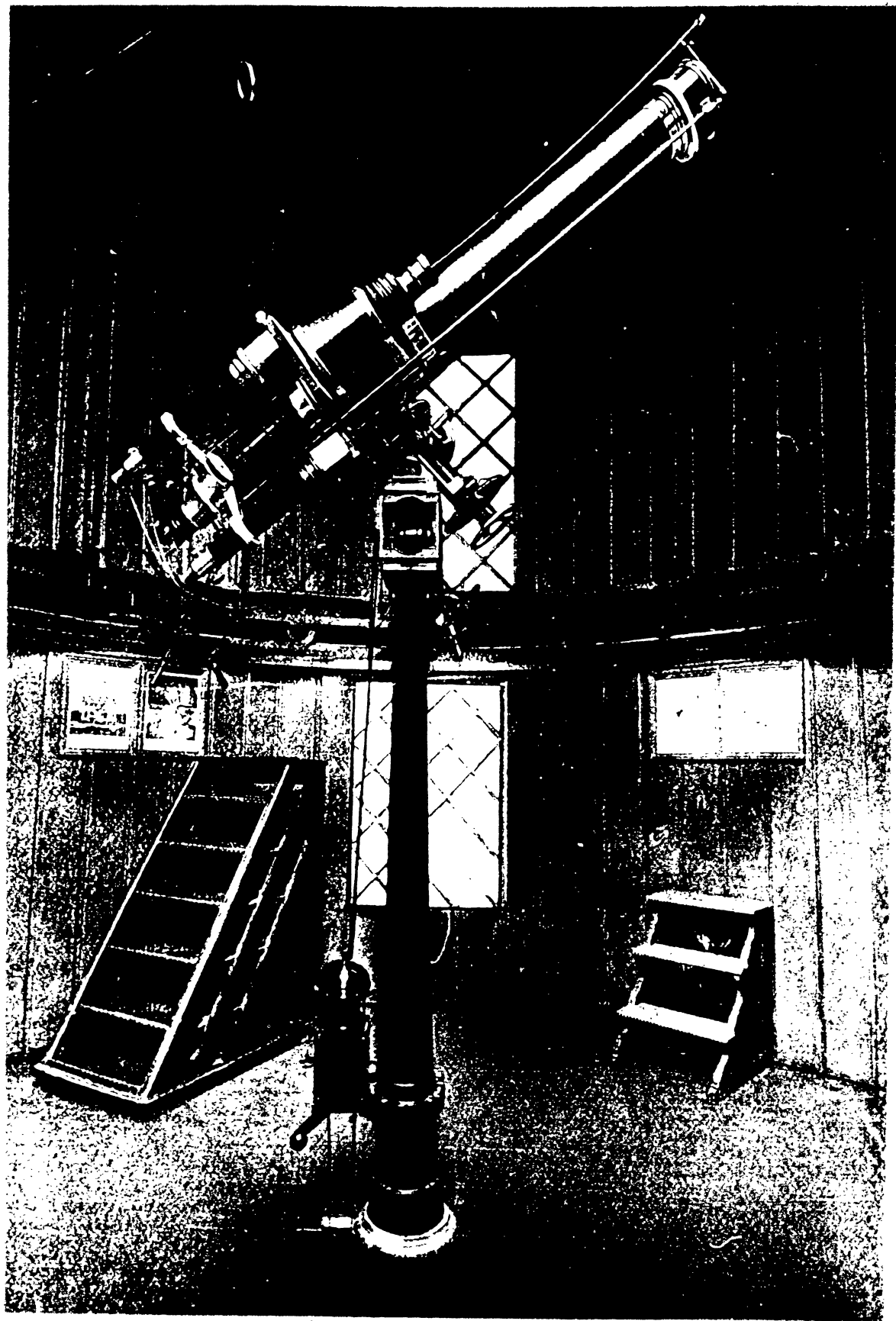


Figure 161: MERZ/KONKOLY 5.1-inch clock-driven refractor in *Hungary*. The viewpoint within the wooden observing dome is from the west (Photo. Courtesy of M.Vargha).



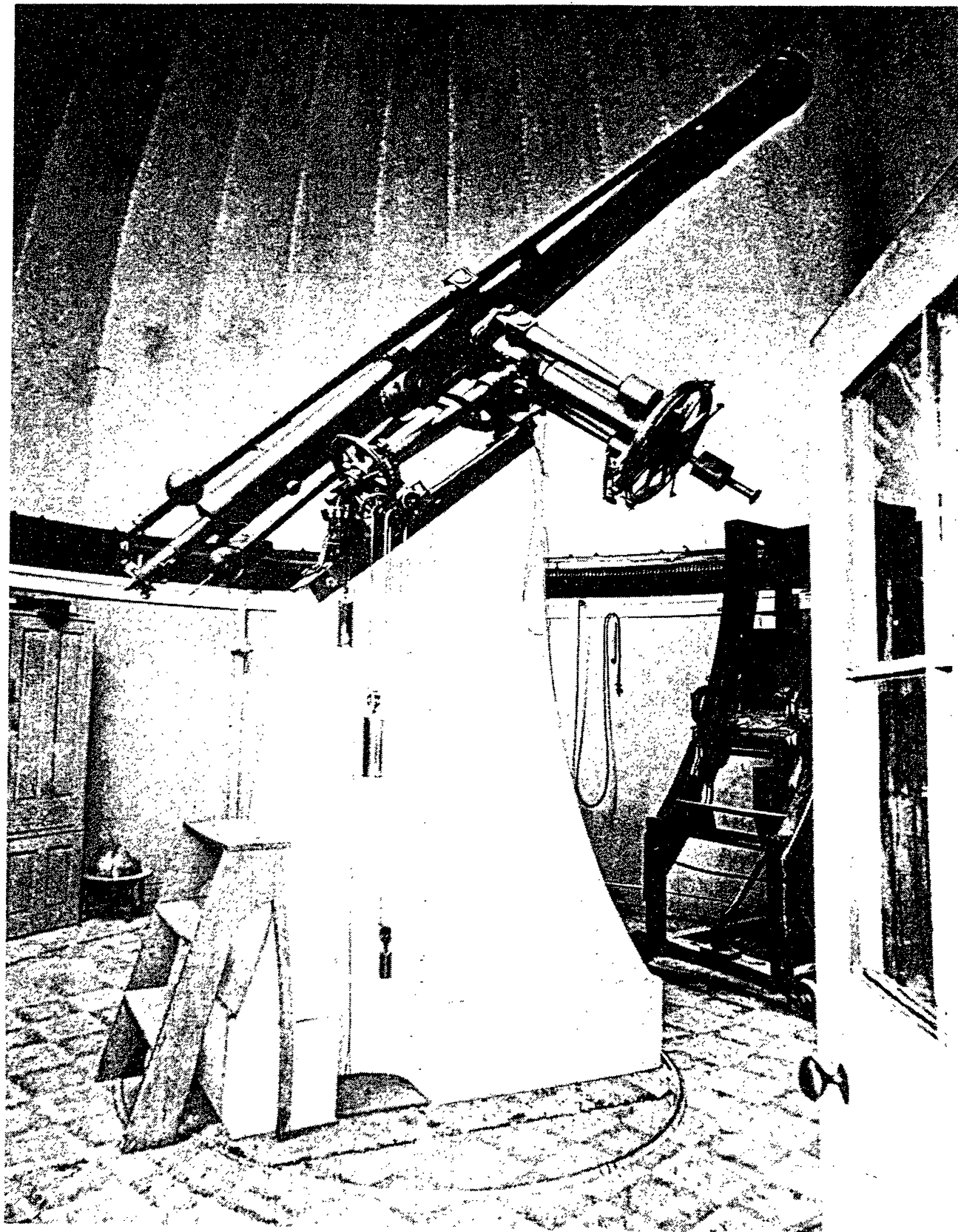


Figure 162: MERZ/MAHLER 15-inch equatorial refractor at *Harvard College Observatory*. Similar instruments were supplied worldwide, a 15-inch at *Pulkova*, an 8.5-inch at *Milan*, a 9.5-inch at *Lund, Sweden*.

McALLISTER and Bro. (1855-59) with a wide variety of optical, mathematical and philosophical instruments. <sup>111</sup>

McCLEAN Frank - English amateur astronomer, late 19C, *Tunbridge Wells, Kent*. He owned a 12in aperture GRUBB refractor with a 10 degree objective prism, and a 24in GRUBB telescope which was donated to the Cape Observatory. <sup>112</sup> A large bequest was left by McCLEAN to the Cambridge Observatory.

McDOWELL James B - U.S. optician and engineer, assistant to BRASHEAR. He had been employed at the glassworks of BRYCE Co., and was married to BRASHEAR's daughter, Effie. He was associated with Frederick HAGEMAN. <sup>113</sup> His expertise was called upon when he made the final correction to the 72in diameter mirror for the Canadian Dominion Astrophysical Observatory telescope at Victoria B.C.

McGREGOR Duncan - Scots retailer? *Glasgow, Greenock*, c.1803-1867. <sup>114</sup>

MEADE INSTRUMENTS CORP - US telescope makers, present day, *1675 Toronto Way, Costa Mesa, California 92626*. The firm supplies a wide variety of telescopes, e.g. Schmidt-Cassegrains (SC): 4in Model 2040; 8in f/6.3 or f/10 Model 2080 (LX5 and LX100 mounts, quartz controlled drive); 10in f/10 Model 2120 (LX200 mount). Newtonians: 6in Model 628; 8in deluxe Model 856. Research Series reflectors: 8in f/6 Model 826; 8in Model 880; 12.5in Model 1266; 10in f/4.5 Model DS-10; 16in f/4.5 Model DS-16. Refractors: 80mm Model 323; 6in f/9 Model 152ED/APO (apochromatic, with photographic field corrector PFC); also 4in (102ED), 5in (127ED), 7in (178ED). Schmidt Newtonians: 6in Model MTS-SN6. Maksutov Cassegrain: 3.5in f/11 Model 97E, etc. <sup>115</sup>

MEGAREY Alexander - U.S. surveying instrument maker, 19C, *New York*.

MÉGNIE - French family of late-18C instrument makers. A 3ft movable quadrant by MÉGNIE (now at *Verona*) was in use at *rue de Richelieu, Paris*, at a private observatory belonging to CAGNOLI (1782). A 3in aperture transit instrument (focus 4.5ft) dated c.1790 may be found in *Madrid*.

MENDOZA Y RIOS Josef - astronomer, 1762-1816. <sup>116</sup>

MERSENNE Marin - French minorite friar, philosopher and musician, 1588-1648. In 1639 MERSENNE suggested, amongst several optical designs involving two figured mirrors, a parabolic primary speculum with a parabolic secondary for forming an image which could be then magnified by an eyepiece. <sup>117</sup> The idea was apparently ridiculed by DESCARTES. <sup>118</sup>

MERZ - eminent German family of optical instrument makers, in the UTZSCHNEIDER and FRAUNHOFER line. In 1838 MERZ and MAHLER took control of the famous *Benediktbeuern* works, and by 1845 MERZ became the sole owner. We record Georg MERZ (1793-1876), G and J MERZ of Munchen (1842-1878), MERZ and Sons (Sigmund took over *Benediktbeuern* in 1867), Georg and Sigmund MERZ, *Pasing, Munich* (1908). <sup>119</sup> This important firm constructed many of the world's finest telescope objectives, e.g. for the 15in Pulkova refractor (1839), the 11in Potsdam refractor (c.1887, used by VOGEL), the 8.5in refractor (used by SCHIAPARELLI in his work on "canali" on Mars), the 9.5in LUND refractor (c.1870), the 9.6in Naval Observatory refractor, the 15in Harvard refractor (1847). See illustrations. The firm was also associated with UTZSCHNEIDER from 1806, and with FRAUNHOFER 1840-78. <sup>120</sup> There was collaboration between MERZ and PISTOR and MARTINS and the famous German firms of REPSOLD and STEINHEIL. The firm of MERZ was also well-known for its microscopes.

<sup>116</sup>He approached BIRD and SHORT for instruments.

<sup>117</sup>See GREGORY who in 1663 suggested an hyperboloidal speculum, King 48, Chambers 718. ZUCCHI, CAVALIER and DESCARTES had also considered telescope designs incorporating concave mirrors.

