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EARLY MODERN INSTRUMENTS PATENTS DATABASE, 1500- 1800

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ENGLAND (1561-1800):¹

Adams, Dudley, #2407, 30th May 1800, "Making telescopes portable," p.1.²

Adams, George [and Jack, Richard], #656, 25th May 1750, "Quadrant for taking the altitude of the sun or moon by refraction; also a refracting telescope with four spherical lenses," p.2.³

Andrew, John, #1053, 31 August 1773, "Balance (static and hydrostatic) for weighing without weight or scale, and finding the value of gold," p.8.

Arnold, John, #1113, 30th December, 1775, "Pendulum spring for time-keepers; and compensating the effects of heat and cold on the same," p.11.

Arnold, John, #1328, 2nd May 1782, "Escapement and balance, to compensate the effects of heat and cold in pocket-chronometers or watches, also for incurvating the two ends of the helical spring, to render the expansion and contraction of the spring concentric with the center of the balance," p.11.

Barker, Robert, #1612, 19th June, 1787, "Apparatus called 'La nature a coup d'oeil,' for displaying views of nature, at large, by oil painting, fresco, water colours, crayons, or other mode of painting or drawing," p.25.

Barston, John, #566, 21st December 1738, "Universal astronomical quadrant for taking altitudes," p.28.

Beck, George, #1274, 16th December 1780, "Apparatus for planning and surveying by land or sea," p.34.

Blair, Robert, #1473, 26th April 1785, "Refracting telescope and other optical instruments," p.51.

Blair, Robert, #1800, 4th April 1791, "Reflecting telescopes, and other dioptrical instruments," p.51.

Booth [a.k.a. Barlow], Edward, #344, 23rd September 1695, "Watch or clock, with the balance-wheel flat or hollow, to work within and cross the centre of the verge, with teeth like tenterhooks to move the balance or pendulum, the pallets of the verge to be circular, concave and convex. p.56 (Shared with Houghton, William and Tompion, Thomas).

Bosley, Joseph, # 698, 1st March 1755, "New movement in watches; also a slide for regulating watches," p.58.

Brewer, Richard, #817, 14th November 1764, "Quadrant of altitude, applicable chiefly to the uses of navigation," p.65.

Bucknal, William, #528, 30th April 1731, "Mathematical machine in two parts, for the improvement of astronomy and navigation, by applying its uses to various new problems," p.79.

Cole, Richard, #1936, 15th March 1793, "Constructing certain parts and movements of watches, clocks, and timepieces," p.117.

Cook, Edward, #2087, 9th February 1796, "Instruments for taking observations and altitudes by sea and land, without dependence on the visible or sensible horizon," p.123.

[De] Magalhean, John Hyacinth, #825, 28th March 1765, "Instrument for showing the effect of the weight of the atmosphere, with the variation caused by heat and cold; also the quantity of that variation," p.152 (Shared with Pyefinch, Henry).⁴

Debaufre, Peter, #371, 1st March 1704 [with Facio, Nicholas], "Working stones, crystal or glass, and other matters different from metal, for use in clock or watch-work and in other engines," p.155.

Dicas, John, #1259, 27th June 1780, "Constructing hydrometers with sliding rules, to ascertain the strength of spirituous liquours, malt worts and wash for fermentation," p.160.

Dixon, Hugh, #1515, 14th December 1785, "Construction of telescopes, microscopes. spectacles, and other optical instruments," p.162.

Dollond, John, #721, 19th April 1758, "Making object-glasses of refracting-telescopes, by compounding mediums of different refractive qualities," p.166. ⁵

Dollond, John, #752, 2nd October 1760, "Quadrant for taking observations at sea," p.166.

Dollond, Peter, #1017, 22nd May 1772, "Adjusting and improving the glasses of Hadley's quadrant and sextant, placing darkening glasses before of behind the horizon-glasses, in order that images seen by direct vision may occasionally be darkened," p.166.

Downes, John, #872, 13th March 1767, "Deepening-tool for deepening clock and watch wheels," p.170.

Eckhardt, Anthony George, 1771, "Rolling Parallel Ruler".⁶

Edwards, John, #2230, 18th April 1798, "Instruments for ascertaining the geographical position of vessels at sea," p.176.

Elton, John, #501, 27th July 1728, "Instrument for taking the sun's altitude at sea and on land," p.179.

Eva, Richard, #2087, 9th February 1796, "Instruments for taking observations and altitude by sea and on land, without dependence on the visible or sensible horizon," p.182.

Facio [Fatio de Duillier], Nicholas, #371, 1st May 1704, "Working stones, crystal, or glass and other matters different from metal, for use in clock or watch-work, and in other engines," p.184.⁷

Fenn, Isaac, #833, 15th July 1765, "Portable perambulator or measuring-wheel for surveying," p.188.⁸

Fischer, John, #1377, 17th June 1783, "Geometrical and pedometerical watch," p.190.

Foxon, William, #1028, 5th December 1772, "Machine for measuring a ship's way," p.200.

Freeman, James, #946, 13th December 1769, "Central second stop-watch, vertical or horizontal, without the assistance of a compound motion," p.202.

Garrard, William, #1286, 21st March 1781, "Altimeter, or reflecting-sector with its appendages, for measuring angles by land or sea," p.209.

Gower, Richard Hall, #1895, 5th July 1792, "Perpetual log, or instrument for measuring a ship's way through the water, and for ascertaining the rate of sailing at any time," p.223.

Gregory, Henry, #752, 2nd October 1760, "Quadrant for taking observations at sea," p. 230.⁹

Guerimand, James, #1133, 9th September 1776, "Machine for measuring a ship's way with more accuracy than the log-line. "Marine Perambulator," p.233.

Haas, Jacob Bernard, #1385, 22nd August 1783, "Air-pump," p.236.

Hadley, John, #550, 22nd November 1734, "Quadrant for taking at sea the altitude of the sun, moon, or stars, and also any other angles; level to be fixed to a quadrant, for taking meridional altitudes at sea," p.238.

Haley, Charles, #2132, 17th August 1796, "Marine time-keeper for ascertaining the longitude at sea," p.240.

Harris, John, #432, 7th July 1721, "Making and printing globular charts or sea-charts, for use in navigation," p.252 (with John Senex).

Harris, Thomas, #965, 21st July 1770, "Watches," p.252.

Haywood, John, #836, 7th January 1766, "Ring, called a 'Lunar or Calendar Ring.,'" p.260.

Haywood, John, #1107, 17th November 1775, "Making artificial globes or spheres without being covered with printing or drawing, on paper, parchment, or such like material, to improve astronomy, geography, and navigation," p. 260.

Heriot, James, #1322, 20th March 1782, "Mariner's compass, with compass-boxes, pendent or standing, and ventilator to contain either lamp or candle," p.268.

