ASTRONOMICAL INFORMATION.

CHRONOLOGICAL CYCLES FOR 1868.

Dominical Letters	E, D	Solar Cycle	1
Epact	6	Roman Indiction	11
Golden Number	7	Julian Period	6581

Explanation. — Take a year which is not leap-year and which begins on Sunday. Letter all the Sundays A, all the Mondays, B, etc. This lettering remains the same in all years, the twenty-ninth of February never receiving a letter. Then the *Dominical Letter* for any year is the letter denoting the Sundays; and since in leap-years the Sundays change their letters after the twenty-ninth of February, there are two dominical or Sunday letters for every leap-year, the first for January and February, and the second for the remaining months.

The *Epact* is the age of the moon at the beginning of the year. Nineteen years is very nearly equal to a whole number of lunar months; so that once in nineteen years the phases of the moon occur on the same days. These years are numbered from one to nineteen, and the *Golden Number* is the number of the year in this cycle of nineteen years.

A period of twenty-eight years is called the *Solar Cycle*, because in the twenty-ninth year after any year all the days of the week fall on the same days of the month as in the first year. These years are numbered, and 1868 is the first year of the new cycle, and all its days will correspond with those of 1840.

The *Roman Indiction* is a cycle or period of fifteen years, purely chronological, and much used in the Middle Ages. The first indiction began on the first of January, A. D. 313.

The *Julian Period* begins when the indiction, the solar cycle, and the lunar cycle all begin together, and is therefore 15 × 19 × 28 years in length, or 7980 years.

ECLIPSES.

There are no eclipses visible in the United States in 1868.

EXPLANATION OF THE CALENDAR.

The sun or moon is said to rise when its highest part reaches this horizon. In the case of the moon this part is generally dark.

In the column of moon's rising and setting, the time of only one of these events is given for each day, namely, that one which occurs while the sun is down. At the time of new moon, the moon sets about sunset, and sets later and later every night. Against the date of new moon, therefore, or thereabouts, " sets " appears in the column, and the numbers under it indicate the time on the different evenings at which the moon sets. In about a week the moon comes to set after midnight; upon one date, there-fore, it sets a little before midnight, and upon the following date it does not set at all, since on that night it does not set until after midnight, when the date changes. Against that date, therefore, "morn" is written, and the numbers following are the times in the morning at which the moon sets. About full moon, the moon begins to rise after sunset, and then it sets so late in the morning that the time of setting is of no consequence. We therefore stop giving that time and write "rises" in the column, and what follows are the times of rising in the evening. The rising takes place later every night, until it rises after midnight. Then a date occurs upon which it does not rise at all, and "morn" is written in the column, after which the moon rises in the morning.

TIDES.

There is not room in the calendar to give complete tide-tables. But the tides of the mornings of the 1st and 15th of each month are given; and by adding 26 minutes for each tide after those, the time of any tide can be found approximately. To find the time

more accurately, enter the following table* at the top with the name of the place, and at the side with the hour of the moon's southing found in the calendar, and in the body of the table will be found a number which, added to the time of the moon's southing, will give the time of high tide. The tides at San Francisco can only be found accurately by means of more extended tables.

