

Although the purity and rarely-disturbed transparency of the sky of Arabia must have especially directed the attention

*Arts*, 1807, vol. i., p. 191) does not either doubt that Ebn-Junis, at the end of the tenth century, applied the pendulum to the measurement of time, but he ascribes the first combination of the pendulum with wheel-work to Sanctorius, in 1612, therefore forty-four years before Huygens. With reference to the very elaborately constructed clock included in the presents which Haroun Al-Raschid, or, rather, the Calif Abdallah, sent, two hundred years earlier, from Persia to Charlemagne at Aix-la-Chapelle, Eginhard distinctly says that it was moved by water (*Horologium ex aurichalco arte mechanica mirifice compositum, in quo duodecim horarum cursus ad clepsidram vertebatur*); *Einhardi Annales*, in Pertz's *Monumenta Germaniæ Historica, Scriptorum*, t. i., 1826, p. 195. Compare H. Mutius, *De Germanorum Origine, Gestis, &c. Chronic.*, lib. viii., p. 57, in *Pistorii Germanicorum Scriptorum*, t. ii., Francof., 1584; Bouquet, *Recueil des Historiens des Gaules*, t. v., p. 333 and 354. The hours were indicated by the sound of the fall of small balls, and by the coming forth of small horsemen from as many opening doors. The manner in which the water acted in such clocks may indeed have been very different among the Chaldeans, who "weighed time" (determining it by the weight of fluids), and in the clepsydras of the Greeks and the Indians; for the hydraulic clock-work of Ctesibius, under Ptolemy Energetes II., which marked the (civil) hours throughout the year at Alexandria, was never known, according to Ideler, under the common denomination of *κλεψύδρα*. (Ideler's *Handbuch der Chronologie*, 1825, bd. i., s. 231.) According to the description of Vitruvius (lib. ix., cap. 4), it was an actual astronomical clock, a "horologium ex aqua," a very complicated "machina hydraulica," working by toothed wheels (*versatilis tympani denticuli æquales alius alium impellentes*). It is therefore not improbable that the Arabs, who were acquainted with the improved mechanical constructions in use under the Roman empire, may have succeeded in constructing an hydraulic clock with wheel-work (*tympana quæ nonnulli rotas appellant, Græci autam πεπιροχα*. Vitruvius, x., 4). Leibnitz (*Annales Imperii Occidentis Brunsvicensis*, ed. Pertz, t. i., 1843, p. 247) expresses his admiration of the construction of the clock of Haroun Al-Raschid (*Abd-Allatif*, trad. par Silvestre de Sacy, p. 578). The piece of mechanism which the sultan sent from Egypt, in 1232, to the Emperor Frederic II., seems, however, to have been much more remarkable. It was a large tent, in which the sun and moon were moved by mechanism, and made to rise and set, and show the hours of the day and night at correct intervals of time. In the *Annales Godefridi Monachi S. Pantaleonis apud Coloniam Agrippinam*, it is said to have been a "tentorium, in quo imagines solis et lunæ artificialiter motæ cursum suum certis et debitis spatiis peragrant, et horas diei et noctis infallibiliter indicant." (*Freheri Rerum Germanicarum Scriptores*, t. i., Argentor., 1717, p. 398.) The monk Godefridus, or whoever else may have written the annals of those years in the chronicle composed for the convent of St. Pantaleon at Cologne, which was probably the work of many different authors (see Böhmer, *Fontes Rerum Germanicarum*, bd. ii., 1845, s. xxxiv.-xxxvii.), lived in the time of the great Emperor Frederic II. himself. The emperor caused this curious work, the value of which was estimated at 20,000 marks, to be preserved at Venusium, with other treasures. (Fried. von Raumer, *Gesch. der Hohenstaufen*, bd. iii., s. 430.)