<sup>118</sup>NEWTON's speculum was made in c.1672, and about the same time HOOKE constructed a pierced speculum (Cassegrain ?) telescope.

<sup>119</sup>See Brachner 1985, and Handlist; also Herman's article in *Vistas* vol.28, p.391; and many sources from Deutsches Museum. There is, however, a remarkable lack of documentation on MERZ's close collaborator MAHLER. No portrait of MAHLER was found by the author.

<sup>120</sup>See Handlist; King 249; *Astron. Astroph.* vol.13, 85, 1894.

<sup>111</sup>Handlist.

<sup>112</sup>Known as the Victoria 24in telescope. See King 300, 350. There is also a direct vision spectroscope probably associated with McCLEAN. See JHA vol.30, 363 with reference to photographic spectra.

<sup>113</sup>See Brash 84.

<sup>114</sup>See BG.

<sup>115</sup>See illustrations and advertisements in *Sky and Telescope*, e.g. ST, March 1991. Also, *Astronomy*, October 1983. See also the US firms, CELESTRON and VIXEN, and a multitude of Japanese companies.

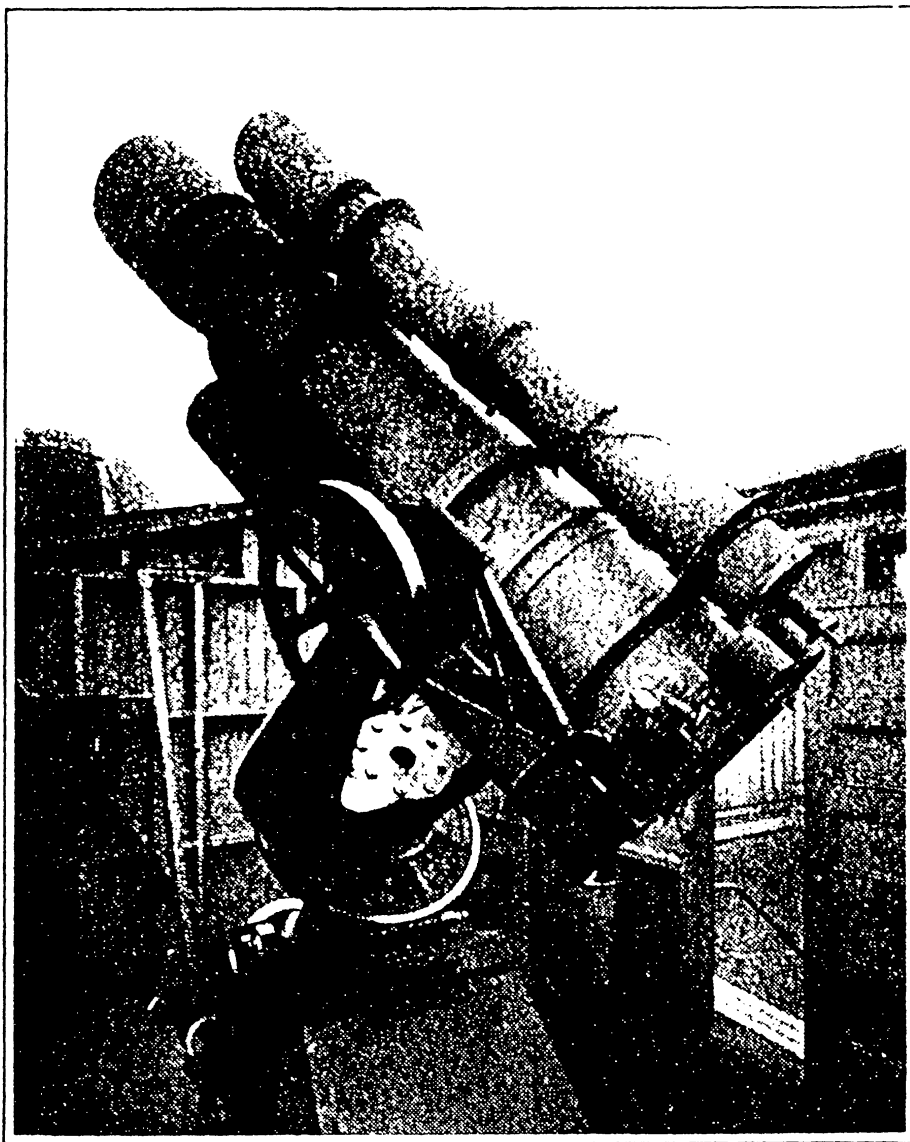


Figure 163: METCALF 16-inch photographic telescope on fork mounting at *Harvard College Observatory*. Note the conical tube to accommodate very large photographic plates. Since the focal surface is curved the photographic plate has to be slightly deformed by exhausting the air within part of the plate-holder. This was not necessary in the 10-inch METCALF refractor at the *Boyden Observatory, Bloemfontein*. The optical design of the 10-inch objective was such that flat fields of nearly 8 by 10 square degrees were possible. A GERRISH drive, controlled by a pendulum with precise weights added to the pendulum depending on the attitude of the telescope, allowed excellent tracking.



Figure 164: (a) MORTON 5-inch brass reflecting telescope on altazimuth mount (body tube 33in long; c.1860) with rack-gear slow motion in altitude and rotating walnut and brass platform for azimuthal motion. The mounting in mahogany with cabriole legs is remarkable (Sotheby's 1989 £2000-3000. See also Christie's September 1991).

(b) Thomas MORTON Kilmarnock is inscribed on the back plate of the speculum mirror.



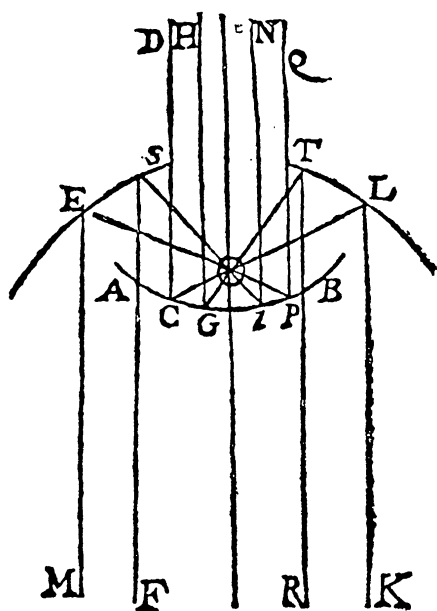


Figure 165: Drawings illustrating 17C telescope designs involving two optically figured mirrors. Both Bonaventura CAVALIERI (1598-1647) and Marin MERSENNE (in 1636-39) made proposals which were ridiculed by the famous René DESCARTES. See CAVALIERI's *Lo Specchio Ustorio*, Bologna 1632 and MERSENNE's *l'Harmonie Universelle* 1636. See Isaac NEWTON and Guillaume CASSEGRAIN.

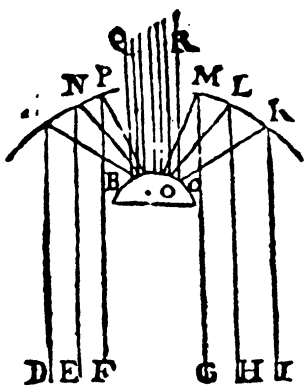
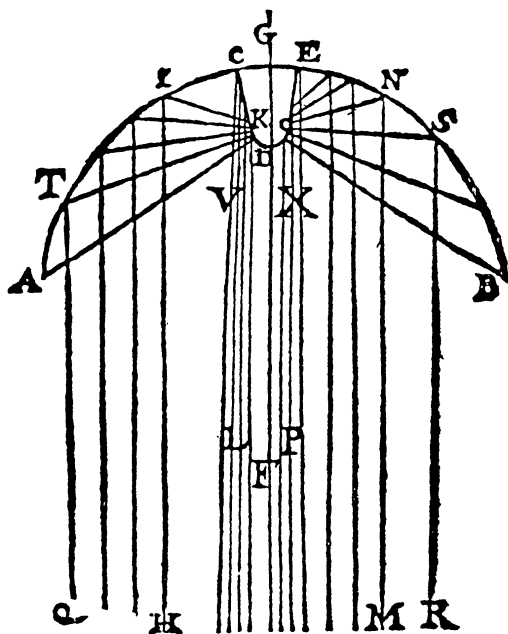




Figure 166: NAIRNE and BLUNT portable equatorial telescope (c.1780). Courtesy of Whipple Museum, Cambridge.

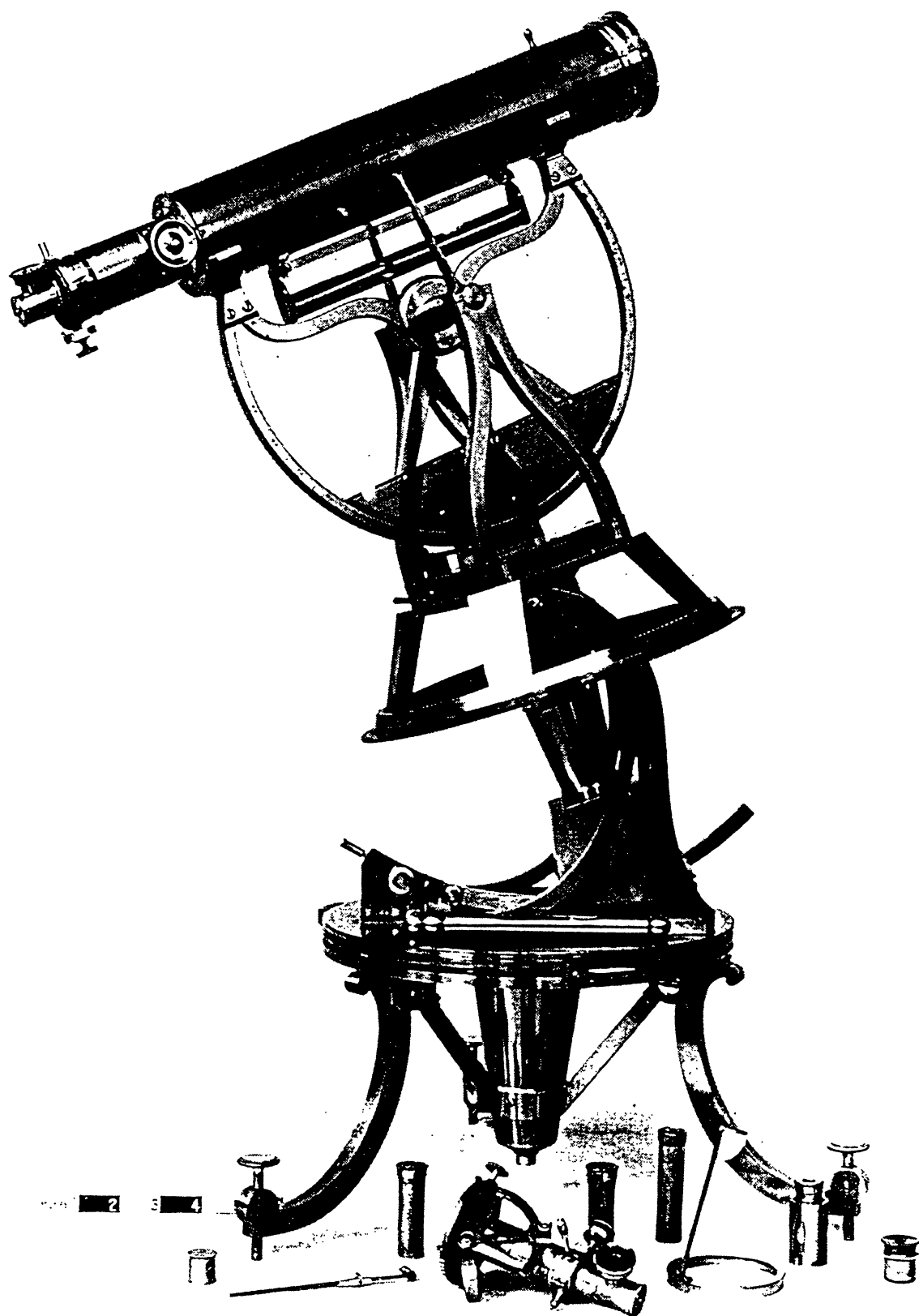


Figure 167: Portable equatorial telescope with conical bearings for added stability (Courtesy of Science Museum, London).