Time of Moon's Southing.	Boston, Mass.	New York, N.Y.	Philadelphia, Penn.	Old Pt. Comfort, Va.	Baltimore, Md.	Smithville, N.C.	Charleston, S.C.	Fort Pulaski, Savannah, Ga.	Key West, Fla.	San Francisco, Cal.
h. m.	h. m.	h. m	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
0 0	11 38	8 20	1 31	8 55	6 47	7 26	7 38	7 30	9 33	12 5
0 30	11 33	8 18	1 28	8 49	6 42	7 21	7 33	7 25	9 26	11 59
1 0	11 28	8 15	1 25	8 44	6 37	7 16	7 27	7 19	9 19	11 53
1 30	11 24	8 10	1 21	8 40	6 31	7 13	7 21	7 15	9 13	11 47
2 0	11 20	8 6	1 18	8 35	6 26	7 9	7 16	7 11	9 6	11 41
2 30	11 16	8 0	1 14	8 32	6 21	7 6	7 12	7 8	9 1	11 36
3 0	11 13	7 55	1 11	8 27	6 17	7 4	7 8	7 6	8 57	11 33
3 30	11 10	7 52	1 8	8 22	6 13	7 3	7 5	7 5	8 53	11 33
4 0	11 7	7 52	1 6	8 20	6 11	7 2	7 2	7 4	8 53	11 38
4 30	11 6	7 52	1 3	8 21	6 10	7 3	7 2	7 3	8 56	11 46
5 0	11 6	7 53	1 0	8 23	6 10	7 4	7 3	7 4	9 2	11 55
5 30	11 9	7 56	0 59	8 26	6 13	7 6	7 7	7 6	9 10	12 3
6 0	11 13	7 59	0 59	8 32	6 19	7 9	7 12	7 8	9 22	12 11
6 30	11 19	8 5	1 1	8 39	6 25	7 13	7 19	7 12	9 33	12 16
7 0	11 25	8 11	1 7	8 48	6 32	7 17	7 24	7 16	9 49	12 23
7 30	11 32	8 17	1 15	8 58	6 39	7 23	7 32	7 22	10 0	12 29
8 0	11 38	8 23	1 23	9 4	6 44	7 28	7 38	7 28	10 6	12 34
8 30	11 43	8 27	1 29	9 8	6 49	7 33	7 45	7 34	10 7	12 37
9 0	11 47	8 32	1 34	9 10	6 52	7 37	7 48	7 39	10 6	12 36
9 30	11 48	8 34	1 39	9 12	6 54	7 39	7 50	7 42	10 3	12 34
10 0	11 49	8 35	1 42	9 10	6 53	7 40	7 50	7 43	9 59	12 30
10 30	11 48	8 34	1 43	9 8	6 52	7 40	7 47	7 41	9 56	12 24
11 0	11 47	8 31	1 41	9 4	6 50	7 36	7 44	7 37	9 48	12 17
11 30	11 43	8 25	1 37	9 2	6 48	7 30	7 41	7 34	9 40	12 9

THE SOLAR SYSTEM

consists of a Sun, Planets, rings of Meteors, other Meteors, Comets, Satellites of Planets, and Rings of Planets.

The Sun ☉ has a diameter one hundred and thirteen times as great as that of the Earth, and is four hundred thousand times as heavy. The amount of heat which it gives out in one hour is equal to that which a layer of coal ten feet thick, and having a surface equal to that of the sun, would give out in burning. The constitution of the Sun and the manner in which its temperature is kept up are not yet fully understood.

The Planets are, Mercury ☿, Venus ♀, the Earth ⊕, Mars ♂, ninety-six Asteroids or minute Planets, Jupiter ♃, Saturn ♄, Uranus ♅, Neptune ♆. The Earth is ninety-two million miles from the Sun; Neptune is at thirty times the distance, and Mercury at one third of the same distance.

Mercury has no satellite (as far as known), nor has Venus; the Earth has one ☾; Mars has none; Jupiter has four; Saturn, about eight; Uranus, six; and Neptune, one.

Saturn has a ring (or rather several in the same plane) which is supposed to be composed of meteors. The Earth has a gaseous ring, the appearance of which is called the "Zodiacal Light."

The Earth enters twice a year into a ring or rings of meteors round the Sun, and this gives rise to the showers on the mornings of the 10th of August and the 14th of November. Once in thirty-three years the shower is very brilliant.

The planets revolve nearly in the same plane and in the same direction. The comets do not share in these, and seem to enter the solar system accidentally. They become conspicuous, owing to the volumes of vapor which (as they approach the source of heat) surround them, and which trail behind them as tails. In those which return, the vaporous matter seems gradually to diminish.

* From the Coast Survey Report for 1864.