Hewlings, Edward, #2077, 9th December 1795, "Machinery for measuring distances, taking altitudes and descents, dimensions of lands, buildings, and other bodies or articles, at one view; -- applicable to other purposes," p.269.

Hill, Abraham, #143, 3rd March 1664, "[...] Pendulum for measuring time and finding out the longitude at sea," p.273.¹⁰

Irwin, Christopher, #731, 2nd September 1758, "Marine observatory and telescope, and almanack for ascertaining longitude at sea," p.297.

Jefferys, Thomas, #1107, 17th November 1775, "Making artificial globes or spheres without being covered with printing and drawing on paper, parchment, or any such like material," p.302.

Jenkins, Henry, #745, 31st January 1760, "Machine or regulator for discovery of the longitude at sea," p.303.

Kehlhoff, Friederieck, #819, 29th November 1764, "Making watches," p.317.

Knight, Gowin, #850, 10th June 1766, "Constructing compasses in general," p.322.

Leguin, Estienne, #1753, 1st June 1790, "Instruments for calculating longitude," p.335.

Leslie, Robert, #1970, 13th December 1793, "Clocks, watches, and other timekeepers used at sea or on land," p.336.

Lindsay, George, #588, 17th February 1743, "Portable microscope," p.340.

Litherland, Peter, #1830, 14th October 1791, "Escapement to be applied to watches, clocks, or dials, for use at sea or on land," p.341.

Litherland, Peter, #1889, 12th June 1792, "Watches, particularly escapements to be applied to them," p.341.

MacCulloch, Kenneth, #1663, 12th August 1788, "Mariner's compass," p.353.¹¹

Marie, David, #771, 29th April 1762, "Constructing and making watches," p.363.

Martin, Joshua Lover, #1088, 25th November 1774, "Hadley's quadrant, or sea octant and sextant," p.365.¹²

Martin, Joshua Lover, #1316, 14th January 1782, "Drawing tubes plated with silver or gold on copper or other metal, for the construction of telescope, perspective, opera-glasses, and other instruments," p.365.¹³

Mill, Henry, #376, 12th April 1706, "Mathematical instrument, consisting of several springs, for the case of persons riding in coaches, chaises, and other conveyances," p.379.

Morland, Samuel, # 151 and #157, 1667-1674, p.388.¹⁴

Morley, Hilldebrand, #1325, 15th April 1782, "Automaton clock or timepiece," p.388.

Morley, Hilldebrand, #1342, 5th November 1782, "Single and compound timepieces," p.388.

Nairne, Edward, #1318, 5th February 1782, "Electrical-machine, or a method of insulating such machine, and constructing the conductors so that either shocks or sparks may be received from them. 'Insulated Medical Electrical-Machine,'" p.395.¹⁵

Neale, John, #605, 12th July 1744, "Quadrantal planetarian-machine for taking the altitude of the planets and stars," p.398.

Norton, Eardley, #987, 2nd May 1771, "Clock which strikes the hours and parts; also a watch which repeats the hours and parts, and contrived to contain its appendages, as a key, seal, or tricket," p.414.

Norton, Eardley, #987, 2nd May 1771, "Clock which strikes the hours and parts; also a watch which repeats the hours and parts, and contrived to contain its appendages, as a key, seal, or tricket," p.414.

Nugent, Patrick Rooney, #1980, 18th March 1794, "Instruments whereby the latitude, longitude, and magnetic variation at sea or on shore may be obtained," p.415.

Nugent, Patrick Rooney, #2246, 27th June 1798, "Instruments whereby the latitude and longitude, also the variation and inclination of the needle at sea or on shore, may be obtained," p.415.

Ould, Henry, #1842, 17th December 1791, "Apparatus to be affixed to Hadley's quadrant to obtain an artificial horizon," p.420.¹⁶

Peckham, Randall, #2280, 17th December 1798, "Constructing a watch so as to unite it with a mariner's compass. 'A Polar Watch,'" p.434.

Pyefinch, Henry, #976, 28th December 1770, "Constructing and making refracting-telescopes with object glasses," p.463.

Quare, Daniel, #342, 2nd August 1695, "Making a portable weather-glass or barometer," p.463.¹⁷

Ramsden, Jesse, #1112, 30th December 1775, "Astronomical equatorial instrument," p.465.

Rand, Cater, #2289, 26th January 1792, "Military and naval telescope," p.466.

Recordon, Louis, #1249, 18th March 1780, "Making watches to keep time and motion without winding up by key or other manual operation," p.471.

Reynoldson, George, #534, 18th October 1731, "Machine that gives exactly the way a ship makes, and counts her leeway, tells what speed the winds blow, and proves the different force of current at any depth; also a machine that will retard a ship when driving upon a lee shore where there is no anchorage, or on being forced back in her voyage by contrary winds," 475.

Ribright, Thomas, #640, 7th February 1749, "Making small perspective-glasses with mathematical and other instruments and twees in the same case, with and without microscope or magnifying glasses," p.475.

Rowe, Jacob, #431, 20th October 1720, "Instrument for taking altitudes at sea..." p.491.

Rowning, John, #535, 11th January 1732, "Clock which with one set of wheels strikes the hours and quarters, or the past hours with each quarter," p.493.

Russell, John, #2144, 5th November 1796, "Apparatus to exhibit the phenomena of the moon. 'Selenographia,'" p.495.

Scatliff, Daniel, #752, 2nd October 1760, "Quadrant for taking observations at sea," p.503.

Senex, John, #432, 7th July 1721, "Making and printing globular charts or sea-charts, for use in navigation," p.508 (with John Harris).

Short, Thomas, #1069, 27th April 1774, "Making reflecting telescopes with more than two specula, to be used by the same person at the same time, whereby their magnifying power and uses are increased, also two persons are enabled to view the same object at the same time, and with the same telescope," p.515.

Small, William, #1048, 22nd July 1773, "Constructing time-pieces," p.522.

Smethwick, Francis, #149, 14th May 1666, "Grinding optical glasses in figures which are not spherical," p.523.¹⁸

Storer, William, #183, 4th March 1778, "Optical instrument or accurate delineator, entirely obviating the defects of the camera-obscura, being used without the assistance of the sun in the day-time, and also by candle-light, for drawing the human face, inside of rooms or buildings, also perspectives, landscapes, foliage and fibres of trees and flowers, exactly representing the true outlines, lights, shades, and colours," p.547.

Storer, William, #1252, 10th April 1780, "Telescopes, microscopes, spectacles, opera-glasses, and other optical instruments," p.547.

Storer, William, #1407, 12th December 1783, "Preparing and making optic glasses ('Syllepsis glasses'); application thereof to optical instruments in general," p.547.

Syeds, John, #1789, 21st January 1791, "Quadrant for determining altitudes at sea when no horizon can be found, and for more easily ascertaining the longitude," p.553.¹⁹

Tompion, Thomas, #344, 23rd September 1695, "Watch and clock making," [shared with Booth, Edward and Houghton, William] p.572.²⁰

Tyrer, Thomas, #1311, 1st January 1782, "Horizontal escapement for a watch, to act with two wheels," p.579.

