attacks of the men of the north, represented by Ammianus Marcellinus as being the Picts divided into two tribes (the Dicaledones and the Vecturiones), the Saxons, the Attacotti, and the Scots. He was so far successful that the countries between the walls of Hadrian and Antoninus became yet again a subjected province, named Valentian by Theodosius, in honour of the emperor,—a conquest, however, which can have lasted but a brief period. Henceforth, if we except the effusions of the poet Claudian, the scanty notices of Britain to be met with during several succeeding centuries present the same sad tale of sufferings inflicted on the now effeminate Britons of the south by their warlike neighbours, till at length the settlement of large bodies of Saxons in England changed the aspect of affairs.

The etymology of the word Caledonia has been variously given. *Celydd* (in Welsh, a woody shelter) is the popular derivation; but Isaac Taylor (*Words and Places*, p. 44) thinks the word may possibly contain the root *gael*, and if so, the Caledonians would be the Gaels of the duns or hills. Equally obscure are the ethnological relations of the people, the most probable opinion being that which regards them as belonging to the British branch of the great Celtic family. A casual inference, hazarded by Tacitus (*Agricola*, chap. xi.), that the red hair and large limbs of the inhabitants of Caledonia point clearly to a German origin, must not be pressed too far. There were probably even in his day Teutonic settlements along our eastern and northern shores, but it seems too much to assume that that race was the dominant one north of the Forth. It is a still more doubtful question to what race the Picts belonged. But the discussion of these and other points belongs to the history of SCOTLAND (*q.v.*) (See *Claudii Ptolemæi Geographia*, ed. Wilberg, Essendiæ, 1838; Roy's *Military Antiquities of the Romans in North Britain*, London, 1793; Burton's *History of Scotland*, vol. i., Edin. 1867.) (J. M'D.)

CALENBERG, or KALENBERG, a former principality of Hanover, which was traversed by the Weser and the Leine, and had an area of about 1050 square miles. It derived its name from an ancient castle, now in ruins. In the Middle Ages it belonged to Lüneburg, and after passing from one branch to another of the house of Brunswick, it came, in 1705, to Ernst August, electoral prince of Hanover.

CALENDAR

A CALENDAR is a method of distributing time into certain periods adapted to the purposes of civil life, as hours, days, weeks, months, years, &c.

Of all the periods marked out by the motions of the celestial bodies, the most conspicuous, and the most intimately connected with the affairs of mankind, are the *solar day*, which is distinguished by the diurnal revolution of the earth and the alternation of light and darkness, and the *solar year*, which completes the circle of the seasons. But in the early ages of the world, when mankind were chiefly engaged in rural occupations, the phases of the moon must have been objects of great attention and interest,—hence the *month*, and the practice adopted by many nations of reckoning time by the motions of the moon, as well as the still more general practice of combining lunar with solar periods. The solar day, the solar year, and the lunar month, or lunation, may therefore be called the *natural* divisions of time. All others, as the hour, the week, and the civil month, though of the most ancient and general use, are only arbitrary and conventional.

DAY.—The true solar day is the interval of time which elapses between two consecutive returns of the same terrestrial meridian to the sun. By reason of the inclined position of the ecliptic, and the unequal progressive motion of the earth in its orbit, it is not always of the same absolute length. But as it would be hardly possible, in the artificial measurement of time, to have regard to this small inequality which is besides constantly varying, the *mean solar day* is employed for all civil purposes. This is the time in which the earth *would* make one revolution on its axis, as compared with the sun, if the earth moved at an equable rate in the plane of the equator. The mean solar day is therefore a result of computation, and is not marked precisely by any astronomical phenomenon; but its difference from the true solar or apparent day is so small as to escape ordinary observation.