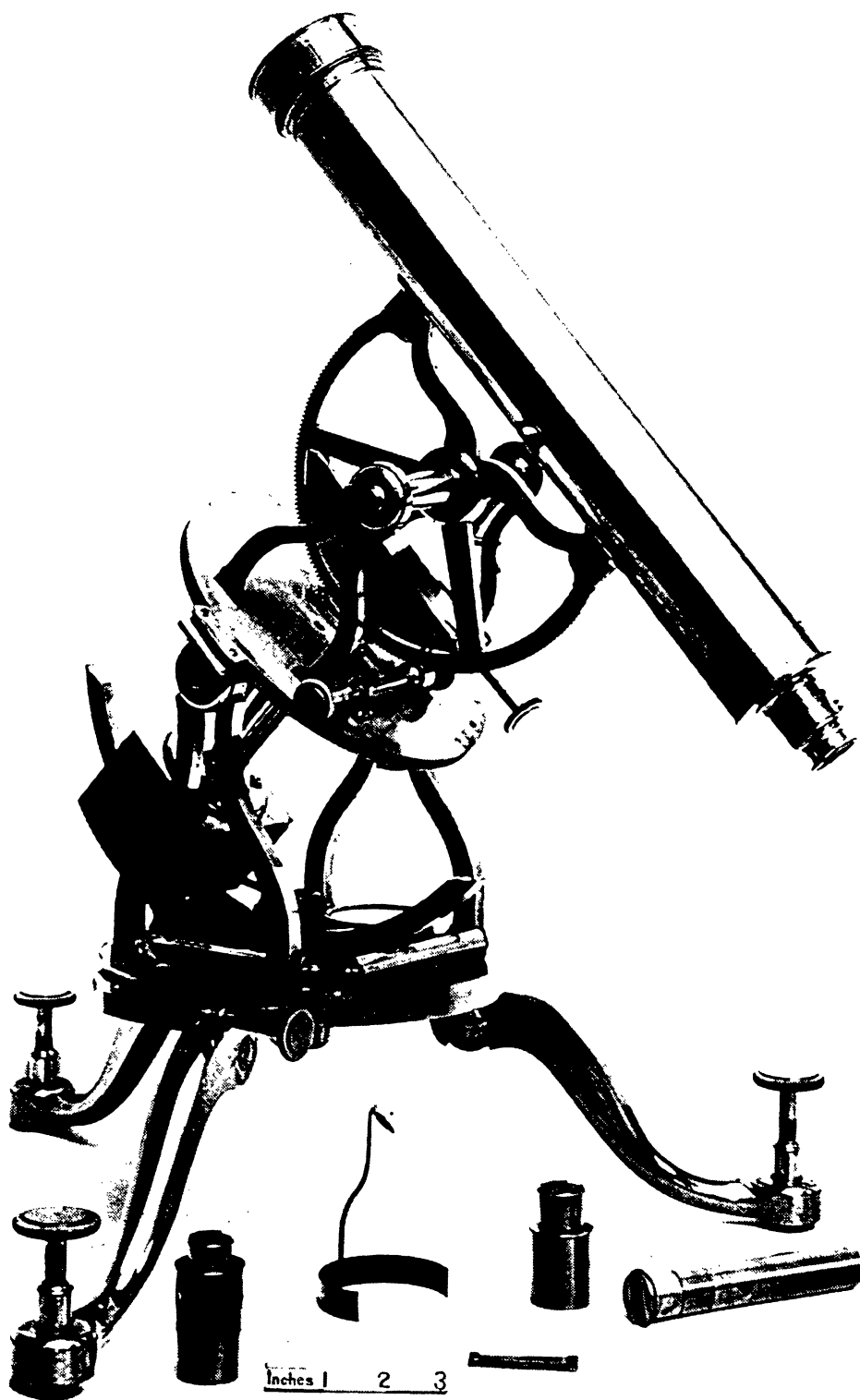


Figure 168: Many eminent instrument makers, e.g.DOLLOND, constructed portable equatorial telescopes (c.1800). See also *Figs.169, 170 and 171*. Courtesy of Science Museum, London.



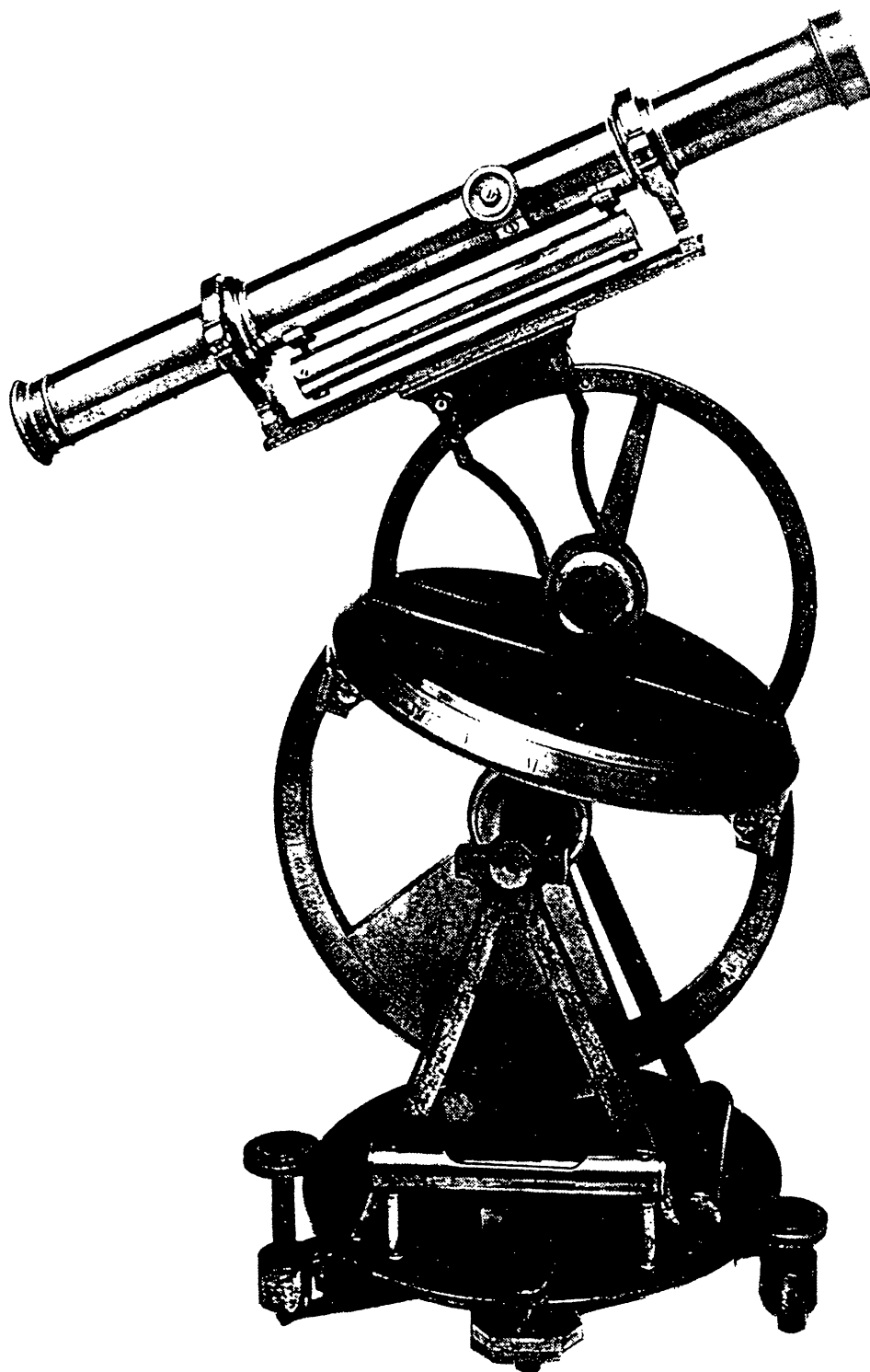


Figure 169: ADAMS portable equatorial telescope (c.1785).  
Courtesy of Whipple Museum, Cambridge.

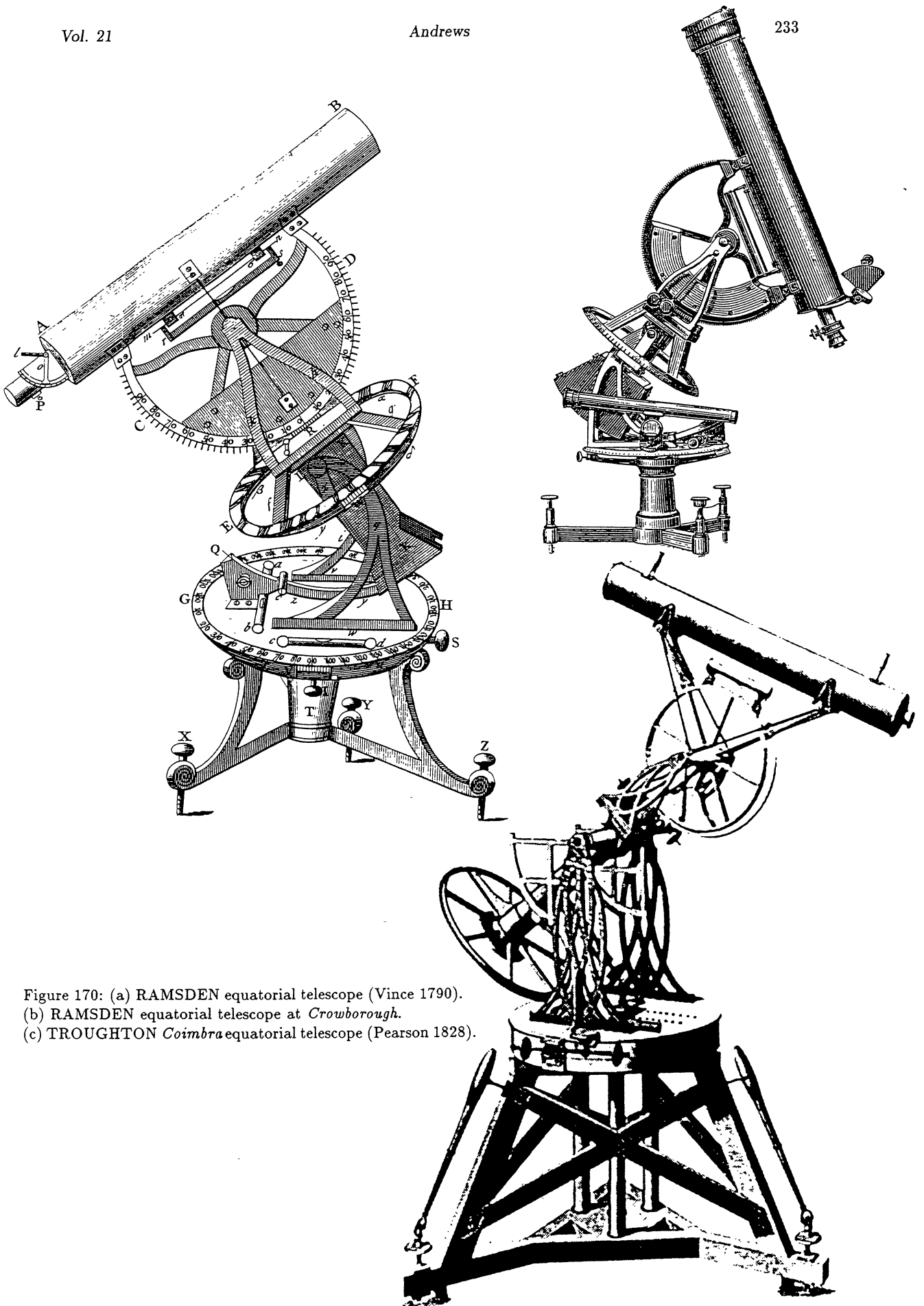


Figure 170: (a) RAMSDEN equatorial telescope (Vince 1790).  
 (b) RAMSDEN equatorial telescope at *Crowborough*.  
 (c) TROUGHTON *Coimbra* equatorial telescope (Pearson 1828).

