Jansen and his father were the real inventors of the telescope in 1610, and that Lippershey only made a telescope after hints acci­dentally communicated to him of the details of Jansen’s invention. But the most trustworthy information on the subject is to be got from the researches of Van Swinden.@@[[1]](#footnote-2) Briefly summarized, this evidence is as follows. In the library of the university of Leyden, amongst the MSS. of Huygens there is an original copy of a document (dated 17th October 1608) addressed to the states-general by Jacob Andrianzoon (the same individual who is called James Metius by Descartes), petitioning for the exclusive right of selling an instrument of his invention by which distant objects appear larger and more distinct. He states that he had discovered the instrument by accident when engaged in making experiments, and had so far perfected it that distant objects were made as visible and distinct by his instrument as could be done with the one which had been lately offered to the states by a citizen and spectacle­maker of Middelburg. Among the Acts of the states-general pre­served in the Government archives at The Hague, Van Swinden found that on 2d October 1608 the assembly of the states took into consideration the petition of Hans Lippershey, spectacle-maker, a native of Wesel and an inhabitant of Middelburg, inventor of an instrument for seeing at a distance. On 4th October a committee was appointed to test the instrument, and on the 6th of the same month the assembly agreed to give Lippershey 900 florins for his instrument. Further, on the 15th December of the same year they examined an instrument invented by Lippershey at their request to see with both eyes, and gave him orders to execute two similar instruments at 900 florins each ; but, as many other persons had knowledge of this new invention to see at a distance, they did not deem it expedient to grant him an exclusive privilege to sell such instruments. The dates of these documents dispose effectually of Borel’s statement that Lippershey borrowed the ideas of Jansen in 1610. They also prove that, whilst Metius was in possession of a telescope, with which he may have experimented, about the time when Lippershey presented his application for patent rights, yet he makes no pretension that Lippershey borrowed the invention from him. The conclusion is that Lippershey was the first person who independently invented the telescope, and at the same time made the instrument known to the world. The common story is that Lippershey, happening one day, whilst holding a spectacle-lens in either hand, to direct them towards the steeple of a neighbouring church, was astonished, on looking through the nearer lens, to find that the weathercock appeared nearer and more distinct. He fitted the lenses in a tube, in order to adjust and preserve their relative distances, and thus constructed his first telescope. But doubt may be thrown on this traditional account owing to the further statement that the image of the weathercock so viewed was seen turned upside down. All the original Dutch telescopes were composed of a convex and a concave lens, and telescopes so con­structed do not invert. The inverting telescope, composed of two convex lenses, was a later invention ; still it is not impossible that the original experiment was made with two convex lenses.

Telescopes seem to have been made in Holland in con­siderable numbers soon after the date of their invention, and rapidly found their way over Europe. Sirturus, in his *De Telescopio* (1618), states that “a Frenchman pro­ceeded to Milan in the month of May 1609 and offered a telescope for sale to Count di Fuentes”; and Lorenzi Pigorna writes,@@[[2]](#footnote-3) under date 31st August 1609, that “Galileo had been appointed lecturer at Padua for life on account of a perspective like the one which was sent from Flan­ders to Cardinal Borghese.” Simon Marius, the German astronomer, appears to have made astronomical observa­tions in 1609 with a telescope which he procured from Holland, and Professor Rigaud of Oxford found from the MSS. of Harriot, the mathematician, that he had been making astronomical observations with a Dutch telescope as early as July 1609. Galileo, in his *Nuncius Sidereus,* states that, happening to be in Venice about the month of May 1609, he heard that a Belgian had invented a per­spective instrument by means of which distant objects appeared nearer and larger, and that he discovered its construction by considering the effects of refraction. In his *Saggiatore* Galileo states that he solved the problem of the construction of a telescope the first night after his return to Padua from Venice, and made his first telescope next day by fitting a convex lens in one extremity of a leaden tube and a concave lens in the other one. A few days afterwards, having succeeded in making a better telescope than the first, he took it to Venice, where he communicated the details of his invention to the public, and presented the instrument itself to the doge Leonardo Donato, sitting in full council. The senate, in return, settled him for life in his lectureship at Padua and doubled his salary, which was previously 500 florins, and which then became treble that which any of his predecessors had enjoyed. Galileo may thus claim to have invented the telescope independently, but not till he had heard that others had done so. In fact the time was ripe ; and, as often happens in similar circumstances, only a hint was necessary to complete the latent chain of thought. Galileo devoted all his time to improving and perfecting the telescope. Knowing the theory of his instrument, and possessed of much practical skill, coupled with unwearied patience, he conquered the difficulties of grinding and polishing the lenses, and soon succeeded in producing telescopes of greatly increased power. His first telescope magnified three diameters ; but he soon made instruments which magnified eight diameters, and finally one that magnified thirty-three diameters.@@3 With this last in­strument he discovered in 1610 the satellites of Jupiter, and soon afterwards the spots on the sun, the phases of Venus, and the hills and valleys on the moon. He demon­strated the rotation of the satellites of Jupiter round the planet, and gave rough predictions of their configurations, proved the rotation of the sun on its axis, established the general truth of the Copernican system as compared with that of Ptolemy, and fairly routed the fanciful dogmas of the philosophers. These brilliant achievements, together with the immense improvement of the instrument under the hands of Galileo, overshadowed in a great degree the credit due to the original discoverer, and led to the uni­versal adoption of the name of the Galilean telescope for the form of the instrument invented by Lippershey.

Kepler first explained the theory and some of the prac­tical advantages of a telescope constructed of two convex lenses in his *Catoptrics* (1611). The first person who actually constructed a telescope of this form was Father Scheiner, who gives a description of it in his *Rosa Ursina* (1630). William Gascoigne was the first who practically appreciated the chief advantages of the form of telescope suggested by Kepler, viz., the visibility of the image of a distant object simultaneously with that of a small material object placed in the common focus of the two lenses. This led to his invention of the micrometer and his application of telescopic sights to astronomical instruments of pre­cision (see Micrometer, vol. xvi. p. 242). But it was not till about the middle of the 17th century that Kepler’s telescope came into general use, and then, not so much because of the advantages pointed out by Gascoigne, but because its field of view was much larger than in the Galilean telescope. The first powerful telescopes of this construction were made by Huygens, after much labour, in which he was assisted by his brother. With one of these, of 12-feet focal length, he discovered the brightest of Saturn’s satellites (Titan) in 1655, and in 1659 he published his *Systema Saturnium,* in which was given for the first time a true explanation of Saturn’s ring, founded on observations made with the same instrument. The sharpness of image in Kepler’s telescope is very inferior to that of the Galilean in­strument, So that when a high magnifying power is required it becomes essential to increase the focal length. Cassini discovered Saturn’s fifth satellite (Rhea) in 1672 with a telescope of 35 feet, and the third and fourth satellites in 1684 with telescopes made by Campani of 100 and 136 feet focal length. Huygens states that he and his brother

@@@3 This last power could not be exceeded with advantage in this form of telescope till after the invention of the achromatic object-glass.

1. @@@ See Dr Moll of Utrecht, in *Journ. Roy. Inst.,* vol. i., 1831. [↑](#footnote-ref-2)
2. *@@@ Lettre d'Uomini Illustri,* p. 112, Venice, 1744. [↑](#footnote-ref-3)