busy providing for their issue, or preparing for winter quarters.

October. — This is the month when spiders of all kinds are most noticeable, their gossamer threads glistening high up in the air, or their webs disfiguring shrubs and buildings. Immigrant plant-lice come on the wing to store away the winter egg on congenial trees; and the other insects most noticeable are those which hibernate, and are getting ready to do so. The buck moth (Hemileuca maia) flies quietly, with its delicate crape-like wings, among the dropping leaves of the forest, and is the species most peculiar to the month.

November. — In this month most insects are hushed in death or torpor; but the fall canker-worm moths will rise from the ground after a severe frost, and many hibernating Hymenoptera and Coleoptera will take an airing when the weather is mild. The cluster-fly (Pollenia rudis) holds out against the cold much longer than the house-fly, which it so much resembles.

December. — Nothing peculiar marks this month; but most of the species mentioned for both November and January may be seen in December, when the temperature and circumstances favor.

WEATHER FORECASTS.

"Another storm brewing; I hear it
Sing i' the wind."

SHAKSPEARE.

THE methods by which weather forecasts are made are based almost wholly upon facts of observation rather than upon established deductions of science. This is unavoidable, because atmospheric movements are very complicated, and because the science of meteorology is not yet sufficiently advanced to satisfactorily explain them in the detail necessary for successful forecasting.

The leading fact upon which predictions depend is that atmospheric conditions advance in a direction generally easterly. The motion may vary in velocity, but in direction is usually between north-east and south-east, rarely towards any other point of the compass. During this advance, changes in condition may occur; and it is necessary to foresee the character of these changes, as well as the direction, and rate of motion. The indications of the barometer are the chief aid in understanding the weather conditions themselves, and the changes which may be expected. At any given moment there exist, in the territory occupied by the United States, differences in the atmospheric pressure which may amount to two inches in the height of the barometer. Usually there are one or more areas of pressure above the average, and one or more below the average, the pressures at intermediate points lying between the highest and lowest values. Each of these areas of high and of low pressure is accompanied by its peculiar conditions, and is moving towards the Atlantic coast with varying velocity. Thus the low area, if its centre is more than two or three tenths of an inch below the average pressure, is accompanied by clouds, and rain or snow, and forms a storm. The area of high pressure is usually attended by clear skies; and the radiation of solar heat to the earth during the day, or from the earth at night, is unchecked by clouds: consequently in summer, when the days are long, the temperatures which accompany an area of high pressure are above the average; while in winter, when the nights are long, low temperatures are found with high pressures. Many similar facts have been learned from the study of meteorological observations, upon which dependence is placed in weather-predicting.

Under the auspices of the U.S. signal-service, observations are made three times each day at a hundred and twenty-nine stations suitably located. Each of these observations is made at the same moment (seven A.M., three P.M., and eleven P.M., Washington time), and includes determinations of the atmospheric pressure, the temperature and humidity of the air, the direction and velocity of the wind, the kinds and motion of clouds, and other meteorological data. The results are at once telegraphed to the central office, and maps formed which show graphically the conditions at the moment of observation, and the changes which have occurred in the past few hours. From these maps a detailed prediction is made for the twenty-four hours following, based upon the conditions which exist at the time, the changes which have occurred, and the changes which, former experience shows, usually follow similar conditions.

The weather prediction thus assumes that coming changes will agree with the changes noted in former times under like circumstances. This is true on the average; but, whenever exceptions occur, the prediction fails. Increased skill in predicting depends upon increased skill in anticipating these exceptional cases. At the present time the government predictions are verified in eight cases out of ten. Reliable forecasts cannot be made for a period longer than twenty-four hours,

though it is hoped that an increase in the time may be successfully made at some future day. There is needed a better understanding of the laws which underlie atmospheric changes, so that empirical generalizations may give way to scientific deductions.

EARTHQUAKES IN THE UNITED STATES AND CANADA.

"Some say, the earth
Was feverous, and did shake."
SHAKSPEARE.

THE part of the earth's surface occupied by the United States is not generally regarded as much affected by earthquakes. As compared with some other localities, this is true; yet records show that moderate earthquakes are not so infrequent here as is usually supposed.

In the twelve years from 1872 to 1883 inclusive, three hundred and sixty-four earthquakes have been recorded as occurring in Canada and the United States, not including Alaska. Their geographical distribution may be expressed in this way. Suppose the country divided into three districts, — one extending from the Pacific Ocean eastward, to include Idaho, Utah, and Arizona, which may be called the Pacific slope; the second extending from Montana, Wyoming, Colorado, and New Mexico eastward, to include Ohio, Kentucky, Tennessee, and Alabama, which may be called the Mississippi valley; and the third, or Atlantic slope, extending eastward again to the Atlantic Ocean, and including the Appalachian region from the St. Lawrence to Florida and Georgia. Then the distribution of these three hundred and sixty-four earthquakes has been

Pacific slope	151
Mississippi valley	66
Atlantic slope	147
	364

These numbers indicate that about once in twelve days an earthquake occurs *somewhere* in the United States or Canada, and about once a month one occurs somewhere on the Atlantic slope.

It is quite likely, also, that for every earthquake which is of sufficient intensity to get itself noted in the midst of our busy American life, several lighter tremors may have occurred, which, although not violent enough to attract the attention of any one, would yet have left their record on a properly constructed seismoscope.

So, if any of our readers feel disposed to set up a seismoscope, they need not be deterred by the paucity of shocks in our country. A seismoscope anywhere along our eastern seaboard, or, still better, on the western coast, might fairly be expected to record ten or a dozen shocks in the course of the year, and might detect a much larger number. Such observations would be of high scientific value.

TEMPERATURE AND ITS CHANGES IN THE UNITED STATES.

"For hot, cold, moist, and dry, four champions fierce
Strive here for mastery."
MILTON.

IN the United States the changes of temperature with the seasons are of several types. These are illustrated in the accompanying diagrams, constructed chiefly from our signal-service reports; the thermometric scale being indicated by marks for every twenty degrees Fahrenheit on the left, and for every ten degrees Centigrade on the right, of each local division. The middle horizontal line shows the measure of that arithmetical abstraction commonly known as the mean annual temperature; and the adjoining lines above and below indicate how much variation there may be in the means of different years. In this respect, St. Vincent, Minn., has a much more irregular climate than Key West. The dots connected by a fine, dotted, curved line, represent the mean monthly temperature, beginning with October on the left side, descending to the January minimum, crossing the mean annual line about April, on the way to the July maximum, and descending again to October on the right margin. In illustration of the least annual variation, a curve is introduced for the equatorial station of Singapore, at the extremity of the Malay Peninsula, where the mean annual change is only seven degrees (F.); and, in contrast with this torrid uniformity, we find Yakutsk, Siberia, in the so-called temperate zone, giving the greatest known annual variation, on account of being far north, and far within a great continental region. St. Vincent, the coldest of the signal-service stations, is probably our nearest approach to this extreme variability.

The irregularity of the monthly means in different years is shown by short transverse lines above and below the dots: these are farther apart in winter than in summer, on account of the frequency of winter storms which produce great and sudden