Webster, Robert, #1021, 31st July 1772, "Repeating watch," p.602.

Wilson, Henry, #432, 7th July 1721, "Making and printing globular charts or seacharts for use in navigation," p.625.

Winter, Thomas, #752, 2nd October 1760, "Quadrant for taking observations at sea," p.630.

Worcester, Edward, Marquis of., #131, 8th February 1661, "Making a watch or clock to go for several weeks without spring, chain, or other method of winding-up, [plus many other different inventions]," p.637.

Wright, Edward, #52, July 22, "A grant to make and utter mathematical instruments". Term: 8 years.²¹

Wright, Gabriel, #1229, 25th June 1779, "Azimuth and amplitude compass and quadrant, for use in navigation and practical astronomy," p.639.

Wright, Gabriel, #1815, 5th July 1791, "Making magnetical-compasses, commonly called azimuth, amplitude, steering, and hanging compasses for use in navigation, marine-surveying, &c.," p.639.

Wright, Gabriel, #2081, 19th January 1796, "Azimuth and amplitude compasses, or adding to the same a reflecting quadrant and horizon, to enable a person without assistance, to take the azimuth of celestial objects and their altitude at the same time, in every latitude or in any altitude of the

object; method of stopping the card of the compass, and reading off the degrees and minutes from the vernier with or without the card being stopped; apparatus for mechanically working and solving the problems for finding the magnetic and true azimuths of objects taken by the compass," p.639.

Wright, Thomas, #1354, 1st February 1783, "Watch or timekeeper," p.641.

COLONIAL AMERICA AND EARLY UNITED STATES:

January 1736, Rowland Houghton, "New Kind of Theodolite for the Surveying & measuring of Land, by the use whereof Surveying is Rendred more Easy and Expeditious..."²²

April 1789, John Churchman obtained a patent to sell in the US all globes, maps, and tables constructed according his method to find longitude by magnetic variation.²³

THE NETHERLANDS - States General:²⁴

25-11-1593, "Mathys Syverts-Maps and instruments for determining the ship's position at sea-term: 15 years (applied for 15 years). Suppliant asks for further remuneration payable to him when the invention will be found reliable and satisfactory. Later on he received f.300 in consideration of a 'paskaart' (chart) invented by him," p.95.

8-3-1597, "Reynier Pietersz van Twisch, ship's mate, resident of Hoorn-Instruments for the determination of the geographical longitude and latitude-Term: 10 years (applied for 10 years)," p.97.

1-6-1600, "In an application filed by Jacob van der Straten (accompanied by a letter of recommendation from the Prince) it is alleged that he has found a way to determine the longitudes of all places both at sea and on land and it is decided that all who allege to have invented such means should hand in any documents relating to their invention under closed cover within 2 months. The documents will then be examined and a remuneration of a lump sum of 5000 guilders and 1000 Flemish pounds of 20 pence each a year is promised to the person whose invention gives satisfaction; in case of more than one satisfactory invention, the remuneration shall be divided among their inventors. On 15-6-1600 it is further instructed that all those who allege that they have found means to determine the longitudes namely from East and from West, shall hand in documents within 2 months. Simon van Eyck, Plancius [Plantius], and Van Straten were among them. On 6-10-1600 Van Straten is requested to bring the invention of Pietersz van Twisch to The Hague too," p.100.

2-6-1601, "Francois Balochi was granted a patent for the sole manufacture and sale of a celestial globe invented by him, which rotates by itself, as per model to be affixed and sealed to the letters patent," p.101.

7-3-1603, "A patent for a term of 10 years was granted to Mr. Adriaen Anthonisz, engineer of the States General, for the sole manufacture and sale of an instrument called 'Astrolabium annulare' invented by him," p.105.²⁵

9-7-1611, "Deed for Thomas Leomer [Laemer?], Englishman, resident of the City of Amsterdam. Should his invention for the determination of longitudes at sea prove to be a success, he will be

awarded a recompense," p.109.

23-5-1612, "Deed for Courdt Borreker, citizen of Bremen. He is awarded a recompense, should his invention for the determination of the longitudes with the aid of a copper 'granaat' be proved to be a success," p.110.

13-9-1617, "Maerten Joosten Wagenaer, m. box-maker at Enchuysen--Navigation instrument-Term: 10 years (applied for 20 years)," p.116.²⁶

31-3-1623, "Claes Jacobsz. Broer, burgher of the town of Edam--Navigation instrument-Term: 12 years," p.122.

30-5-1625, "Albert Lieffertsz. from Swol (Zwolle)--Navigation instrument--Term: 6 years," p.126.

30-1-1626, "Guilliam de Neve, balance-maker, resident of Amsterdam--Weighing instrument-Term: 12 years (applied for 25 years)," p.126.

23-2-1629, "Cornelis Pietersz. Biensz., resident of the town of Enchuysen--Instrument for the determination of the sun's altitude, also for the determination of the height of buildings, etc.-Term: 10 years (applied for 16 years)," p.130.

27-1-1632, "Hendrick Jansz. Beermans, resident of Amsterdam-Maps printed on cloth-Term: 7 years," p.135.

3-10-1650, "Dirck van Cal, resident of the town of Steewyck in the province of Overyssel-Celestial globe, moving for days after having been wound up, with a representation of the ecliptic-Term: 30 years (applied for 30 years)," p.145.

16-6-1657, "Salomon [Coster] -Huygens' clock-Term: 20 years (applied for 20 years)," p.146.²⁷

9-8-1658, "Symon Douw, town-clockmaker of Rotterdam-Clock-Term: 21 years (applied for 12 years)," p.147.²⁸

25-9-1660, Breen, Joost van, for "...a treatise namend 'Stiermans Gemack', with the accompanying instruments...". This instrument was the spiegelboog (mirror-staff), the first known example of a navigational instrument to use a glass mirror.²⁹

22-3-1662, "Isaack van Nickele, watch-maker of Haarlem-Clock running for years without winding up being necessary-term: 15 years (applied for 30 years)," p.149.

17-3-1663, "Willem Meester, m. watch-maker at Leyden-Clock and striking-mechanism driven by the same weights-Term: 15 years (applied for 15 years)," p.149.

5-12-1664, "Christiaen Huygens-Improvement to his pendulum-clock-Term: 20 yrs (applied for 20 years)," p.150.³⁰

29-8-1664, "Wilhelm, watch-maker of Leyden-Mechanism instead of toothwheels but without teeth for clocks, spits, mills, etc.-Term: 21 years (applied for 20 years)," p.150.³¹

4-10-1675, "Christiaen Huygens of Zuylichem--Pocket watch-Term: 15 years," p.153.