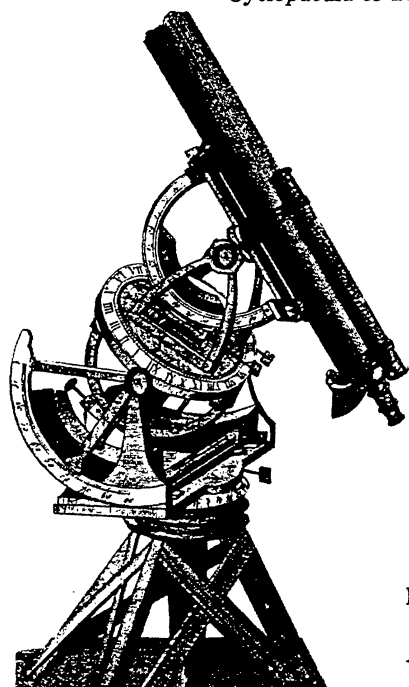
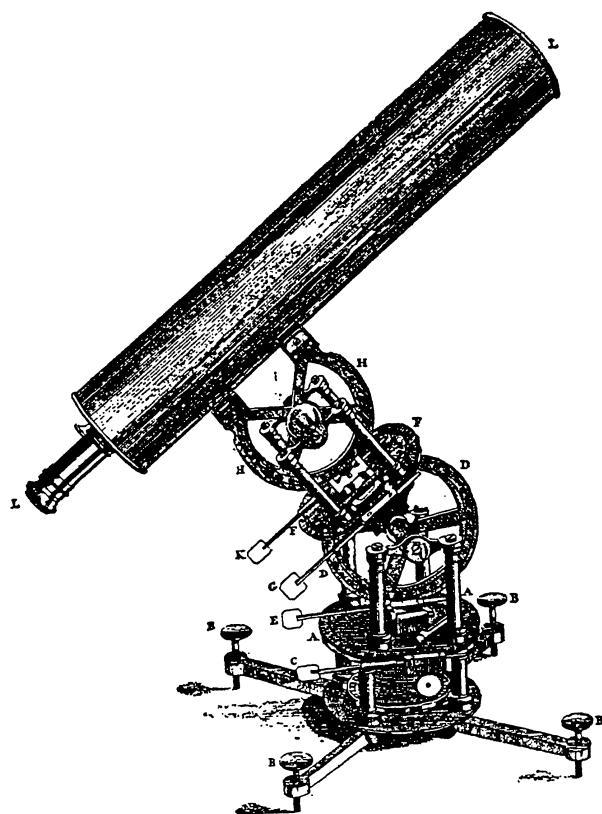
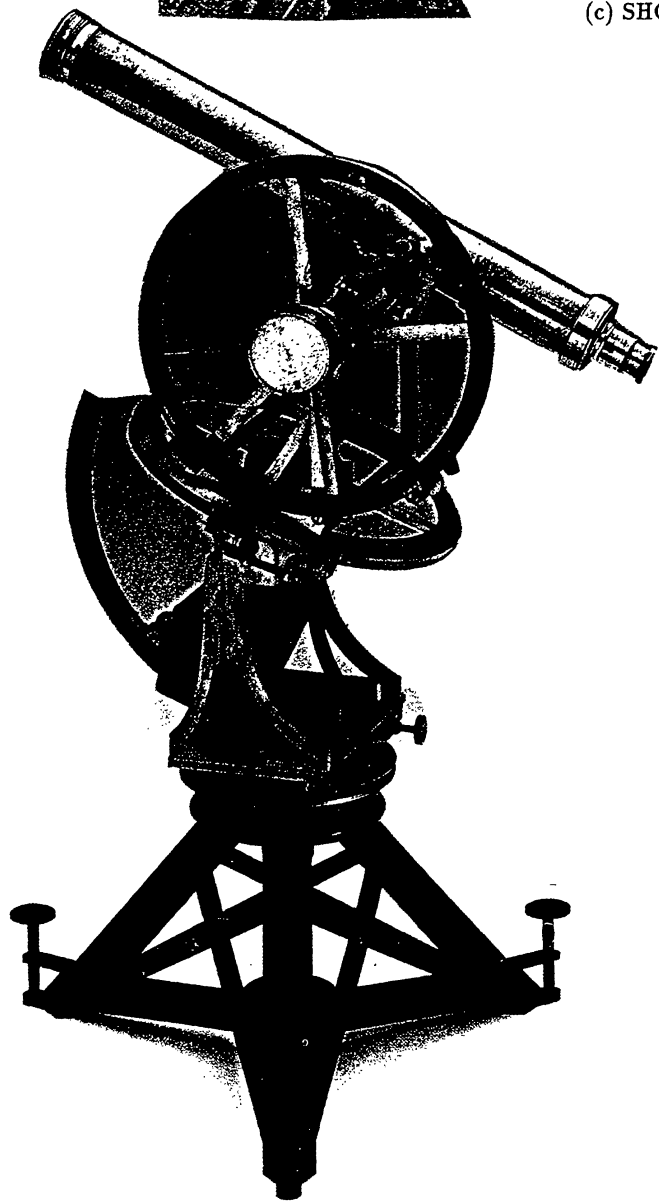


Figure 171: (a) NAIRNE equatorial telescope, 1771 (from Lalande's *Astronomie*).

(b) NAIRNE and BLUNT equatorial telescope (See Christie's April 1988).

(c) SHORT Gregorian equatorial telescope, 1749.



<sup>121</sup> They supplied a variety of auxiliary equipment, e.g. heliometer objectives (bisected lenses), helioscopic eyepieces etc. as well as star spectroscopes, as used by the eminent Italian astronomer, SECCHI. <sup>122</sup>

METCALF Joel H. (Rev) - U.S. amateur optician and astronomer, d.1923. He designed and constructed two famous photographic lenses, the 16in doublet at f/5.25, and the 10in triplet. <sup>123</sup>

METIUS Jacob - *Alkmaar, Netherlands*, d.1628. He was claimant to the invention of the telescope. <sup>124</sup>

METZ C - Dutch instrument maker, *Amsterdam*, fl.c.1685. <sup>125</sup> He made sextants and azimuthal quadrants.

MEWETTE - English telescope engineer, 20C. See GRUBB and SINDEN.

MEYERSTEIN M (von) - c.1880, astronomical & physical instruments, *University of Göttingen*. <sup>126</sup>

MEYER Hugo, - *Optische und Feinmechanische Werke, Görlitz* (German World War II binocular code ccx). The firm made RUDOLPH's *plasmats* in 1920.

MICHELL John (Rev) - English gentleman astronomer, *Thornhill, Yorkshire*, b.c.1724, d.c.1793. In 1780 he owned a number of self-made instruments, including an unusual f/4.1 telescope (29.5in focal length). <sup>127</sup>

MIGON - *Paris*, c.1678. He made a refracting telescope with an inclinable axis and two circles. <sup>128</sup>

MILLER John - Scots mathematical, philosophical

<sup>121</sup>Handlist.

<sup>122</sup>See other Refs. in Bennett. Also CHrSep89, lot 142 illustr. We note that the 8in object glass in the Liverpool Museum may possibly be by MERZ. See Howse 76.

<sup>123</sup>The 10in was in use at the Boyden Observatory in *Bloemfontein* in the 1960's and 1970's. We find also mention of a 12in doublet which used slightly curved photographic plates. See King 422. An incomplete 13in triplet was later finished by LUNDIN and utilized in the discovery of the planet, Pluto, at Lowell Observatory. METCALF, himself, discovered six comets and forty one asteroids.

<sup>124</sup>Bell 4.

<sup>125</sup>Howse 46, 47.

<sup>126</sup>Handlist.

<sup>127</sup>See Dict. Nat. Biogr. William HERSCHEL bought some mirror-making tools belonging to MICHELL and a speculum when MICHELL died.

<sup>128</sup>Howse 14.

and optical instrument maker, uncle of Alexander ADIE, fl.1774-1803, dc.1825. MILLER is recorded at several addresses in *Edinburgh, Nicholson St*, and *George IV Bridge*, and at *Back of the Fountain Well* (1774), *Parliament Close* (1775-94), *38 South Bridge St* (1795-1801) and *86 South Bridge St* (1803-04). He was succeeded by MILLER and ADIE. <sup>129</sup>

MILLER John (Snr) - English optical instrument maker, d.c.1802. <sup>130</sup>

MILLER John (Jnr) - English optical instrument maker, 1746-1815. He worked with George ADAMS.

MILNE James - master brass founder, in the time of the ADIE's. <sup>131</sup>

MOGEY W and D - retailers, *New Jersey, US*, c.1896. <sup>132</sup>

MOLYNEUX William - natural philosopher and mathematician, interested in theoretical optics, 1656-98, a contemporary of HUYGENS. Between 1677-89 and 1690-98 he resided partly at *Castle Dillon, Co.Armagh*. His son, Samuel, became a distinguished figure, also an astronomer. William MOLYNEUX designed a sundial-mounted telescope <sup>133</sup> and wrote "*Dioptrica Nova*" (1692). <sup>134</sup>

MOLYNEUX Samuel - secretary to the Prince of Wales, politician and distinguished astronomer, 1689-1728. <sup>135</sup> He owned a 24ft zenith sector. <sup>136</sup> As a wealthy gentleman astronomer with a private observatory in 1725-27 at *Kew House, Richmond*, he made a 26in focus Newtonian telescope. <sup>137</sup>

MOLYNEUX Robert and Sons - chronometer makers, fl.1815-38. <sup>138</sup>

<sup>129</sup>SIMON.

<sup>130</sup>See BG 67, and for the ADIE connection, BG 25.

<sup>131</sup>BG 50.

<sup>132</sup>Handlist.

<sup>133</sup>"*Sciothericum Telescopicum*", Dublin 1686.

<sup>134</sup>See "*Some People and Places in Irish Science and Technology*", ed.Mollan et al., Roy. Irish Acad. 1985, and King 56, 96.

<sup>135</sup>King 110, Tayl 10, ShC. Also Bell 27, on mirrors.

<sup>136</sup>King 111.

<sup>137</sup>MOLYNEUX wrote "*The Method of Grinding and Polishing Glasses for Telescopes and on the Casting of Metals for Reflecting Instruments*" in Robert SMITH's book, "*A Compleat System of Opticks*" (2 vols). Cambridge, vol.2, p.281 (1738).

<sup>138</sup>The connection with Samuel and William is not clear. See Tayl. There is also recorded a certain, T. MOLINEUX,