The subdivision of the day into twenty-four parts, or hours, has prevailed since the remotest ages, though different nations have not agreed either with respect to the epoch of its commencement or the manner of distributing the hours. Europeans in general, like the ancient Egyptians, place the commencement of the civil day at midnight, and reckon twelve morning hours from midnight to mid-day, and twelve evening hours from mid-day to midnight. Astronomers, after the example of Ptolemy, regard the day as commencing with the sun's culmination, or noon, and find it most convenient for the purposes of computation to reckon through the whole twenty-four hours. Hipparchus reckoned the twenty-four hours from midnight to midnight. Some nations, as the ancient Chaldeans and the modern Greeks, have chosen sunrise for the commencement of the day; others, again, as the Italians and Bohemians, suppose it to commence at sunset. In all these cases the beginning of the day varies with the seasons at all places not under the equator. In the early ages of Rome, and even down to the middle of the 5th century after the foundation of the city, no other divisions of the day were known than sunrise, sunset, and mid-day, which was marked by the arrival of the sun between the Rostra and a place called Græcostasis, where ambassadors from Greece and other countries used to stand. The Greeks divided the natural day and night into twelve equal parts each, and the hours thus formed were denominated *temporary hours*, from their varying in length according to the seasons of the year. The hours of the day and night were of course only equal at the time of the equinoxes. The whole period of day and night they called νυχθήμερον.

WEEK.—The week is a period of seven days, having no reference whatever to the celestial motions,—a circumstance to which it owes its unalterable uniformity. Although it did not enter into the calendar of the Greeks, and was not introduced at Rome till after the reign of Theodosius, it has been employed from time immemorial in almost all eastern countries; and as it forms neither an aliquot part of the year nor of the lunar month, those who reject the Mosaic recital will be at a loss, as Delambre remarks, to assign to it an origin having much semblance of probability. It might have been suggested by the phases of the moon, or by the number of the planets known in ancient times, an origin which is rendered more probable from the names universally given to the different days of which it is composed. In the Egyptian astronomy, the order of the planets, beginning with the most remote, is Saturn, Jupiter, Mars, the Sun, Venus, Mercury, the Moon. Now, the day being divided into twenty-four hours, each hour was consecrated to a particular planet, namely, one to Saturn, the following to Jupiter, the third to Mars, and so on according to the above order; and the day received the name of the

planet which presided over its first hour. If, then, the first hour of a day was consecrated to Saturn, that planet would also have the 8th, the 15th, and the 22nd hour; the 23rd would fall to Jupiter, the 24th to Mars, and the 25th, or the first hour of the second day, would belong to the Sun. In like manner the first hour of the 3rd day would fall to the Moon, the first of the 4th day to Mars, of the 5th to Mercury, of the 6th to Jupiter, and of the 7th to Venus. The cycle being completed, the first hour of the 8th day would return to Saturn, and all the others succeed in the same order. According to Dio Cassius, the Egyptian week commenced with Saturday. On their flight from Egypt, the Jews, from hatred to their ancient oppressors, made Saturday the last day of the week.

The English names of the days are derived from the Saxon. The ancient Saxons had borrowed the week from some Eastern nation, and substituted the names of their own divinities for those of the gods of Greece. In legislative and justiciary acts the Latin names are still retained.

Latin.	English.	Saxon.
Dies Solis.	Sunday.	Sun's day.
Dies Lunæ.	Monday.	Moon's day.
Dies Martis.	Tuesday.	Tiw's day.
Dies Mercurii.	Wednesday.	Woden's day.
Dies Jovis.	Thursday.	Thor's day.
Dies Veneris.	Friday.	Friga's day.
Dies Saturni.	Saturday.	Seterne's day.

MONTH.—Long before the exact length of the year was determined, it must have been perceived that the synodic revolution of the moon is accomplished in about $29\frac{1}{2}$ days. Twelve lunations, therefore, form a period of 354 days, which differs only by about $11\frac{1}{4}$ days from the solar year. From this circumstance has arisen the practice, perhaps universal, of dividing the year into twelve *months*. But in the course of a few years the accumulated difference between the solar year and twelve lunar months would become considerable, and have the effect of transporting the commencement of the year to a different season. The difficulties that arose in attempting to avoid this inconvenience induced some nations to abandon the moon altogether, and regulate their year by the course of the sun. The month, however, being a convenient period of time, has retained its place in the calendars of all nations; but, instead of denoting a synodic revolution of the moon, it is usually employed to denote an arbitrary number of days approaching to the twelfth part of a solar year.