21-1-1683, "Hendrick van Landtschot, surveyor and watchmaker of Middelburgh in the province of Zeeland--Navigation instrument-Term: 15 years," p.154.

9-7-1722, "Johannes Deur, citizen of the City of Amsterdam--A rotating terrestrial globe showing the movements of sun and stars-Term: 15 years," p.159.

THE NETHERLANDS -- States of Holland and West-Friesland:

3-9-1594, "In connection with a request from the 'Merchants of the ocean-going trade to the Indies' for the patenting of Plantius' invention bearing on the determination of longitudes and latitudes at sea, a committee was set up," p.171.

12-7-1595, "Reynier Pietersz van Twisch, mate, citizen of Hoorn-Instrument for the determination

of the latitude and longitude at sea and bolting-machines-Term:12 years (applied for 12 years)," p.173.

12-9-1595, "Simon van der Eyck. He had invented an instrument for the determination of longitudes and latitudes and applied for a patent so as to prevent the said instrument and the maps with the aid of that instrument from being imitated, printed or sold without the applicant's consent. He asked also for a reward unless his art should be found unsatisfactory. It was decided that the art had to be examined and if found satisfactory, the inventor had to be granted a fair reward. Further, all inventors had to be requested 'within 3 months from then on to show the drawings and their inventions to the Deputies of the States, together with fundamental evidence and a description of their arts and inventions, in order that the States be in a position to take all such measures as to prevent in good order all possible dissensions, misunderstandings, and other difficulties and inconveniences, for the good of the country, by granting the proper patent," p.17.

15-3-1598, "Reynardt Pietersz, citizen of the town of Hoorn, engineer--Navigation instruments," p.174.

26-6-1598, "A petition from Petrus Plantius [Plancius] and Mathys Syvertsz for 'obtaining a reward for their art and invention to determine the longitude at sea.' A committee was set up: Dr. J. Schaligerum, R. Snellius, S. Stevin, R. v. Coelen, L.J. Wagenaer," p.174.³²

21-5-1601, "A few persons applied for a reward for navigation instruments invented. Each of them was requested to 'submit a drawing of the art invented by him... with annotations denoting the particulars underlying the art and the secret knowledge, in order that all such drawings and particulars together could be taken care of and kept secret.' It was further decided that a compensation would be granted for demonstration on board ship and if the instruments turned out to be satisfactory, a reward as well," p.175.

July 1657, "Salomon Coster-A new invention in the field of horology by Christiaen Huygens bearing on a movement much different from movements till then used in such instruments, etc.", p.179.³³

December 1658, "Mr. Symon Douw, town-clockmaker, Rotterdam-A Watch of another construction than that invented by Chr. Huygens, for which Salomon Coster had been granted a patent," p.180.³⁴

March 1662, "Isaack van Nickele, watch-maker, Haarlem-An invention relating to a means to have all clocks, large or small, with or without striking-mechanism, run for 3 months, 6 months, 1, 2, 3, 4, 5, 6 or more years without rewinding being necessary," p.180.

July 1663, "Joost Noorda, master clockmaker at Leyden-An invention relating to a watch running without balance, spindle, or balance-wheel, etc.", p.181.

27-12-1675, "Christiaen Huygens of Zuylichem-Pocket-watch," p.184.³⁵

November 1682, "Remmert Teunis. Backer, Enkhuysen-The invention of a plane map equal to an earth globe, which map can be made in any size desired and on which all places can be shown in the exact relation to one another in which they lie; further a map equal to the celestial globe, from which the longitude of a place can be determined," p.186

December 1682, "Hendrick van Lantschot, Middelburgh, surveyor and master clockmaker-Invention relating to the determination of longitudes," p.186.

May 1684, "Andries van Luchtenberg, Rotterdam-The invention of a new Celestial, Earth and World Globe, etc. with the aid of which all the firmament, earth and sun can be measured. The patent was prolonged in July 1698," p.187.³⁶

June 1701, "Gerard Valck, art-dealer, Amsterdam-Improved celestial and terrestrial globes and 'Planetolabium,'" p.190.³⁷

August 1711, "Cesar Caze, Amsterdam-The invention of calculating machines and a dissertation on the use and improvement of arithmetic," p.192.

June 1722, "Johan Deur, Amsterdam-The invention of a spring in a celestial globe by means of which it not only rotates but does so in the same manner and in the same time as the Earth does in one day according to Copernicus' system," p.192.

April 1735, "Denys Audebert, watch-maker, Amsterdam-The invention of celestial and terrestrial globes on which everything shown on the (appended?) text is indicated by means of springs within the globes," p.192.³⁸

May 1738, "Jan van den Dam, Amsterdam-The invention of a planetarium according to Copernicus' system," p.193.³⁹

December 1756, "Robert Ghutrie, Commander at Sea, Amsterdam-An improvement to compasses doing away with oscillation on ships in storm," p.195.⁴⁰

VENICE:

No instrument patents listed in the incomplete patent rolls available in print.⁴¹

HAPSBURG EMPIRE:⁴²

No. 5, **1536** - Gemma Frisius, "Globe," p.136 (also patented in 1531).⁴³

No. 43, **1581**- Thomas Rueckert, "Hodometer," p.137.⁴⁴

No. 44, **1581** - Josuah. Habermehl, "Device," p.137 (also patented in Saxony).⁴⁵

No. 51, **1583** - Christoph Schissler, "Instrumentum Geodeticum," p.137.⁴⁶

No. 70, **1595** - Christoph Markgraf, "Clockwork; Planetarium," p.138.⁴⁷

No. 71, **1595** - Elias Huetter, "Planetarium," p.138.⁴⁸

No. 72, **1598** - Melchior & Caspar Strobel, "Special Clockwork," p.138.