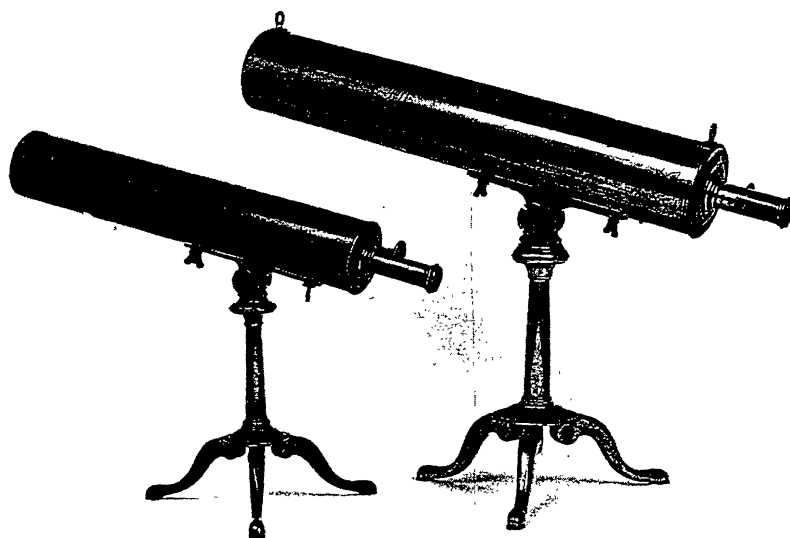
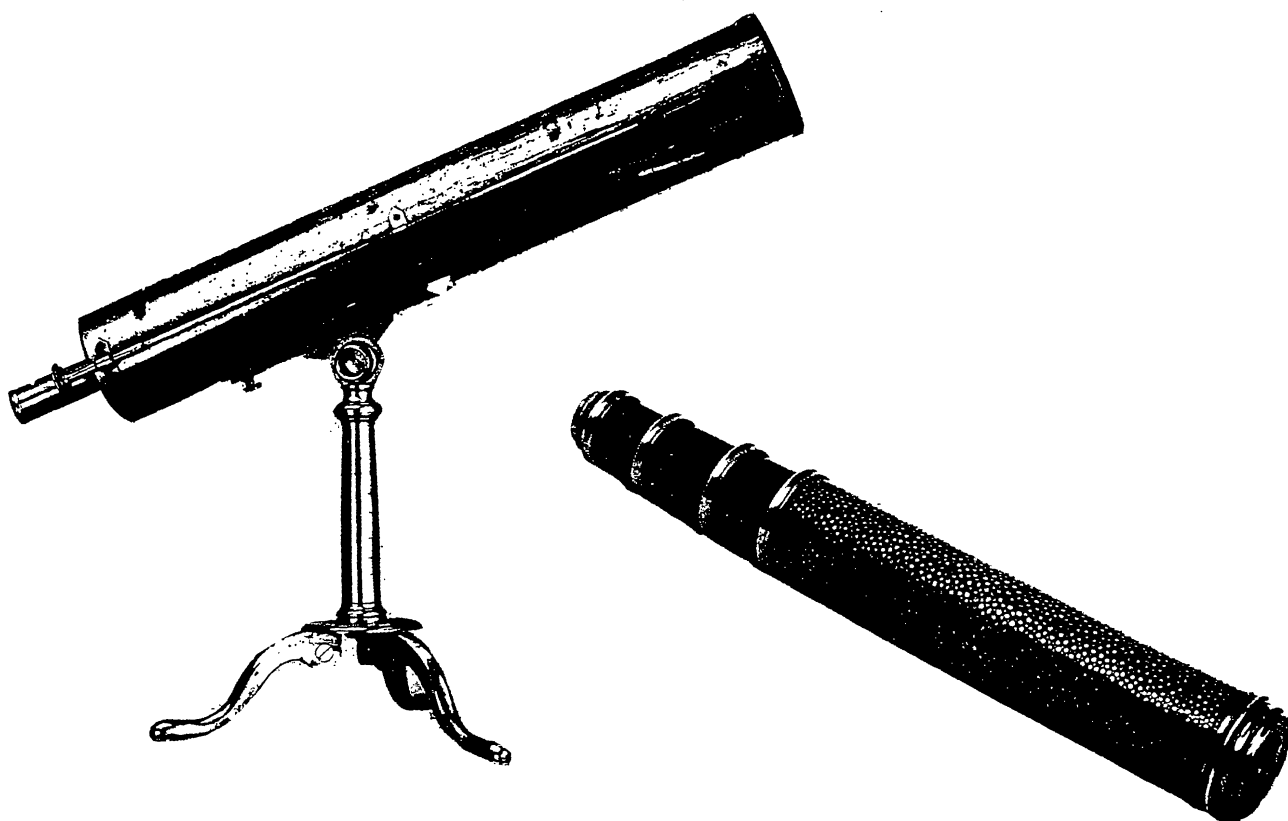


Figure 172: (a) NAIRNE 3.5-inch brass reflecting telescope (serial number inscribed 2/149=481). See Christie's March 1991.

(b) NAIRNE 4.25-inch lacquered brass reflecting telescope. Note the fore and aft sights (Christie's March 1991).

(c) NAIRNE and BLUNT 4-inch lacquered brass reflecting telescope (body-tube 25.5in long; serial number 3/166=729). This fine instrument is contained in a mahogany carrying case (30.8in wide) with a brass swan-neck handle (Christie's March 1991, lot 62).

(d) NAIRNE refracting telescope in shagreen, vellum and lacquered brass (Christie's June 1989).



MONTI Francois and Son - *Turin*, 19C. <sup>139</sup>

MORGAN John - mathematical instrument maker, fl.1749, dc.1758, at *Finch Lane, Cornhill, London* (1755), *Fleet St* (1758). <sup>140</sup>

MORIN Jean Baptiste - 1583-1656. He suggested replacing visual sights with telescopic sights in early instruments. It is most likely that imaging was so poor in early telescopes that sights may have been adequate. HOOKE and FLAMSTEED also suggested improvements to Tycho BRAHE's sights. <sup>141</sup>

MORTON Thomas - Scots optical instrument maker and amateur astronomer, *Kilmarnock*. He owned a private observatory. <sup>142</sup>

MOSS and WINDRED - fl.1838. A quadrant constructed by them is recorded. <sup>143</sup>

MUDGE John - English medical physician and amateur scientist, 1721-93. <sup>144</sup> His hobby was mirror making, and he invented zonal tests of specula and utilised a tin /copper formula for specula. <sup>145</sup>

MUDGE Thomas - English chronometer maker, 1717-94. He was apprenticed to George GRAHAM. <sup>146</sup>

MÜLLER Johannes - d.1476, known as REGIOMONTANUS. <sup>147</sup> He had a portable equatorial or "*torquetum*" in 1544 without optics. <sup>148</sup>

MUR Christian - *Freysing*, c.1719. A telescope attributed to him is in the Deutsches Museum. <sup>149</sup> See STERR.

MURRAY and HEATH - manufacturer and retailer

mathematics teacher, *Macclesfield*, fl.1820-38. This name is included to avoid possible confusion with MOLYNEUX.

<sup>139</sup>See ChrSep86.

<sup>140</sup>SIMON.

<sup>141</sup>See A.Turner 137 regarding telescope sights, and also Chapman in *Vistas* vols.20 and 23, and King 94. See under GASCOIGNE.

<sup>142</sup>See illustration, also BG 190, and [ChrSep91], lot 98.

<sup>143</sup>Tayl.

<sup>144</sup>See SHORT.

<sup>145</sup>See article by Edward FRANCIS, "Amateur Work" 1886, p.376. William MUDGE, surveying engineer, 1762-1820, was the son of John, and nephew of Thomas MUDGE. See Dict. Nat. Biogr. and King 88.

<sup>146</sup>Dict. Nat. Biogr.

<sup>147</sup>King 14.

<sup>148</sup>Tycho BRAHE's "*equatoria*" were also without optics.

<sup>149</sup>Daumas 333.

of optical instruments and photographic apparatus, 43 *Piccadilly, London*, also 69 *Jermyn St, London* (four doors from *St James' St*), fl.1862-67. <sup>150</sup>

MUSSCHENBROEK - an important family of instrument makers in the Netherlands, c.1660-1748, *Leyden*. <sup>151</sup> They produced mostly philosophical instruments, pumps, demonstration pieces.

## N

NACHET Camille Sébastien - 1799-1881, French microscope and optical instrument maker, founded in 1839. The firm moved to 17 *rue Saint Séverin, Paris* in 1863 as NACHET and son.

NAIRNE Edward - notable English optical, mathematical and philosophical instrument maker, bound to LOFT (1741), and working at *Lindsay Row, Chelsea, London*, and *Golden Spectacles, Reflecting Telescope and Hadley's Quadrant in Cornhill, Golden Spectacles* (1752), *Corner of Bartholomew Lane, Threadneedle St* (1752), 20 *Cornhill, opp. Royal Exchange* (1772), b.1726, d.1806. NAIRNE was later in partnership with BLUNT (1774) at 20 and 20/22 *Cornhill*. NAIRNE made many different types of instruments, including fine telescopes. <sup>152</sup> He supplied Benjamin FRANKLIN with instruments. <sup>153</sup> It is recorded that he discussed designs with LUDLAM. <sup>154</sup>

NAIRNE and BLUNT - eminent English firm of instrument makers, *London*, in partnership 1774-93. See under NAIRNE. <sup>155</sup>

NANDOR Süss - Hungarian surveying instrument maker, late 19C. <sup>156</sup>

<sup>150</sup>See Handlist.

<sup>151</sup>We find Samuel Joosten (1639-81) and his brother, Johan Joosten (1660-1707) who succeeded him, and also Jan van MUSSCHENBROEK (1687-1748), son of Johan. See Daumas 115.

<sup>152</sup>Turner. The code for NAIRNE's inscriptions = radius of curvature, model serial number, and serial number amongst all instruments by him.

<sup>153</sup>Tayl 33, 62.

<sup>154</sup>See Pearson 518, and 18C [ChrMar91] illustr(x2).

<sup>155</sup>Thomas BLUNT took over the business, although we note another possible association with HILL. A catalogue is believed to exist from 1829 of William HARRIS (recording "late NAIRNE and BLUNT, *London*." See Bennett. Biographer: G.L'E Turner. Also, Handlist and early 19C examples in ChrMar91, [ChrApr88], and Daumas 317.

<sup>156</sup>See [ChrSep89], lot 198.

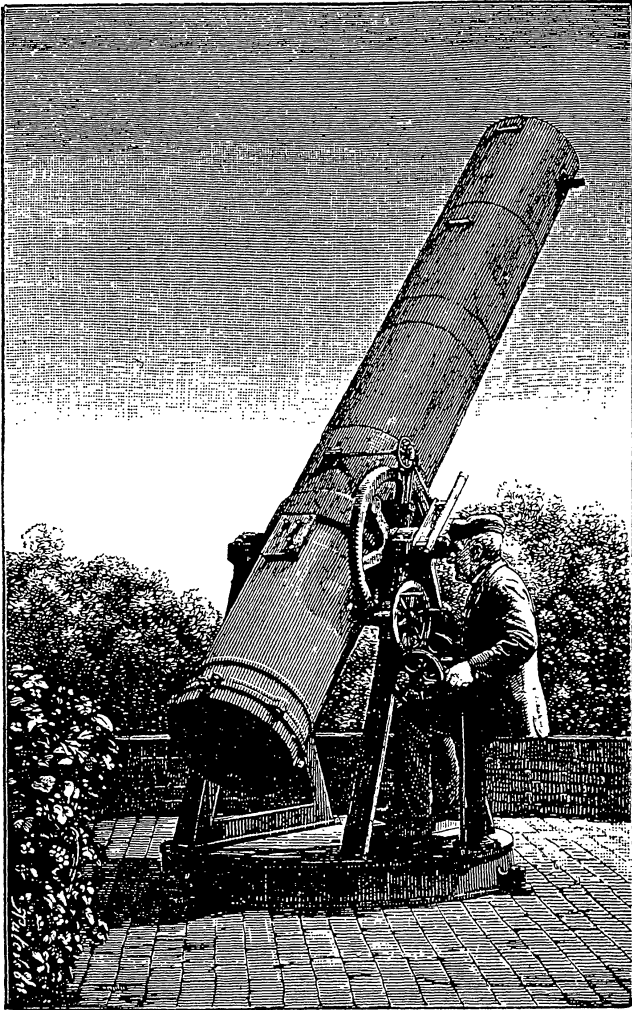
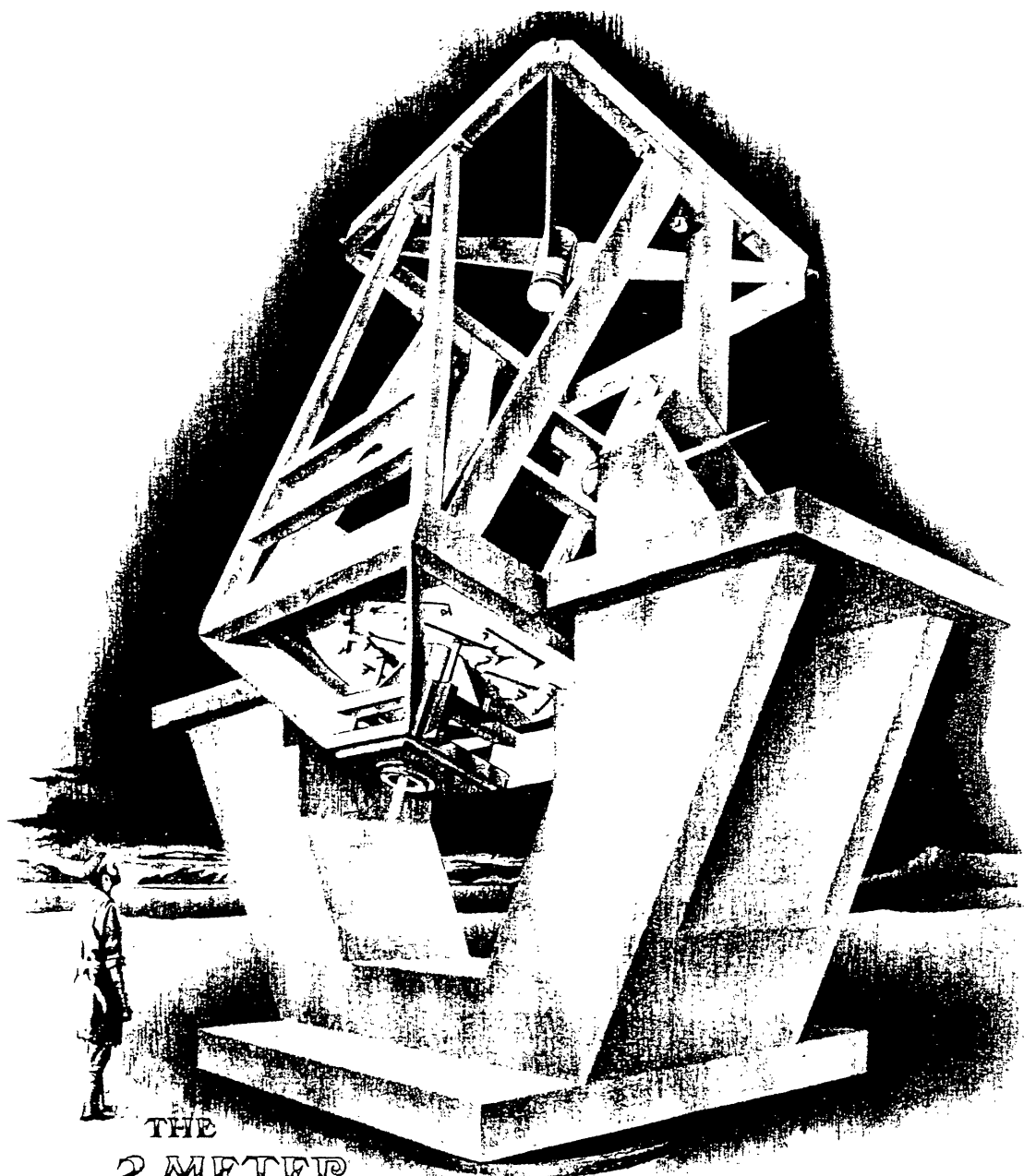


Figure 173: (a) James NASMYTH (1808-1890).