Among the ancient Egyptians the month consisted of thirty days invariably; and in order to complete the year, five days were added at the end, called supplementary days. They made use of no intercalation, and by losing a fourth of a day every year, the commencement of the year went back one day in every period of four years, and consequently made a revolution of the seasons in 1461 years. Hence 1461 Egyptian years are equal to 1460 Julian years of $365\frac{1}{4}$ days each. This year is called *vague*, by reason of its commencing sometimes at one season of the year, and sometimes at another.

The Greeks divided the month into three decades, or periods of ten days,—a practice which was imitated by the French in their unsuccessful attempt to introduce a new calendar at the period of the Revolution. This division offers two advantages: the first is, that the period is an exact measure of the month of thirty days; and the second is, that the number of the day of the decade is connected with and suggests the number of the day of the month. For example, the 5th of the decade must necessarily be the 5th, the 15th, or the 25th of the month; so that when the day of the decade is known, that of the month can scarcely be mistaken. In reckoning by weeks, it is necessary to keep in mind the day of the week on which each month begins.

The Romans employed a division of the month and a method of reckoning the days which appear not a little extraordinary, and must, in practice, have been exceedingly inconvenient. As frequent allusion is made by classical writers to this embarrassing method of computation, which is carefully retained in the ecclesiastical calendar, we here give a table showing the correspondence of the Roman months with those of modern Europe.

Days of the Month.	March. May. July. October.	January. August. December.	April. June. September. November.	February.
1	Calendæ.	Calendæ.	Calendæ.	Calendæ.
2	6	4	4	4
3	5	3	3	3
4	4	Prid. Nonas.	Prid. Nonas.	Prid. Nonas.
5	3	Nonæ.	Nonæ.	Nonæ.
6	Prid. Nonas.	8	8	8
7	Nonæ.	7	7	7
8	8	6	6	6
9	7	5	5	5
10	6	4	4	4
11	5	3	3	3
12	4	Prid. Idus.	Prid. Idus.	Prid. Idus.
13	3	Idus.	Idus.	Idus.
14	Prid. Idus.	19	18	16
15	Idus.	18	17	15
16	17	17	16	14
17	16	16	15	13
18	15	15	14	12
19	14	14	13	11
20	13	13	12	10
21	12	12	11	9
22	11	11	10	8
23	10	10	9	7
24	9	9	8	6
25	8	8	7	5
26	7	7	6	4
27	6	6	5	3
28	5	5	4	Prid. Cal. Mart.
29	4	4	3	
30	3	3	Prid. Calen.	
31	Prid. Calen.	Prid. Calen.		

Instead of distinguishing the days by the ordinal numbers first, second, third, &c., the Romans counted *backwards* from three fixed epochs, namely, the *Calends*, the *Nones*, and the *Ides*. The Calends (or Kalends) were invariably the first day of the month, and were so denominated because it had been an ancient custom of the pontiffs to call the people together on that day, to apprize them of the festivals, or days that were to be kept sacred during the month. The Ides (from an obsolete verb *iduare*, to divide) were at the middle of the month, either the 13th or the 15th day; and the Nones were the *ninth* day before the Ides, counting inclusively. From these three terms the days received their denomination in the following manner:—Those which were comprised between the Calends and the Nones were called *the days before the Nones;* those between the Nones and the Ides were called *the days before the Ides;* and, lastly, all the days after the Ides to the end of the month were called *the days before the Calends* of the succeeding month. In the months of March, May, July, and October, the Ides fell on the 15th day, and the Nones consequently on the 7th; so that each of these months had six days named from the Nones. In all the other months the Ides were on the 13th and the Nones on the 5th; consequently there were only four days named from the Nones. Every month had eight days named from the Ides. The number of days receiving their denomination from the Calends depended on the number of days in the month and the day on which the Ides fell. For example, if the month contained 31 days, and the Ides fell on the 13th, as was the case in January, August, and December, there would remain 18 days after the Ides, which, added to the first of the following month, made 19 days of Calends. In January, therefore, the 14th day of the month was called the *nineteenth before the Calends of February* (counting inclusively), the 15th was the 18th before the Calends, and so on to the 30th, which was called the third before the Calends (*tertio Calendas*), the last being the second of the Calends, or the day before the Calends (*pridie Calendas*).