No. 83, **1602** - Joost Burgi, "Instrumentum Geodeticum," p.138.⁴⁹

SAXONY:⁵⁰

1581 Joshua Habermehl, Land surveying instrument.

FRANCE before 1699:⁵¹

1647, April 16, Jacques Buot, "Roue de proportion."⁵²

1649, May 22, Blaise Pascal, "Arithmetical machine."⁵³

1665, Christiaan Huygens, "Pour l'usage des montres a Pendule sur mer."⁵⁴

1675, Christiaan Huygens, "Spring watch."⁵⁵

1670 (ca.), Pere Cherubin, "Binoculars."⁵⁶

FRANCE after 1699:⁵⁷

- 1699, M. Loulie', "Sonometre," Vol. I, pp.187-9.
- 1702, M. du Me', officier d'artillerie, "Eprouvette a poudre", Vol. II, pp. 29-30.⁵⁸
- 1704, M. Verjus, "Niveau," Vol. II, pp.83-4.
- 1705, M. le Fevre, "Micrometre," Vol. II, pp.103-5.⁵⁹
- 1709, M. Molard, "Machine pour faire mouvoir des aiguilles eloignees de l'horloge," Vol. II, pp. 159-60.
- 1714, M. le Bon, horlogeur, "Pendule qui marque le temps vrai," Vol. III, pp.21-2.
- 1714, M. le Bon, "Remontoir de pendule," Vol. III, pp.23-4.
- 1716, M. Sully, "Montre pour la mer," Vol. III, pp. 93-4.⁶⁰
- 1716, M. Sully, "Maniere d'eviter les frotemens dans l'echappemens des montres," Vol. III, pp.95-6.
- 1717, M. Duval, "Nouveau compas pour prendre exactement sur tous plans des angles des degres et minutes, des degres, minutes et secondes ensemble, et pour les marquer sur le papier," Vol. III, pp. 113-15.
- 1717, M. Julien le Roy, "Pendule qui marque le temps vrai, le lieu et la declinaison du soleil," Vol. III, pp.151-5.
- 1719, M. Pomchef, "Horloge pour mesurer le chemin d'un vaisseau," Vol. III, pp. 203-5.
- 1722, M. Le Bon, "Cadrature de pendule qui marque le temps vrai," Vol. IV, pp.45-6.
- 1723, M. Meynier, "Sphere mouvante," Vol. IV, pp.56-7.
- 1723, M. Meynier, "Horloge qui marque le lieu du soleil et son passage par le meridien," Vol. IV, pp. 59-60.
- 1723, M. Meynier, "Planishere," Vol. IV, pp.61-4.
- 1724, M. Thiout, "Projet de pendule pour marquer le temps vrai," Vol. IV, pp.67-8.
- 1724, M. Thiout, "Autre projet de pendule qui marque le temps vrai," Vol. IV, p.69.
- 1724, M. Meynier, "Machine pour prendre hauteur au mer," Vol. IV, pp. 71-4.
- 1724, M. Sully, "Horloge pour mesurer le temps en mer," Vol. IV, pp. 75-81.
- 1724, M. de Meau, "Instrument qui rassemble les usages et proprietes des plusieurs autres instrumens," Vol. IV, pp. 83-7.
- 1724, M. Le Chevalier D'Albert, "Methode pour trouver les longitudes," Vol. IV, pp. 89- 91.
- 1724, M. Meynier, "Odometre ou compte-pas," Vol. IV, pp. 93-106.
- 1725, M. Lepine, "Machine arithmetique," Vol. IV, pp.131-6.
- 1725, M. Isaac Brouckner, "Globe terrestre," Vol. IV, pp. 343-4.
- 1725, M. Le Vicair de S. Cyr, "Quadrature de pendule qui marque le temps vrai," p.149.
- 1726, M. Duchesne, "Pendule d'equation," Vol. IV, pp.153-4.
- 1726, M. Krieglissen, "Pendule qui marque le temps vrai," Vol. IV, pp.155-6.
- 1726, M. Thiout, "Quadrature d'une pendule qui marque le temps vrai et le temps moyen en minutes et secondes," pp. 173-5.
- 1727, M. Clairault le Pere, "Planchette ou instrument trigonometrique qui sert d'astrolabe et de quartier de reduction..." Vol. V, pp. 3-9.
- 1727, L'Abbe' Outhier, Prestre, "Globe mouvant," Vol. V, pp. 15-7.
- 1727, M. Le Comte Prosper, "Horloge a sable," Vol. V, pp. 23-9.
- 1727, M. de Mairan, "Nouveau cric pour l'usage des lunettes," Vol. V, pp. 31-3.
- 1728, M de Montigny, "Instrument pour prendre hauteur en mer," Vol. V, pp. 57-8.

1728, M. de Montigny, "Machine pour suspendre des instrumens en mer," Vol. V, pp. 59-60.

1728, M. Julien le Roy, "Disposition nouvelle d'une repetition," Vol. V, pp. 61-2.

1728, M. Julien le Roy, "Pendule qui marque le temps vrai," Vol. V, pp. 63-6.

1728, M. Julien le Roy, "Machine pour faire sonner le temps vrai applique' a un cercle d'equation," Vol. V, pp. 67-70.

1728, M. le Roy, "Cercle d'equation perfectionne avec la maniere d'y appliquer la sonnerie du temps vrai," Vol. V, pp. 71-3.

1728, M. Collier, "Pendule a repetition et a tout-ou-rien," Vol. V, pp. 75-6.

1728, M. Collier, "Tout-ou-rien perfectionne et applique a la pendule precedente," Vol. V, pp. 77-8.

1728, M. Dutertre, "Horloge a double pendule pour la marine," Vol. V, pp. 79-80.

1729, M. ***, "Machine pour prendre hauteur en mer," Vol. V, pp. 97-8.⁶¹

1730, M. de Hillerin de Boistissandeau, "Machine arithmetique," Vol. V, pp. 103-115.

1730, M. de Hillerin de Boistissandeau, "Seconde machine arithmetique," Vol. V, p. 117.

1730, M. de Hillerin de Boistissandeau, "Troisieme machine arithmetique," Vol. V, pp. 121-3.

1732, M. Grandjean, "Nouveau micrometre universel," Vol. VI, pp. 45-7.

1732, M. Godin, "Tour commode pour observations astronomiques," Vol. VI, pp. 49-52.

1732, M. Godin, "Maniere d'observer commedement avec des longues lunettes," Vol. VI, pp. 53-6.⁶²

1732, M. Godin, "Maniere d'employer les plus longs tuyaux de lunettes sans que ce tuyaux plient," Vol. VI, pp. 57-60.

1732, M. Jacques le Maire, "Telescope de reflection," Vol. VI, pp. 61-3.

1732, M. L'Abbe' Outhier, "Maniere de perfectionner et rendre egal le mouvement des pendules a ressort," Vol. VI, pp.65-70.

1732, M. Grandjean, "Nouvel instrument pour observer les hauteurs en mer," Vol. VI, pp. 79-81.⁶³

1732, M. Julien le Roy, "Echappement de pendule," Vol. VI, pp. 83-4.⁶⁴

1732, M. Mauny, "Sphere nouvelle," Vol. VI, pp. 89-93.

1733, M. Grandjean, "Niveau perfectionne," Vol. VI, pp. 113-4.

1733, M. Quereineuf, "Instrument pour prendre hauteur en mer," Vol. VI, pp. 117-9.

1733, M. Maillard, "Maniere de rendre egal le tirage du grand ressort des pendules," Vol. VI, pp. 123-4.

1733, M. l'Abbe' Nollet, "Chambre obscure de nouvelle construction," Vol. VI, pp. 125- 6.⁶⁵

1733, M. l'Abbe' Nollet, "Machine pour tailler les verres de lunettes," Vol. VI, pp.127-8.

1733, M. du Quet, "Horloge hydraulique," Vol. VI, pp.131-3.

1733, M. Bouvet, "Machine pour mesurer le force des vents de la mer," Vol. VI, pp. 153- 5.