(b) Illustration depicting NASMYTH at his 20-inch *fixed focus* alt-azimuth reflecting telescope. By the use of additional mirrors it is possible to direct the light pathway through either the polar or declination axes, i.e. the *trunnions* of the equatorial mount. Another modification, the COUDÉ optical system, allows light to be directed into a laboratory beneath the telescope housing. The US astronomer, PORTER, devised an interesting version, the *Springfield Mounting* for small instruments





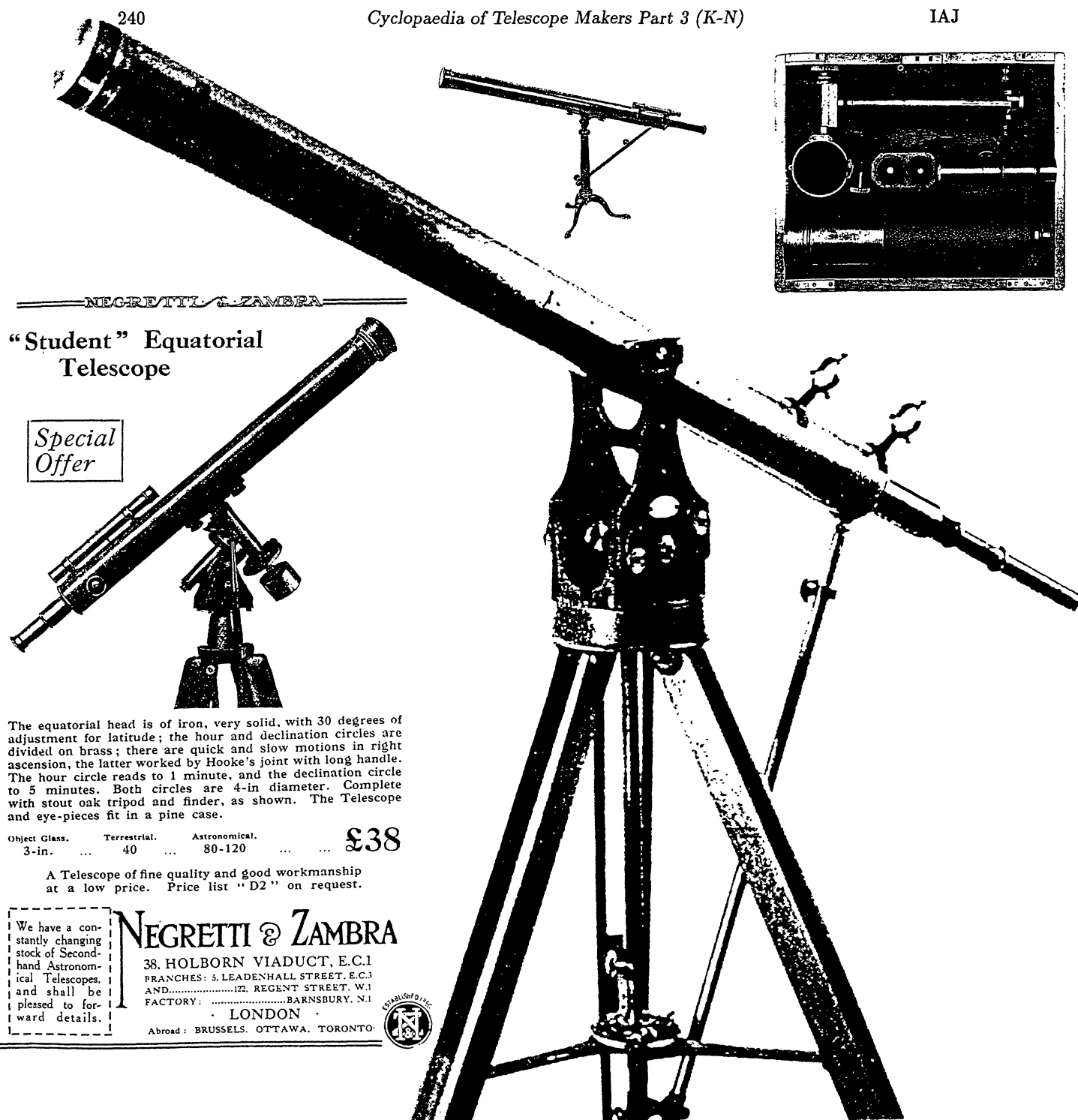
THE  
2 METER  
ADVANCED  
TECHNOLOGY  
TELESCOPE

R.N. SHOWALTER  
'79'

Figure 174: NASMYTH's focus as depicted in a present-day design (Courtesy R.N.Showalter).

Illustration of large telescope with NASMYTH focus. The light path to the observer (or fixed auxiliary instrument) is through the declination axis, a principle which functions equally well with an equatorial or alt-azimuth mounting. It is possible that LEREBOURS (early 19C) experimented with this idea of fixing the position of the observer's eye.





The equatorial head is of iron, very solid, with 30 degrees of adjustment for latitude; the hour and declination circles are divided on brass; there are quick and slow motions in right ascension, the latter worked by Hooke's joint with long handle. The hour circle reads to 1 minute, and the declination circle to 5 minutes. Both circles are 4-in diameter. Complete with stout oak tripod and finder, as shown. The Telescope and eye-pieces fit in a pine case.

Object Glass.	Terrestrial.	Astronomical.	
3-in. ...	40 ...	80-120 ...	£38

A Telescope of fine quality and good workmanship at a low price. Price list "D2" on request.

We have a constantly changing stock of Second-hand Astronomical Telescopes, and shall be pleased to forward details.

## NEGRETTI & ZAMBRA

38, HOLBORN VIADUCT, E.C.1  
BRANCHES: 5, LEADENHALL STREET, E.C.3  
AND.....122, REGENT STREET, W.1  
FACTORY: .....BARNBURY, N.1  
LONDON

Abroad: BRUSSELS. OTTAWA. TORONTO.



Figure 175: (a) NEGRETTI and ZAMBRA 3.75-inch astronomical telescope on alt-azimuth mount (iron), with tangent screw for movement in azimuth, body tube 50in long, with two draw-tubes and extension, late-19C (Christie's September 1989, sold at £2640). This is probably that advertised as with an *improved and equipoise stand*. Such an instrument was recently seen by the author from *County Antrim, N.Ireland*.

(b) Advertisement of 3-inch *Student Equatorial* by NEGRETTI and ZAMBRA.

(c) 3.5-inch (focus 60in) refractor by NEGRETTI and ZAMBRA, body tube 49in long, on pillar and tripod with steadying bar. A terrestrial eyepiece (magnification 60 times), and two celestial eyepieces (90 and 160 times), and solar filters, in fitted mahogany case (Christie's March 1991 lot 57, valued at £1500-2000).

(d) NEGRETTI and ZAMBRA oxidised brass *Travellers* 3.4-inch telescope in mahogany case (16in wide), with alt-azimuth mount, pillar and tripod, and leather covered tapering body tube (64.25in long fully extended). See Christie's March 1991, lot 53.

NASMYTH James - English engineer, 1808-90, telescope maker and amateur astronomer, *Patricroft, Nr. Manchester*, retiring to *Penshurst, Kent*.<sup>157</sup> Although he invented the famous steam hammer, he is remembered in astronomical circles for the telescope design with the NASMYTH focus in which the light path is through the trunnions of the telescope mount as in his own 20in telescope. This large instrument followed the success of his construction of a 6in mirror in 1827. Using a steam-driven machine, NASMYTH was able to reproduce LASSELL's method of mirror making, i.e. using short, curved strokes.<sup>158</sup>

NEGRETTE and ZAMBRA - see under NEGRETTE.

NEGRETTE Enrico Angelo Ludvico (Henry) - optical, mathematical, philosophical, photographic instrument makers and retailers, *London*, 1819-79, associated with TAGLIABUE, PIZZI and Joseph Warren ZAMBRA (partner, d.1897). NEGRETTE and ZAMBRA owned many premises simultaneously from 1850 and continued business well into the 20C. We record NEGRETTE AND ZAMBRA, *11 Hatton Garden* (1850-59), *1 Hatton Garden* (1859) and *107 Holborn Hill* (1859-60), and *59 Cornhill, London* (1857-59 and 1865-70), *122 Regent St, W London* (1865-1901), *Holborn Circus, Holborn Viaduct* (1870-90), and *153 Fleet St, EC* (1865-70), and *2 Charterhouse St, EC* (1870-1901), *45 Cornhill EC* (1875-1901).<sup>159</sup>

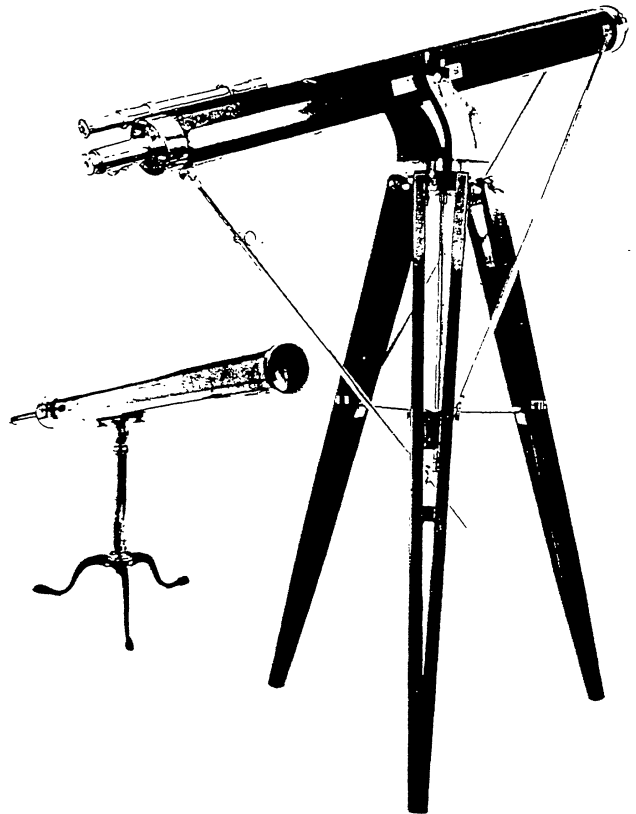
NEILE Paul (Sir) - *Wadham College, Oxford* (c.1650). He participated in Wadham's observatory which possessed, successively, REEVE 12ft to 35ft aerial telescopes erected under the guidance of NEILE.<sup>160</sup> The 35ft REEVE telescope was similar to that at Gresham College erected by WREN in 1653, and other larger ones erected by HOOKE.