YEAR.—The year is either astronomical or civil. The solar astronomical year is the period of time in which the earth performs a revolution in its orbit about the sun, or passes from any point of the ecliptic to the same point again; and consists of 365 days 5 hours 48 min. and 46 sec. of mean solar time. The civil year is that which is employed in chronology, and varies among different nations, both in respect of the season at which it commences and of its subdivisions. When regard is had to the sun's motion alone, the regulation of the year, and the distribution of the days into months, may be effected without much trouble; but the difficulty is greatly increased when it is sought to reconcile solar and lunar periods, or to make the subdivisions of the year depend on the moon, and at the same time to preserve the correspondence between the whole year and the seasons.

Of the Solar Year.—In the arrangement of the civil year, two objects are sought to be accomplished,—first, the equable distribution of the days among twelve months; and secondly, the preservation of the beginning of the year at the same distance from the solstices or equinoxes. Now, as the year consists of 365 days and a fraction, and 365 is a number not divisible by 12, it is impossible that the months can all be of the same length, and at the same time include all the days of the year. By reason also of the fractional excess of the length of the year above 365 days, it likewise happens that the years cannot all contain the same number of days if the epoch of their commencement remains fixed; for the day and the civil year must necessarily be considered as beginning at the same instant; and therefore the extra hours cannot be included in the year till they have accumulated to a whole day. As soon as this has taken place, an additional day must be given to the year.

The civil calendar of all European countries has been borrowed from that of the Romans. Romulus is said to have divided the year into ten months only, including in all 304 days, and it is not very well known how the remaining days were disposed of. The ancient Roman year commenced with March, as is indicated by the names September, October, November, December, which the last four months still retain. July and August, likewise, were anciently denominated Quintilis and Sextilis, their present appellations having been bestowed in compliment to Julius Cæsar and Augustus. In the reign of Numa two months were added to the year, January at the beginning, and February at the end; and this arrangement continued till the year 452 B.C., when the Decemvirs changed the order of the months, and placed February after January. The months now consisted of twenty-nine and thirty days alternately, to correspond with the synodic revolution of the moon, so that the year contained 354 days; but a day was added to make the number odd, which was considered more fortunate, and the year therefore consisted of 355 days. This differed from the solar year by ten whole days and a fraction; but, to restore the coincidence, Numa ordered an additional or intercalary month to be inserted every second year between the 23rd and 24th of February, consisting of twenty-two and twenty-three days alternately, so that four years contained 1465 days, and the mean length of the year was consequently 366¼ days. The additional month was called *Mercedinus*, or *Mercedonius*, from *merces*, wages, probably because the wages of workmen and domestics were usually paid at this season of the year. According to the above arrangement, the year was too long by one day, which rendered another correction necessary. As the error amounted to twenty-four days in as many years, it was ordered that every third period of eight years, instead of containing four intercalary months, amounting in all to ninety days, should contain only three of those months, consisting of twenty-two days each. The mean length of the year was thus reduced to 365¼ days; but it is not certain at what time the octennial periods, borrowed from the Greeks, were introduced into the Roman calendar, or whether they were at any time strictly followed. It does not even appear that the length of the intercalary month was regulated by any certain principle, for a discretionary power was left with the pontiffs, to whom the care of the calendar was committed, to intercalate more or fewer days according as the year was found to differ more or less from the celestial motions. This power was quickly abused to serve political objects, and the calendar consequently thrown into confusion. By giving a greater or less number of days to the intercalary month, the pontiffs were enabled to prolong the term of a magistracy, or hasten the annual elections; and so little care had been taken to regulate the year, that, at the time of Julius Cæsar, the civil equinox differed from the astronomical by three months, so that the winter months were carried back into autumn, and the autumnal into summer.

In order to put an end to the disorders arising from the negligence or ignorance of the pontiffs, Cæsar abolished the use of the lunar year and the intercalary month, and regulated the civil year entirely by the sun. With the advice and assistance of Sosigenes, he fixed the mean length of the year at 365¼ days, and decreed that every fourth year should have 366 days, the other years having each 365. In order to restore the vernal equinox to the 25th of March, the place it occupied in the time of Numa, he ordered two extraordinary months to be inserted between November and December in the current year, the first to consist of thirty-three, and the second of thirty-four days. The intercalary month of twenty-three days fell into the year of course, so that the ancient year of 355 days received an augmentation of ninety days; and the year on that occasion contained in all 445 days. This was called the last year of confusion. The first Julian year commenced with the 1st of January of the 46th before the birth of Christ, and the 708th from the foundation of the city.