1734, M. Carlier, "Instrument universel qui sert a connoistre la hauteur du soleil dans l'instant qu'il marque l'heure," Vol. VI, pp. 187-9.

1734, M. Larcay, "Pendule sonnante et a repetition," Vol VI, pp.191-3.

1734, M. de Quereneuf, "Instrument pour trouver en mer la variation de l'aiguille aimantee," Vol. VII, pp. 3-25.

1735, M. Grandjean de Fouchy, "Machine pour caler et mouvoir commodement un quart-de-cercle," Vol. VII, pp. 47-8.

1736, M. de Parcieux, "Machine pour tailler les verres objectifs de lunette," Vol. VII, pp. 51-3.

1736, M. de Geussane, "Instrumens astronomiques," Vol. VII, pp. 55-7.⁶⁶

1737, M. Thiout l'Aine, Horloger, "Cadrature de repetition," Vol. VII, pp. 61-9.

1737, M. l'Abbe' Soumille, "Niveau," Vol.VII, pp. 71-5.
1740, M. Gallonde, Horloger, "Pendule," Vol. VII, pp. 79-83.
1741, M. de Geussane, "Niveau," Vol. VII, pp. 109-10.
1741, M. de Geussane, "Machine pour mesurer d'une seule station, des petites distances inaccessibles," Vol. VII, pp. 111-4.
1742, M. Pierre le Roy, "Echappement a repos pour le montres," Vol. VII, pp.127-38.
1742, M. Volet, "Echappement de montre," Vol. VII, pp. 139-40.
1742, M. Gourdain, Horloger, "Echappement a repos," Vol. VII, pp. 141-5.
1742, M. Gourdain, Horloger, "Pendule portative, et montre de gousset, toutes deux a echappement a repos sans fuse'e ni chaine," Vol. VII, pp.147-52.
1742, M. Jean-Baptiste du Tetre, Horloger, "Montre a equation," Vol. VII, pp. 153-7.
1742, M. Gallonde, Horloger, "Echappement a ancre," Vol. VII, pp. 159-61.
1742, M. de Tilieres, "Compas pour tracer des spirales," Vol. VII, pp.163-74.
1742, M. l'Abbe' Outhier, "Odometre," Vol. VII, pp. 175-82.
1743, M. Langlois, Ingenieur du Roi pour les instrumens de mathematiques, "Pantographe," Vol. VII, pp. 207-14.
1743, M. Gourdain, Horloger, "Horloge d'une demi-minute pour l'operation du loke" Vol. VII, pp. 217-20.
1746, M. Gallonde, Horloger, "Compas d'engranage," Vol.VII, pp. 315-9.
1746, M. l'Abbe' Soumille, "Echappement de pendule," Vol. VII, pp. 325-34.
1746, M. Passemant, "Telescope de reflexion applique' au quart-de-cercle, avec une nouvelle maniere de le diviser," Vol. VII, pp. 341-57.
1747, M. le Maire, Fils, Ingenieur du Roi en instrumens de mathematique, "Compas de variation," Vol. VII, pp. 361-7.
1748, M. le Roy, Fils Aine, Horloger, "Echappement a detente," Vol. VII, pp. 385-94.
1751, M. le Plat, Horloger, "Machine pour remonter les pendules par le moyen d'un courant d'air," Vol. VII, pp. 401-6.
1752, M. Ferdinand Berthoud, Horloger a Paris, "Pendule a equation," Vol. VII, pp. 425-8.
1754, M. Ferdinand Berthoud, "Description d'une pendule a equation, a secondes concentriques, marquant les mois & quantiemes des mois, les annees bissextiles, & va treize mois sanse etre remontee," Vol. VII, pp. 473-8.

SPAIN:⁶⁷

1572, Juan Alonso, natural de Canarias, "Instrumento nautico."
1573, Licenciado Ruiz, "Instrumento nautico."⁶⁸
1574, Juan Herrera, "Instrumento nautico par hallar la longitud."⁶⁹

ENDNOTES:

¹ With the exception of the entries concerning Edward Wright's and Anthony George Eckhardt's patents, the list of British patents is drawn from Bennet Woodcroft, *Alphabetical Index of Patentees of Inventions from March 2, 1617 to October 1, 1852* (London, 1854). The # sign in the entries refers to the patent numbers as listed in Woodcroft. For the 1561-1600 period (not covered by Woodcroft) I have consulted the rolls in Wyndham Hulme, "The History of the Patent System Under the Prerogative and at Common Law" *Law Quarterly Review* 12 (1896): 141-154; 16 (1900): 44-56. *NOTA BENE*: the period between 1600 and 1617 is not covered by either Hulme or Woodcroft. A list of British and US patents of navigational instruments (before and after 1800) is in Peter Inland, *Taking the Stars: Celestial Navigation from Argonauts to Astronauts*, (Malabar: Krieger Publishing, 1998), pp. 192-197.

² Son of George Adams and, like him, member of the Grocers' Company (Joyce Brown, *Mathematical Instrument-Makers in the Grocers' Company 1688-1800*, London: Science Museum, 1979), p. 52). He was appointed Mathematical Instrument Maker to George II in 1796. An advertisement of his shop is in Michael Crawforth, "Evidence from Trade Cards for the Scientific Instrument Industry", *Annals of Science* 42(1985), p. 492.

³ Was member of the Grocers' Company (Brown, *Mathematical Instrument-Makers*, p. 36).

⁴ De Magalhães (or J.H. de Magellan), was not an instrument maker but an agent. He purchased instruments in London for Van Marum in the 1780s (Gerard L'E Turner, "The London Trade in Scientific Instrument-Making in the Eighteenth Century," *Scientific Instruments and Experimental Philosophy 1550-1850*, (Aldershot, 1990), p. 13). His role in this patent, therefore, may have been that of the financial backer - a pattern often found in early modern European patents. His role as "expert witness" in patent matters is discussed in Eric Robinson. "James Watt and the Laws of Patents," *Technology and Culture* 13 (1972): 115-39.

⁵ Richard Sorrenson, "Dollond & Son's Pursuit of Achromaticity," *History of Science* 34 (2001): 31-55; Biagioli "From Print to Patents," p. 144.

⁶ Peter de Clercq, "'A Dutch Gentleman' in London: Anthony George Eckhardt, F.R.S. (1740-1810) and Instruments of His Invention," *SIS Bulletin* no. 84 (2005): 10-16, at p. 11. De Clercq has found that Eckhardt transferred this patent to the Dollonds.

⁷ The invention was opposed by the Clockmakers' Company and subsequently withdrawn (David Landes, *Revolution in Time*, (Cambridge, MA, 1983), pp. 138-9).

⁸ An advertisement for this instrument is reproduced in Crawforth, "Trade Cards for the Scientific Instrument Industry", p. 505. It was sold by Benjamin Martin (John Milburn, *Retailer to the Sciences* (London Vademecum Press, 1896), p.86).