NEWALL Robert Stirling - English inventor, manufacturer of wire ropes and gentleman astronomer, *Ferndene, Gateshead-on-Tyne, Newcastle*. His son, Hugh Frank NEWALL (1857-1944) became a well-known astronomer.<sup>161</sup> The family owned a 12in

COOKE refractor, and a 25in COOKE refractor (1865/1871), the last that COOKE manufactured.<sup>162</sup>

NEWMAN J - manufacturer and retailer of philosophical instruments, *8 Lisle Street, London*, fl.1822-45.<sup>163</sup>

NEWTON W.E and F - English instrument maker, *3 Fleet St, London* (1854). They formed the firm of NEWTON and Co. at *Temple Bar, Fleet St*, with testing rooms at *471 Hornsey Rd, London*.<sup>164</sup>



refractor. See Chambers 720 and Obituary in MNRAS vol.105, 95, 1945.

<sup>162</sup>The 25in COOKE telescope, which NEWALL hardly used, is now in Athens.

<sup>163</sup>In 1827 NEWMAN advertised optical instruments also at *122 Regent Street, London*. See Handlist.

<sup>164</sup>See AZ 45 J1, and [CHrSep89], lot 148, and CHrJun92, lot 244. We record also NEWTON and Co, *London*, fl.c.1854-1910. See Handlist. We find NEWTON W, and also NEWTON, Son and BERRY, *Chancery Lane, London* c.1836, who made celestial globes. See Vistas vol.33, 169 and JMcF. These famous globes were based on PIAZZI's Catalogue and BODE's Catalogue of nebulae, double stars and proper motion stars (from SOUTH's work).

Figure 175: (e) NEWTON and Co. 3-inch lacquered brass refractor, with rack and pinion focussing, on tapering pillar, folding tripod with cabriole legs and pad feet (Christie's September 1989 lot 148, sold at £605). A similar 3-inch telescope (body 41in long) was available on a tripod stand with single steadying rod and carrying case and accessories (Christie's April 1992 lot 58, sold at £1650). (f) A fine 5.5-inch NEWTON and Co. refractor is depicted with octagonal wooden body (80in long) and three steadying rods (Courtesy of Christie's).

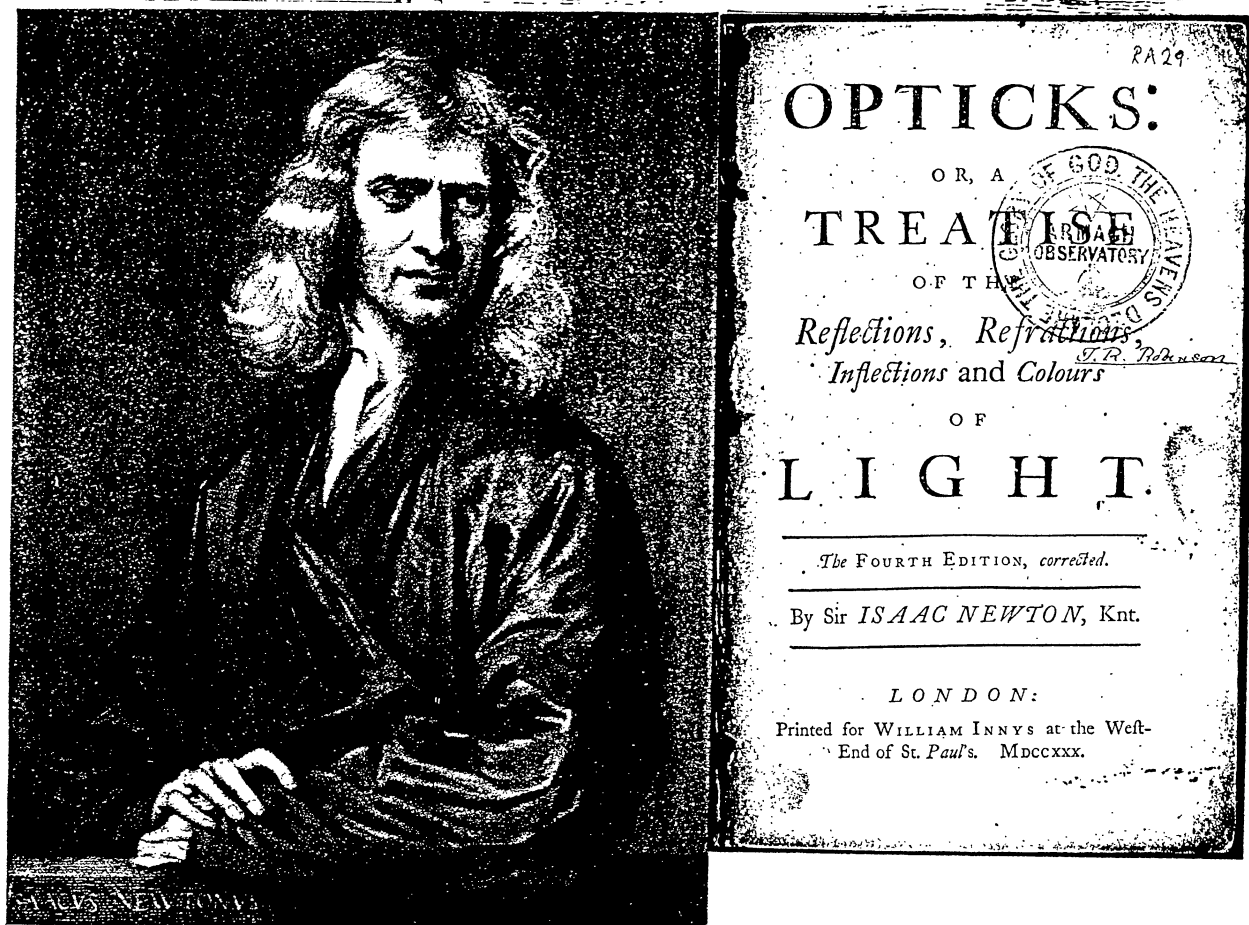


Figure 176: (a) Isaac NEWTON's childhood house at *Woolsthorpe, Lincolnshire*. Sundials he made are seen on the wall.

(b) Portrait of Isaac NEWTON.

(c) Frontispiece of NEWTON's "*Opticks*" (4th Edition, 1730) from Armagh Observatory archives, signed T.R. Robinson.

(d) Shown opposite is NEWTON's sketch of his reflecting telescope. The diagonal secondary is a prism, the eyepiece a simple plano-convex lens.

**NEWTON Isaac (Sir)** - eminent English natural philosopher and mathematician, 1642-1727. Lucasian Professor of Mathematics at the University of Cambridge and President of the Royal Society, the discoverer of the inverse square law of gravitation, laws of mechanics and numerous mathematical and physical formulations, theories of light, the demonstration of the component colours in white light, and author of the monumental "*Principia*" and "*Opticks*"<sup>165</sup> NEWTON was also familiar with the practical matter of the defects in optical mirrors. The "Newtonian" telescope finally devised by him consisted of a primary concave mirror<sup>166</sup> with a right-angled prism which deflected the converging light through 45 degrees (*Fig.176d*) to a focus near the inner edge of the telescope tube.<sup>167</sup>

**NIGGL** - *Munchen*, 19C.<sup>168</sup>

**NIXON John** - surveyor, fl.1825-35. He possessed a widely-used DOLLOND repeating circle.<sup>169</sup>

**NOBERT F.A** - scientist and engineer, *Barth, Pommerania, on the Baltic coast*, 1806-81. He built a fine-ruling machine (0.12 microns), a circle dividing machine, and also resolution test-plates for microscopes and diffraction gratings, used by **ANGSTROM** to measure solar absorption lines.<sup>170</sup>

**NOËL Nicolas (dom)** - Benedictin monk, 1712-81, from the workshop of *l'abbaye de St Germain-des-Prés*. An ardent mirror maker, he was custodian of Louis XV's instruments (reign 1715-74). He made a 22in diameter, 24ft focus "Gregorian"<sup>171</sup> reflecting telescope 1772. The speculum was repolished by **CAROCHEZ** in 1787.<sup>172</sup> It was installed in *Paris* at *l'hotel de la Muette*.<sup>173</sup> NOËL's position was later held by **Abbé ROCHON**.

<sup>165</sup> "*Philosophiae Naturalis Principia Mathematica*" (1687), and "*Opticks*" (1704).

<sup>166</sup> NEWTON's first reflecting telescopes had spherical mirrors, and only later were the much more difficult parabolically-figured mirrors employed. NEWTON experimented with light initially to remove colour defects in lenses. As a student (during the Great Plague), he spent much enforced time at home producing some of his greatest mathematical results.

<sup>167</sup> An oblique secondary mirror instead of the prism is generally used today. See popular accounts of NEWTON in ST vol.59, p.207, JBAA vol.61, p.109.

<sup>168</sup> CHrJun89.

<sup>169</sup> Tayl.

<sup>170</sup> Turner Mic 16.

<sup>171</sup> Daumas says Cassegrain. See Daumas *Fig.90*.

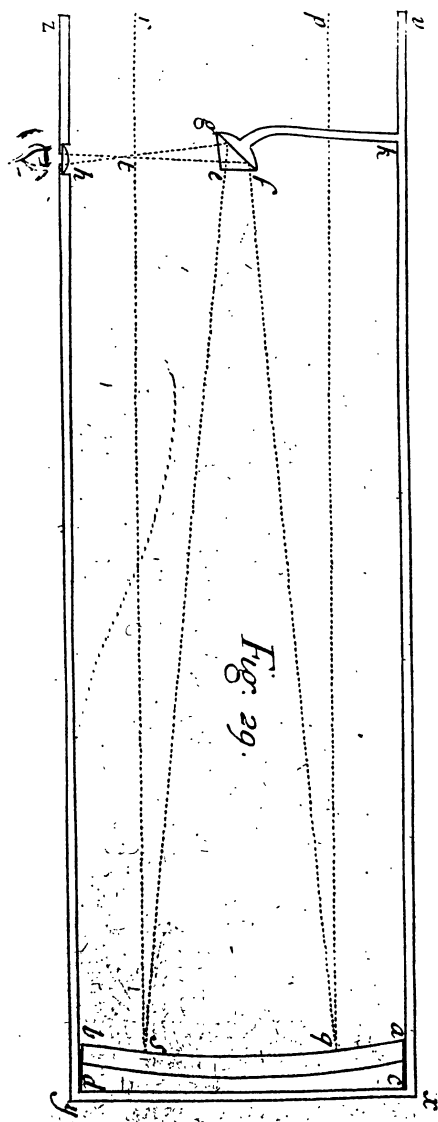
<sup>172</sup> Howse 14, King 91.

<sup>173</sup> NOËL's telescope was apparently never seen by any French astronomer, but SHUCKBURGH believed it magnified x200, half that said by NOËL.

**NOLLET** - contemporary with the eminent French instrument maker **LENOIR**.

**NUNN** - U.S. optician, mid-20C, associated with **BAKER** in designing wide-field astronomical cameras used in the Harvard Observatory stations worldwide, e.g. at the Boyden Observatory several cameras with lens systems were operated, designed by **BAKER-NUNN** for several wavelengths.<sup>174</sup>

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<sup>174</sup> See **GROSSIE** in *Cyclopaedia Part 2*. The Harvard three-colour survey and patrol programme at Boyden Observatory in the 1970s utilised **BAKER-NUNN** lens optics, not Schmidt optics as previously stated.



