to him the invention of *forty* mechanical contrivances; the moderns regard him as the founder of Mechanics. The protracted defense of Syracuse against the Romans, sustained chiefly by his machines, is a wonderful fact in history.

MECHANICS.

Mechanics in some form, must have had an existence almost commensurate with the creation of man. Power and motion belong to life. Their application was needed even in the preparation of food and clothing. Implements were required in the erection of the first hut and the formation of the first battle-club.

The growth of mechanics must have been rapid. The love of power is deeply seated in the heart; and every instrument that could multiply its force would be eagerly sought. Mechanical inventions were the earliest indications of inventive skill. What they were in ancient times, history only indicates—indicates in the ruins of India, Babylon, Egypt, Tyre, and Asia Minor.

Archimedes must be regarded as the founder of this branch of physical science. He was born in Syracuse. 287 B.C. He laid down the principles of *statics* and *hydrostatics*, and invented many machines.

Stevinus, an engineer of the Lower Countries, is the first person in modern times who advanced beyond the ancients. He lived in the sixteenth century.

Galileo promoted this branch of knowledge. He was born at Pisa, 1564. To him we are indebted for the first great steps in modern mechanics. Huggins contributed something. He explained the doctrine of the pendulum. Newton completed the superstructure of the principles of mechanics.

Since his day, the application of these principles has been incessant and varied. England and America have attained an eminence among the nations, on account of their machines. In the latter country, the geometrical lathe of Durand and the press of Hoe cannot be passed over. The former adorns our notes with the most beautiful machine-work, and by rendering counterfeiting impossible, gives security to our currency. The latter by its astonishing capacity, throws off 20,000 impressions in an hour.

The advantages arising from *applied mechanics* are of the greatest importance. To these advantages, as much as to anything else, England and America owe their greatness. Two structures may be named here,—the tubular bridge over Menai Straits, and the Crystal Palace. They are good instances of the perfection of applied mechanics, and the estimation in which the subject is held by the public.

ASTRONOMY.

The ancients were early drawn to the study of the heavens. The Chaldeans and Egyptians excelled in celestial observations. They named the planets, noticed eclipses, marked the constellations of Orion, Pleiades, Hyades, and Bootes, and divided the day into twelve hours. Speculation naturally arose. It was fruitless. The stars appeared as so many brilliant points revolving in a moveable sphere. Their explanations were only vague guesses at truth.

Astronomy lay in this state till Europe awoke from the dead lethargy of the middle ages. It was the first science that fixed the awakening mind. Purbech and Regiomanus prepared the way for Copernicus, the herald of the true system. He gave his views to the world in 1543. Kepler, born in 1570, added much to astronomical knowledge. His observations and reasoning were profound. He discovered the *ellipticity* of the orbits of the planets, and laid down what is known as the three *laws of nature*. While Kepler was thus engaged in explaining the motions of the planets, Galileo, the martyr of astronomy, constructed the telescope. The moon was observed, and a resemblance between the heavenly bodies and the earth indicated. The armed eye gazed upon new fixed stars, and the satellites of Jupiter and Saturn.

With *Newton*, the study of astronomy commenced a new era. The time for establishing the true system on principles had arrived. The motion of the heavenly bodies was compared with the laws of motion as known upon the earth.—The great law of attraction was discovered.

During the last fifty years, the progress of astronomy has been rapid. Instruments have been perfected, and their range enlarged. Lord Rosse's telescope has found a record in every daily sheet. Observatories are multiplied. The theory of comets has been explained. A single year's observations at Washington gives us 15,000 stars, most of which are unknown. New planets are added almost monthly to the record of worlds.

OPTICS.

The science of optics was long neglected. The subtle nature of light seems to have eluded the observations of the acients. Euclid began the study.

In the eleventh century, Alhazen wrote a treatise on optics. He was acquainted with the anatomy of the eye. Bacon, in the seventeenth century made some good remarks on the uses of lenses. Spectacles were invented by Armato, Florentine, 1313. In the fifteenth century, Maurolicus pointed out the crystalline lens of the eye and explained in a good degree the nature of long and short-sighted eyes. Baptista Porta, a Neapolitan, invented the *Camera Obscura*, about the year 1560. It led Kepler to explain the action of the eye in vision. The rainbow was explained in 1610, by Dominis. In 1590, Jansen, Middleburgh, in Zealand, invented the telescope. The news of this was immediately communicated to Galileo, who constructed one and turned it to the heavens. From this time forward, the science of optics rose into notice. Descartes, Gregory, Barrow, Higgins and Newton labored to promote its growth. The theory of light proposed by Newton, for a long time commanded respect. It was the theory of *emission*. Light is thrown off from all luminous bodies. The