by the position of a shadow. A surface so marked is called a sundial, and would serve our purpose admirably if we did not have clocks and watches.

Because the sun does not actually stay on the celestial equator throughout the year, but rather moves along the ecliptic, appearing north of the equator in summer and south of it in winter, for the northern hemisphere, there is an apparent slowing up or increase in the speed of the sun, which can be determined in relation to an instrument which records a uniform speed, such as the watch. This difference in speed can be observed by comparing the sundial and watch. The sundial may record noon when the watch says ten minutes of that hour, or ten minutes after that hour. This is what your household friend, the almanac, calls 'sun slow' or 'sun fast'.

The terms 'sun slow' and 'sun fast' were familiar to our fathers and grandfathers. The sun is said to be slow because it records the hours after the clock has recorded them, and is said to be fast because it records the hours before the clock does. Thus the sun will be slow at some times of the year and fast at others. The exact difference for any day can be determined, which when subtracted from the dial reading when the sun is fast and added to it when slow will give watch time.

We have mentioned the apparent motion of the sun. Do you remember when you first learned that it was the earth turning upon its axis that made the sun move? Even a child in grammar school knows that the earth makes one complete turn about its axis from the west toward the east, every day, thus causing the sun to appear to move in a reverse direction from the east toward the west. It is the earth turning upon its axis that gives us our darkness and light. Hence, it is ob-

vious that a sundial in Boston would not show the same time as one in New York if both dials were read simultaneously. This is shown in Figure 12, where the real motion of the earth and the apparent motion of the sun are indicated. The two dials mentioned would not show the same time, owing

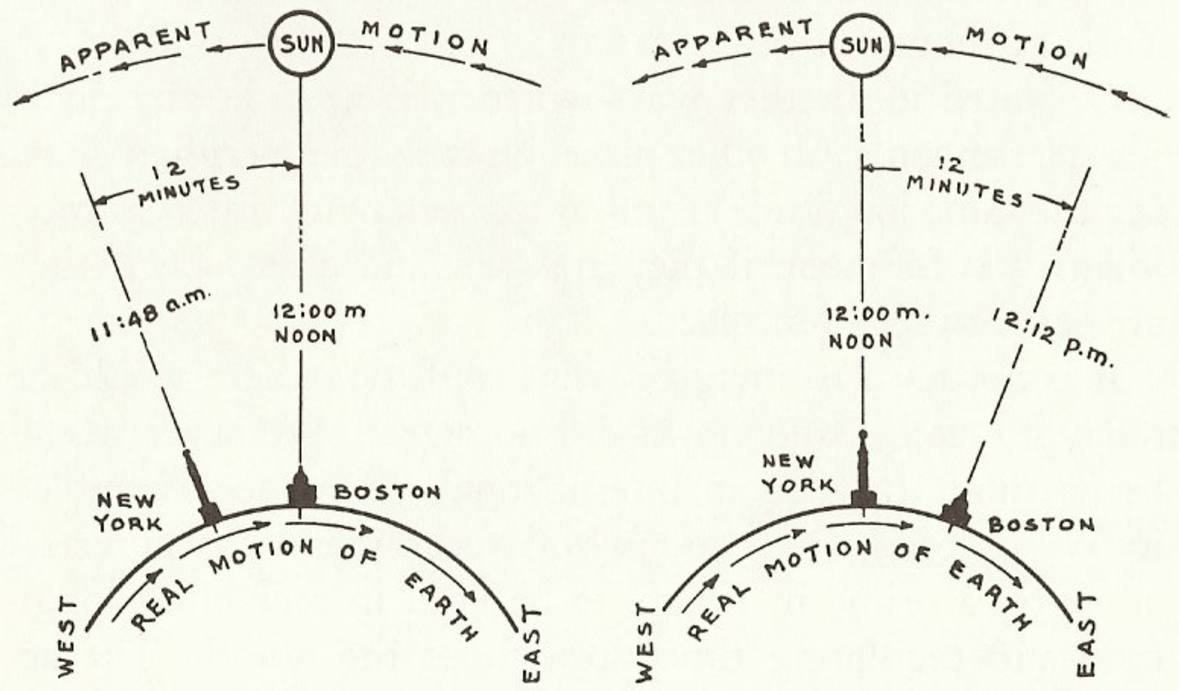

Fig. 12.

to the fact that when the sun is directly over Boston the sundial will read twelve o'clock. It will therefore take some time for the earth to turn sufficiently upon its axis so that the sun is directly over New York, at which time the New York dial will read twelve o'clock and the Boston one will record some few minutes after twelve.

Perhaps a few who read this will recall the days when watches acted the same way. That is, each locality had its own time—called local mean time. Consequently if a New Yorker set his watch at twelve noon and traveled to Boston, he would find that his watch did not agree with that of a Bostonian by some twelve minutes. The Bostonian's watch would be