In the distribution of the days through the several months, Cæsar adopted a simpler and more commodious arrangement than that which has since prevailed. He had ordered that the first, third, fifth, seventh, ninth, and eleventh months, that is January, March, May, July, September, and November, should have each thirty-one days, and the other months thirty, excepting February, which in common years should have only twenty-nine, but every fourth year thirty days. This order was interrupted to gratify the vanity of Augustus, by giving the month bearing his name as many days as July, which was named after the first Cæsar. A day was accordingly taken from February and given to August; and in order that three months of thirty-one days might not come together, September and November were reduced to thirty days, and thirty-one given to October and December. For so frivolous a reason was the regulation of Cæsar abandoned, and a capricious arrangement introduced, which it requires some attention to remember.

The additional day which occurred every fourth year was given to February, as being the shortest month, and

was inserted in the calendar between the 24th and 25th day. February having then twenty-nine days, the 25th was the 6th of the calends of March, *sexto calendas*; the preceding, which was the additional or intercalary day, was called *bis-sexto calendas*,—hence the term *bissextile*, which is still employed to distinguish the year of 366 days. The English denomination of *leap-year* would have been more appropriate if that year had differed from common years in *defect*, and contained only 364 days. In the ecclesiastical calendar the intercalary day is still placed between the 24th and 25th of February; in the civil calendar it is the 29th.

The regulations of Cæsar were not at first sufficiently understood; and the pontiffs, by intercalating every third year instead of every fourth, at the end of thirty-six years had intercalated twelve times, instead of nine. This mistake having been discovered, Augustus ordered that all the years from the thirty-seventh of the era to the forty-eighth inclusive should be common years, by which means the intercalations were reduced to the proper number of twelve in forty-eight years. No account is taken of this blunder in chronology; and it is tacitly supposed that the calendar has been correctly followed from its commencement.

Although the Julian method of intercalation is perhaps the most convenient that could be adopted, yet, as it supposes the year too long by 11 minutes 14 seconds, it could not without correction very long answer the purpose for which it was devised, namely, that of preserving always the same interval of time between the commencement of the year and the equinox. Sosigenes could scarcely fail to know that this year was too long; for it had been shown long before, by the observations of Hipparchus, that the excess of 365¼ days above a true solar year would amount to a day in 300 years. The real error is indeed more than double of this, and amounts to a day in 128 years; but in the time of Cæsar the length of the year was an astronomical element not very well determined. In the course of a few centuries, however, the equinox sensibly retrograded towards the beginning of the year. When the Julian calendar was introduced, the equinox fell on the 25th of March. At the time of the Council of Nice, which was held in 325, it fell on the 21st; and when the reformation of the calendar was made in 1582, it had retrograded to the 11th. In order to restore the equinox to its former place, Pope Gregory XIII. directed ten days to be suppressed in the calendar; and as the error of the Julian intercalation was now found to amount to three days in 400 years, he ordered the intercalations to be omitted on all the centenary years excepting those which are multiples of 400. According to the Gregorian rule of intercalation, therefore, every year of which the number is divisible by four without a remainder, is a leap year, excepting the centurial years, which are only leap years when divisible by four after omitting the two ciphers. Thus 1600 was a leap year, but 1700, 1800, and 1900 are common years; 2000 will be a leap year, and so on.

As the Gregorian method of intercalation has been adopted in all Christian countries, Russia excepted, it becomes interesting to examine with what degree of accuracy it reconciles the civil with the solar year. According to the best determinations of modern astronomy (Le Verrier's *Solar Tables*, Paris, 1858, p. 102), the mean geocentric motion of the sun in longitude, from the mean equinox during a Julian year of 365·25 days, the same being brought up to the present date, is 360° + 27″·685. Thus the mean length of the solar year is found to be $\frac{360°}{360° + 27''\cdot685} \times 365\cdot25 = 365\cdot2422$ days, or 365 days 5 hours 48 min. 46 sec. Now the Gregorian rule gives 97 intercalations in 400 years; 400 years therefore contain 365 × 400 + 97, that is, 146,097 days; and consequently one year contains 365·2425 days, or 365 days 5 hours 49 min. 12 sec. This exceeds the true solar year by 26 seconds, which amount to a day in 3323 years. It is perhaps unnecessary to make any formal provision against an error which can only happen after so long a period of time; but as 3323 differs little from 4000, it has been proposed to correct the Gregorian rule by making the year 4000 and all its multiples common years. With this correction the rule of intercalation is as follows:—