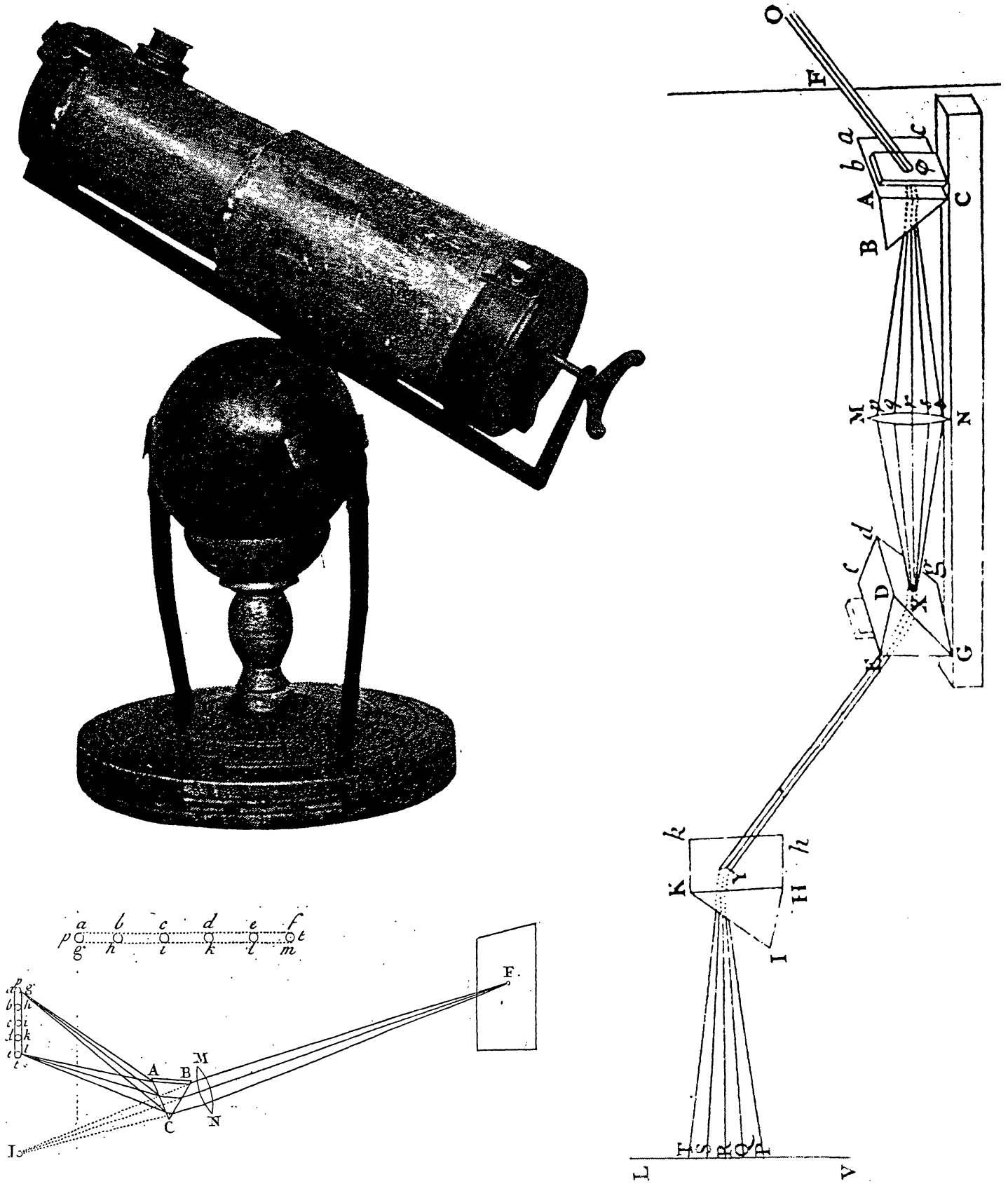


Figure 177: (a) A model of NEWTON's reflecting telescope on a universal ball mount.  
 (b) and (c) NEWTON's illustrations of the dispersion of light by means of prisms from "*Opticks*".

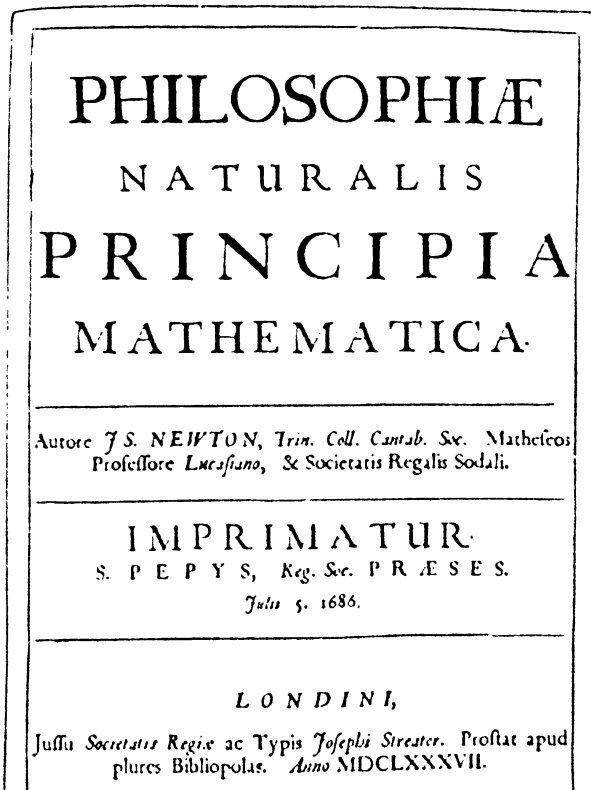
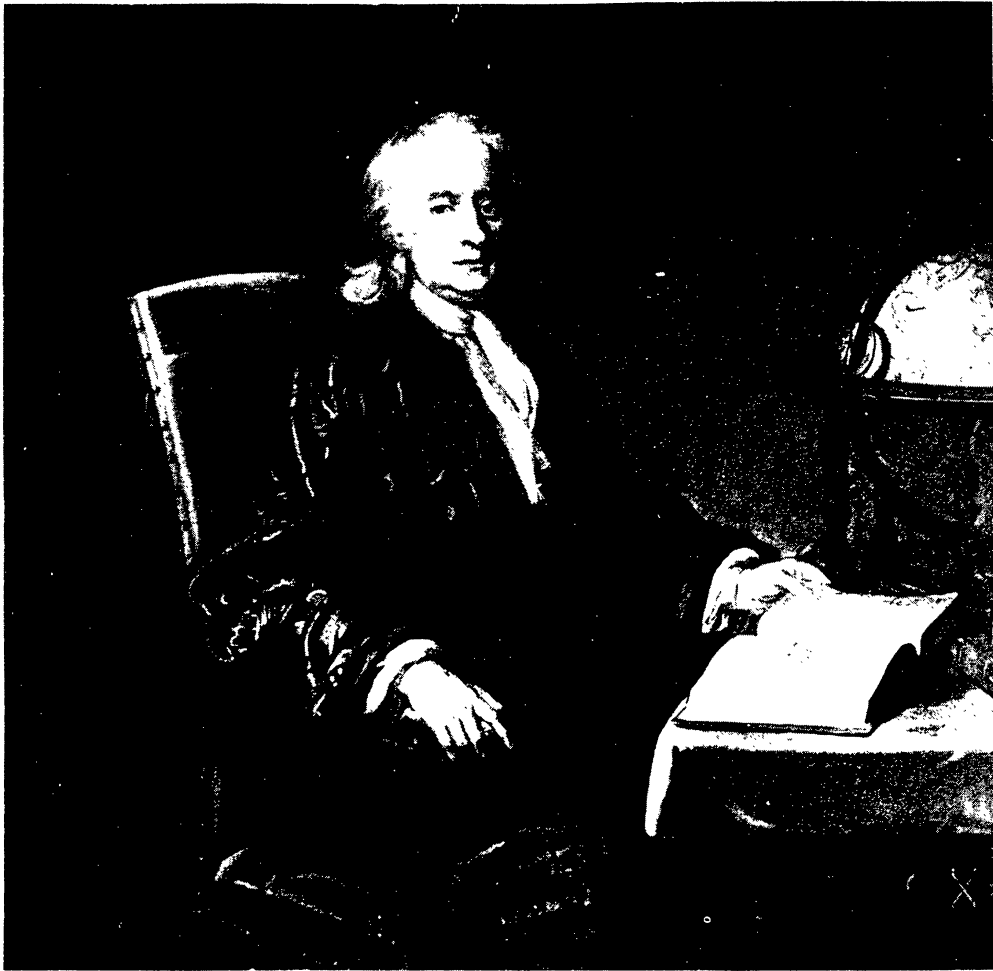


Figure 178: (a) Last known portrait of Isaac NEWTON by Enoch Seaman (Courtesy Prof.A.R.Hall and National I Gallery, London).

(b) Frontespiece of NEWTON's "*Principia*" 1687.







Figure 179: l'Académie Royale des Sciences, Paris, in 1698, illustrating the dominant scientific activities, astronomy, physics and mathematics. The period depicted is that following the great *aerial telescope*, the 5-inch (34ft long) instrument used by J.D. CASSINI in his discovery of the gap or *division* in Saturn's ring system (1675).





Figure 180: A French telescope with Newtonian focus from the period of Louis XV.

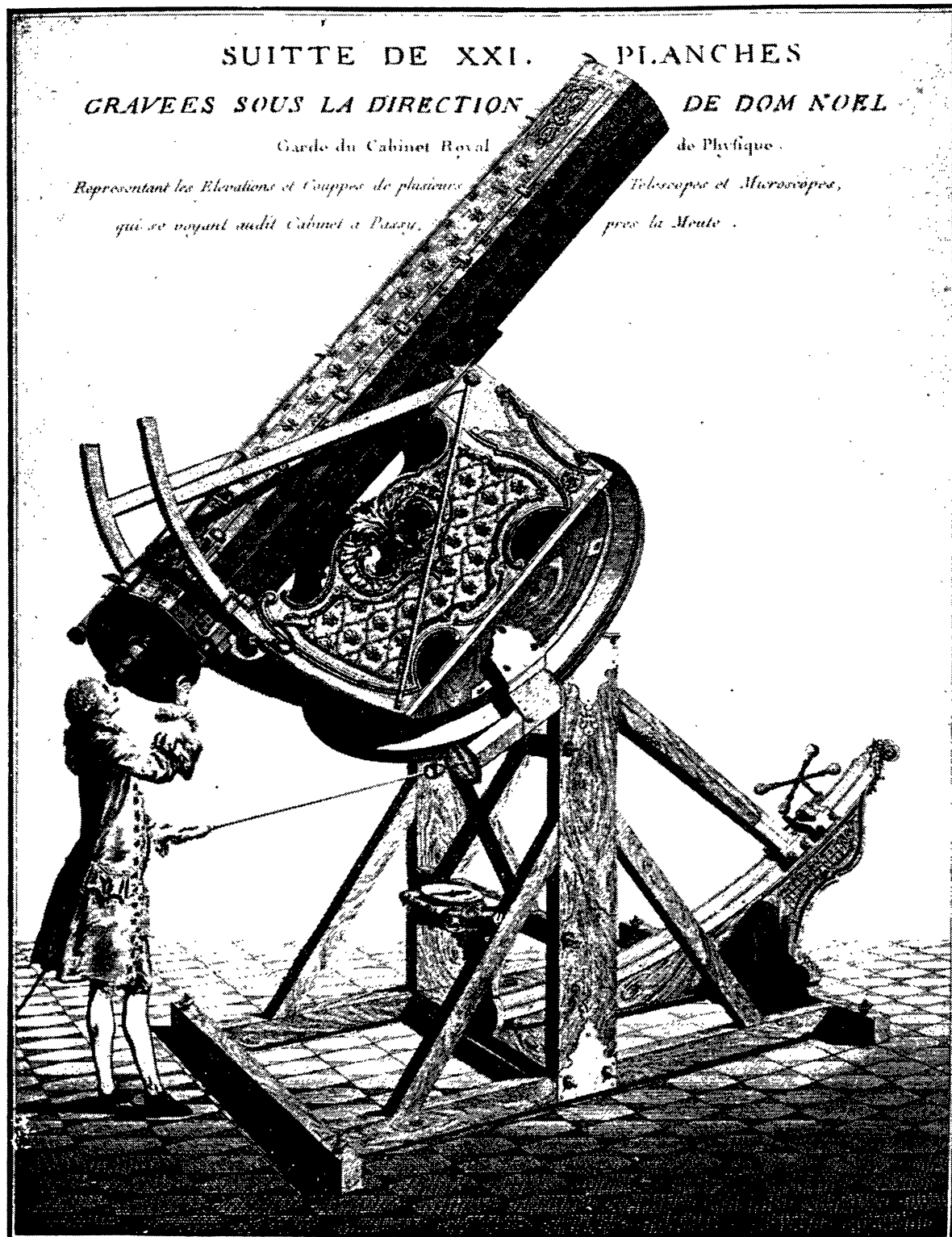


Figure 181: An engraving of an 18C French reflecting telescope which according to Dom NOËL could be seen at *Passy* (probably a 22-inch Gregorian). See main Text. Compare *Fig.39, Cyclopaedia Part 1*.

# The Irish Scientist

Number 1, January 1994

£2.00 (including VAT)



ISSN 0791-878X



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