⁹ This instrument was represented in Gregory's stationery as reproduced in Crawforth, "Trade Cards for the Scientific Instrument Industry", p. 507, bottom of card.

¹⁰ A longer description of this patent, and a detailed discussion of the pendulum clock listed in it is in Christiaan Huygens, *Oeuvres Completes*, (La Haye, 1888-), Vol.XVII, pp. 176-7. Abraham Hill, founding member of the Royal Society, was its treasurer at the time he took out this patent on behalf of the Society. The heterogeneous list of patented claims indicates that this was a "collective" patent including the inventions of various members Mario Biagioli "From Print to Patents: Living on Instruments in Early Modern Europe" *History of Science* 44 (2006), pp.140, 159). The pendulum clock listed in it is probably to be attributed to Hooke.

¹¹ This patent was mentioned in McCulloch's ad reproduced in Crawforth, "Evidence from Trade Cards," p. 516.

¹² Science Museum, London, Inv. 1907-94. The instrument was sold by Benjamin Martin (Milburn, *Retailer to the Sciences*, p. 47).

¹³ It was sold by Benjamin Martin (Milburn, *Retailer to the Sciences*, pp. 21, 75).

¹⁴ Maurice Dumas *Scientific Instruments of the Seventeenth and Eighteenth Centuries and Their Makers* (London, 1989), p.70.

¹⁵ Paola Bertucci, "A Philosophical Business: Edward Nairne and the Patent Medical Electrical Machine (1782)," *History of Technology* 23 (2001): 41-58; Biagioli "From Print to Patents," p. 146.

¹⁶ This instrument is represented in Ould's advertisement reproduced in Crawforth, "Evidence from Trade Cards," p.521.

¹⁷ Joyce Brown, "Guild Organisation and the Instrument-Making Trade, 1550-1830: The Grocers' and Clockmakers' Companies," *Annals of Science* 36 (1979): 1-34, at p.32. Brown reports that this patent was opposed by the clockmakers' guild on June 3, 1695. Evidently the patent was issued as it bear an August 1695 date. Brown also reports that the court decided to uphold his patent against guild members making and selling weather-glasses in breach of his patent. Biagioli, "From Print to Patents" p. 155 and p.181 (note 148) for additional references.

¹⁸ F. Smethwick, "An Account of the Invention of Grinding Opticke and Burning Glass of a figure not-spherical, produced before the Royal Society," *Philosophical*

Transactions, III, no. 33 (1668): 631-2. Was made FRS in 1667 (Michael Hunter, *The Royal Society and Its Fellows* (Chalfont St Giles, 1985), pp.70, 200). Additional refs in Biagioli, "From Print to Patents", pp. 153. 171 (note 25).

¹⁹ Crawforth, "Evidence from Trade Cards," p. 460.

²⁰ This is what became known as the 'cylinder escapement' perfected by assistant and successor, George Graham (R. W. Symonds, *Thomas Tompion: His Life and Work* (London: Batsford, 1951), p. 242). Tompion was a member of clockmakers' guild (Brown, "Guild Organisation," p. 33) and I have found no evidence that the guild opposed his patent. This might be explained by the fact that Tompion was only one of the three patentees and that the other two - Booth (a.k.a.Barlow) and Houghton - are not listed by Brown as members of the clockmakers' guild.

²¹ Wyndham Hulme, "The History of the Patent System Under the Prerogative and at Common Law" *Law Quarterly Review*, 16 (1900): 44-56, at p.51. It seems impossible, without accessing the manuscript evidence, to decide what instruments this grant was about. The grant's title states that it concerns mathematical instruments, but Hulme's brief description of this entry says it concerns "Another water-rising device, obtained by 'long and painful study of the mathematical sciences' by the petitioner, a Cambridge Master of Arts. It is stated 'a special work' for supplying water to London had already been undertaken by the patentee. Prior rights reserved." On Thomas Wright, see E.G.R. Taylor, *The Mathematical Practitioners of Tudor and Stuart England* (Cambridge, 1954), pp. 181-2.

²² Was awarded a 7-year patent by the Colony of Massachusetts (Bruce Bugbee, *Genesis of American Patent and Copyright Law* (Washington: Public Affairs Press, 1967), pp. 67-8.

²³ Given the embryonic state of the US patent and copyright system at this time, the private bill passed by the House shares features of both copyright and patent (Bugbee, *Genesis*, pp.132-4).

²⁴ This list is drawn from G. Doorman, *Patents for Inventions in the Netherlands During the 16th, 17th and 18th Centuries*, (The Hague, Nijhoff, 1942). The original Dutch edition of the book (which I have not been able to consult) includes fuller descriptions of the patents. Typically, a patent was granted by the States General, but also needed to be registered in the specific state of the inventor's residence, leading to duplicate entries for the same patent.

²⁵ This is the father of Jacob Metius, possible co-inventor of the telescope (see Albert van Helden, "The Invention of the Telescope"), and of the mathematician Adriaen Metius.

²⁶ Maria Rooseboom, *Bijdrage tot de geschiedenis der instrumentmakerskunst in de noordelijke nederlanden* (Leiden: Rijksmuseum, 1950), p. 129. [Son of Lucas Jansz Wagenaer?]

²⁷ Biagioli, "From Print to Patents," p. 143. This was Huygens' first pendulum clock. It is interesting that, probably to protect his patenting plan, he published a description of it (the *Horologium*) in 1658, the year after receiving the patent.

²⁸ Entered in a bitter priority and patent infringement dispute with Huygens (Biagioli, "From Print to Patents," p. 173, note 53.

²⁹ This patent is not to be found in Doorman, but has been discovered by Nicolas de Hilster. He discusses it in "The Spiegelboog (mirror-staff): A Reconstruction," *Bulletin of the Scientific Instruments Society* no. 90 (2006), pp.7-8. I wish to thank de Hilster for providing a transcription of the privilege document.

³⁰ Check if this was the clock with cycloid cheeks or Huygens' first remontoire.

³¹ A friend of Christiaan Huygens' brother.

³² On Plantius see Ernst Zinner, *Deutsche und Niederlandische astronomische Instrumente des 11.-18 Jahrhunderts* (Munich, 1967), pp. 468-9.

³³ Rooseboom, *Bijdrage*, pp. 47-8.

³⁴ [Son of Jan Pietersz Dou? (Zinner, *Deutsche und Niederlandische astronomische Instrumente*, p.297)].

³⁵ Also patented in France (Biagioli, "From Print to Patents," pp. 143, 154). Huygens also tried to patent it in the UK, passing the patent's title to either the Royal Society or Oldenburg (see Rob Iliffe, "In the Warehouse", *History of Science* 30 (1992):31-55).

³⁶ Zinner, *Deutsche und Niederlandische astronomische Instrumente*, p. 431.