Every year the number of which is divisible by 4 is a leap year, excepting the last year of each century, which is a leap year only when the number of the century is divisible by 4; but 4000, and its multiples, 8000, 12,000, 16,000, &c. are common years. Thus the uniformity of the intercalation, by continuing to depend on the number four, is preserved, and by adopting the last correction the commencement of the year would not vary more than a day from its present place in two hundred centuries.

In order to discover whether the coincidence of the civil and solar year could not be restored in shorter periods by a different method of intercalation, we may proceed as follows:—The fraction 0·2422, which expresses the excess of the solar year above a whole number of days, being converted into a continued fraction, becomes

$$\cfrac{1}{4+\cfrac{1}{7+\cfrac{1}{1+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{1+,\ \&c.}}}}}}$$

which gives the series of approximating fractions,

$$\frac{1}{4},\ \frac{7}{29},\ \frac{8}{33},\ \frac{31}{128},\ \frac{132}{545},\ \frac{163}{673},\ \&c.$$

The first of these, $\frac{1}{4}$, gives the Julian intercalation of one day in four years, and is considerably too great. It supposes the year to contain 365 days 6 hours.

The second, $\frac{7}{29}$, gives seven intercalary days in twenty-nine years, and errs in defect, as it supposes a year of 365 days 5 hours 47 min. 35 sec.

The third, $\frac{8}{33}$, gives eight intercalations in thirty-three years, or seven successive intercalations at the end of four years respectively, and the eighth at the end of five years. This supposes the year to contain 365 days 5 hours 49 min. 5·45 sec.

The fourth fraction, $\frac{31}{128} = \frac{24 + 7}{99 + 29} = \frac{3 \times 8 + 7}{3 \times 33 + 29}$, combines three periods of thirty-three years with one of twenty-nine, and would consequently be very convenient in application. It supposes the year to consist of 365 days 5 hours 48 min. 45 sec., and is practically exact.

The fraction $\frac{8}{33}$ offers a convenient and very accurate method of intercalation. It implies a year differing in excess from the true year only by 19·45 seconds, while the Gregorian year is too long by 26 seconds. It produces a much nearer coincidence between the civil and solar years than the Gregorian method; and, by reason of its shortness of period, confines the evagations of the mean equinox from the true within much narrower limits. It has been stated by Scaliger, Weidler, Montucla, and others, that the modern Persians actually follow this method, and intercalate eight days in thirty-three years. The statement has, however, been contested on good authority; and it seems proved (see Delambre, *Astronomie Moderne*, tom. i. p. 81) that the Persian intercalation combines the two periods $\frac{7}{29}$ and $\frac{8}{33}$. If they follow the combination $\frac{7 + 3 \times 8}{29 + 3 \times 33} = \frac{31}{128}$, their determination of the length of the tropical year has been extremely exact. The discovery of the period of thirty-three years is ascribed to Omar Cheyam, one of the eight astronomers appointed by Gelal-Eddin Malech Shah, sultan of Khorassan, to reform or construct a calendar, about the year 1079 of our era.

If the commencement of the year, instead of being retained at the same place in the seasons by a uniform method of intercalation, were made to depend on astronomical phenomena, the intercalations would succeed each other in an irregular manner, sometimes after four years and sometimes after five; and it would occasionally, though rarely indeed, happen, that it would be impossible to determine the day on which the year ought to begin. In the calendar, for example, which was attempted to be introduced in France in 1793, the beginning of the year was fixed at the midnight preceding the day in which the true autumnal equinox falls. But supposing the instant of the sun's entering into the sign Libra to be very near midnight, the small errors of the solar tables might render it doubtful to which day the equinox really belonged; and it would be in vain to have recourse to observation to obviate the difficulty. It is therefore infinitely more commodious to determine the commence-