

intercalation. This can hardly be considered as an improvement in the Greek calendar already described.

The first cycle which produced any near correspondence of the reckoning of the moon and the sun, was the *Octaëteris*, or period of 8 years: 8 years of 354 days, together with 3 months of 30 days each, making up (in 99 lunations) 2922 days; which is exactly the amount of 8 years of $365\frac{1}{4}$ days each. Hence this period would answer its purpose, so far as the above lengths of the lunar and solar cycles are exact; and it might assume various forms, according to the manner in which the three intercalary months were distributed. The customary method was to add a thirteenth month at the end of the third, fifth, and eighth year of the cycle. This period is ascribed to various persons and times; probably different persons proposed different forms of it. Dodwell places its introduction in the 59th Olympiad, or in the 6th century, B. C.: but Ideler thinks the astronomical knowledge of the Greeks of that age was too limited to allow of such a discovery.

This cycle, however, was imperfect. The duration of 99 lunations is something more than 2922 days; it is more nearly $2923\frac{1}{2}$; hence in 16 years there was a deficiency of 3 days, with regard to the motions of the moon. This cycle of 16 years (*Heccædecaëteris*), with 3 interpolated days at the end, was used, it is said, to bring the calculation right with regard to the moon; but in this way the origin of the year was displaced with regard to the sun. After 10 revolutions of this cycle, or 160 years, the interpolated days would amount to 30, and hence the end of the lunar year would be a month in advance of the end of the solar. By terminating the lunar year at the end of the preceding month, the two years would again be brought into agreement: and we have thus a cycle of 160 years.²¹

This cycle of 160 years, however, was calculated from the cycle of 16 years; and it was probably never used in civil reckoning; which the others, or at least that of 8 years, appear to have been.

The cycles of 16 and 160 years were corrections of the cycle of 8 years; and were readily suggested, when the length of the solar and lunar periods became known with accuracy. But a much more exact cycle, independent of these, was discovered and introduced by Meton,²² 432 years B. C. This cycle consisted of 19 years, and is so correct and convenient, that it is in use among ourselves to this day. The time occupied by 19 years, and by 235 lunations, is very nearly the same;

²¹ Geminus. Ideler.

²² Ideler, *Hist. Unters.* p. 208.