³⁷ Jean-Francois Gauvin, "Mid-18th Century Traditions in Globe Making: A Comparative Study of the Valks, Didier Robert de Vaugondy and Akerman", *Globe Studies*, 51/52 (2003/2004): 47-57, esp. pp. 48-50.

³⁸ Rooseboom, *Bijdrage*, p. 26.

³⁹ Rooseboom, *Bijdrage*, p. 53.

⁴⁰ This is the only patent for a compass found in Dutch rolls and it was not awarded to a member of the Amsterdam compass-makers guild, though Amsterdam is listed as the

patentee's residence. On Amsterdam compassmakers and their guild affiliations see Sybrich ter Kuile and W.E.J. Moerzer Bruyns, *Amsterdamse kompasmakers ca 1580 - ca 1850* (Amsterdam: NEHA, 1999).

⁴¹ Biagioli, "From Print to Patents", pp.141-2, 169 (note 9).

⁴² This list is drawn from Hansjoerg Pohlmann, "The Inventor's Rights in Early German Law," *Journal of the Patent Office Society* 43 (1961): 121-39, and from the slightly different German original: Hansjoerg Pohlmann, "Neue Materialien zur Fruehentwicklung des deutschen Erfinderschutzes im 16.Jahrhundert," *Gewerblicher Rechtsschutz und Urheberrecht* 62 (1960), Nr.6, pp. 272-83. The author states to have excluded patents that appeared to be issued to people other than the inventor. Patents were also issued by German cities and Electors, but are not included in Pohlmann's survey. For additional references to German patents see Biagioli "From Print to Patents", p. 170, note 11.

⁴³ Peter van der Krogt, *Globi Neerlandici*, (Utrecht: HES, 1993), pp. 38, 49.

⁴⁴ Zinner, *Deutsche und Niederlandische astronomische Instrumente*, pp. 239, 331, 604.

⁴⁵ I do not know which instruments by Josua Habermel are covered by this patent. Some candidates can be found in Ernst Zinner, *Astronomische Instrumente des 11. Bis 18.Jahrhunderts* (Munich: Beck, 1961), pp. 346-347. See also Wolfgang Eckhardt, "Erasmus und Josua Habermel: Kunstsgeschichtliche Anmerkungen zu den Werken der Beiden Instrumentenmacher," *Jahrbuch der Hamburger Kunstsammlungen* 22 (1977): 13-74, esp. pp. 20-2, 65-9.

⁴⁶ Schissler traveled to Prague to the court of Rudolph II in 1583. It is possible that the patent for this instrument was the result of his personal contact with Rudolph II. Refs to Schissler in Biagioli, "From Print to Patents", p. 172 (note 33).

⁴⁷ On Markgraf and his instrument, see Biagioli, "From Print to Patents", pp. 142-3, 172 (note 33).

⁴⁸ Biagioli "From print to Patents", p. 172 (note 32).

⁴⁹ Burgi moved to Rudolph's court in Prague in 1603, so this patent was probably facilitated by his previous patron, the Elector of Hesse-Kassel.

⁵⁰ Biagioli, "From Print to Patents", p. 142; Hans-Juergen Creutz, "Die Herausbildung des Erfindungschutzes in Sachsen im 15. Und 16. Jahrhundert," *Jahrbuch fuer Wirtschafts-geschichte*, 2 (1983): 91-110.

⁵¹ References to the literature on patents in early modern France are in Biagioli “From Print to Patents”, p. 170 (note 12).

⁵² Jacques Buot, *Usage de la roué de proportion...* (Paris: Melchior Mondiere, 1647), privilege at pp. 44-7. This privilege is particularly interesting because it covers both the book on the roué as well as the instrument itself: “Faisant tres-expresses inhibitions & defenses a tous contrefaire, graver, imprimer ou faire graver ny imprimer, vendre, ny distribuer ladite Roue ny ledit Livre de son Usage... (p.45). I thank Jean-Francois Gauvin for the reference and for the comments on the hybrid nature of this privilege.

⁵³ Michel Guern (ed), Pascal, *Oeuvres Completes*, (Paris, 1998), Vol. II, pp. 346-8; Biagioli “From Print to Patents”, pp. 143, 172 (note 39).

⁵⁴ Christiaan Huygens, *Oeuvres Completes*, Vol. XVII, p. 177, note 6.

⁵⁵ Rob Iliffe, “In the Warehouse”; Michael Mahoney, "Drawing Mechanics," in Wolfgang Lefevre (ed), *Picturing Machines, 1400-1700* (Cambridge, MIT Press, 2004), p.298, note 38.

⁵⁶ Pere d’Orleans, *Effets de la force de la contiguite’ des corps...* (Paris, 1688), pp. 413-4.

⁵⁷ This list was compiled from M Gallon (ed), *Machines approuvees par l’ Academie Royale des Sciences* (Paris: Martin, Coignard, Guerin: 1777) seven volumes. Apologies for maiming all French accents. NOTA BENE: This list includes instruments that were approved for patenting by the Academie des Sciences, but it is not clear how many of them were actually patented.

⁵⁸ To compare the power of different blends of gunpowder.

⁵⁹ Daumas, *Scientific Instruments*, p. 77.

⁶⁰ A gimballed clock for ships. On Henri Sully (clockmaker at Versailles) see Daumas *Scientific Instruments*, p. 91.

⁶¹ The name of the patentee is not given in Gallon’s text.

⁶² A rig to attach large telescopes to balconies of private residences, etc.

⁶³ Similar to a backstaff.

⁶⁴ Listed as invented by Sully and perfected by Le Roy.

⁶⁵ Biagioli, “From Print to Patents” p. 146, note 67.

⁶⁶ A transit instrument.

⁶⁷ This list of Spanish patents is compiled from Pablo E. Perez-Mallaina Bueno, "Los inventos llevados de Espana a las Indias en la segunda mitad del siglo XVI", *Cuadernos de Investigacion Historica*, 7 (1983), pp. 46-7. For other sources in Spanish Patents see Biagioli, "From Print to Patents", p. 169, note 10.

⁶⁸ "...Por medio del cual, sin saber el lugar del sol en el zodiaco, ni su declinacion, ni la maxima altitud meridiana, ni otros principios ni cuentas, se puede tomar en la mar la altura del polo en cualquier lugar y en cualquier hora del dia por el sol... y que asimismo, se podia saber con el punto donde estuviere en la mar el camino y derrota que se ha de tomar y seguir con la legua que se navegaren por hora y otras muchas cosas..." Perez-Mallaina Bueno, "Los inventos llevados de Espana," p. 47.

⁶⁹ On Herrera see Nicolas Garcia Tapia and Jesus Carrillo Castillo, *Tecnologia e imperio* (Madrid: Nivola, 2002), pp.79-112. The text of Herrera's patent is cited in Maria Isabel Vicente Maroto, "Juan de Herrera, cientifico," in *Juan de Herrera, arquitecto real* (Barcelona: Lunweg, 1997), p. 170.