

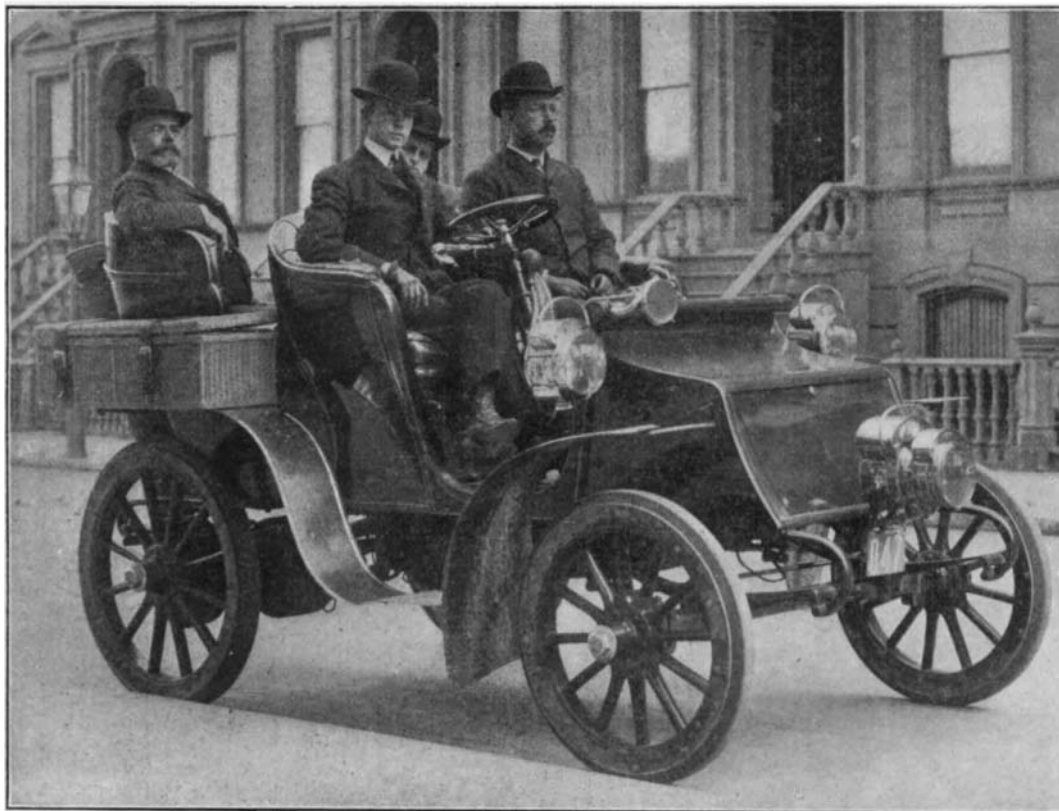
THE LONG-DISTANCE RECORD RUN OF AN AMERICAN ELECTRIC AUTOMOBILE.

The electric tonneau automobile shown herewith arrived in New York about noon on the 20th instant, after having made the journey of 244 miles by road from Boston in five days with five necessary re-chargings of the battery *en route*.

This is the first attempt that has ever been made in America to tour in an electric automobile, and great credit is due the Messrs. Babcock, father and son, of the Buffalo Electric Carriage Company, for demonstrating the entire practicability of touring in this, the pleasantest riding type of all automobiles.

Under the best conditions, the touring car illustrated is capable of making 75 miles on a charge; but, largely on account of rain and muddy roads, this mileage was reduced on the trip to an average of 47. The machine is fitted with forty 200 ampere-hour Helios-Upton lead storage battery cells of the pasted-plate type and weighing 31 pounds per cell. The battery is arranged in six crates placed in front and under the seats. Its total weight is 1,400 pounds, and that of the car, 3,640. The controller furnishes six speeds forward, the highest being 25 miles an hour, and the third, or regular running speed, 12½ miles an hour. Gilmore motors are used.

The trip from Boston to New York was made easily in five days, the tourists taking their time about it and thoroughly enjoying themselves, as they had no repairing or troubles of a mechanical nature to disturb them. A charging plug and rheostat were carried on the vehicle, and no difficulty was experienced in obtaining charging stations. Partial charges were put into the battery during stops for lunch at noon, and, altogether, the battery was charged ten times more or less completely throughout the journey of 244 miles. The cost for re-charging was \$15, or between four and five times the cost of gasoline for propelling a four-passenger gasoline car the same distance. Roughly speaking, therefore, this is the extra cost of safe, sure, and luxurious travel in an electric touring car.



ELECTRIC TOURING CAR WHICH RAN FROM BOSTON TO NEW YORK.

SUN SPOTS.

Mr. George H. Peters, of the Naval Observatory at Washington, D. C., has made probably the most elaborate investigation of the recently observed spots on the sun of which the daily press had so much to say. At first individual spots were seen forming a group; soon they diminished in number, the smaller spots consolidating with others. Altogether, the group was composed of about nine spots, and eventually condensed into two principal groups somewhat separated. On October 12 the total length of the disturbed region was 172,000 miles, with a width of about 59,000 miles, the aggregate length of the principal spots being about 123,000 miles. Such was the vast extent of the spots that they could easily be seen with the naked eye through a smoked glass.

Hardly a year passes but the intense whiteness of the solar image, when viewed through the telescope, is darkened here and there by spots. Usually they are little more than specks. Sometimes, as in the present instance, they attain vast proportions.

The first systematic observation of this constantly recurring phenomenon was made by Schwabe, a German observer, who, however, was not a professional astronomer. With characteristic German patience he began in 1825 to note the spots that could be seen each day. Year by year he continued his work. By 1833 the spots had almost ceased to appear. Although

little, if anything, was to be seen after that year, he continued his observations. Finally in 1836 the spots began to reappear. Apparently the appearance and disappearance followed some cycle. To determine whether or not the spots diminished and increased in number in accordance with any law, Schwabe kept up his daily observations for forty-two years. His patience was at last rewarded by the discovery of a law which has earned for him a lasting rank among astron-

omers. From Schwabe's observations it was found that the average period from one minimum to another is about 11.1 years, and that from one minimum to the next maximum is less than from that on to the next minimum again, or in other words, the spot quantity decreases through a little over seven years, and increases through less than four. No one knows just why this should be so. There is little substantial proof that the maximum and minimum periods coincide with other celestial phenomena.

It has been repeatedly stated that the appearance and disappearance of the sun spots have a marked influence upon the weather, and that it is possible by their means to predict good or bad years for farmers. Prof. S. P. Langley, who is probably the foremost American authority on solar physics, took the trouble to find out whether or not there was any marked influence upon agricultural conditions. Comparing the number of sun spots in certain years with the price of grain in the English market, for the corresponding years, he showed that there certainly was some coincidence. But no astronomer, least of all Prof. Langley,

was quite satisfied with such evidence. As he himself said, we might safely undertake, with study enough, to find a curve depending solely on certain planetary configurations, which would represent with quite striking agreement for a time, the rise and fall of any given railroad stock, the relative numbers of Democratic and Republican congressmen from year to year, or anything else with which the heavenly bodies have as little to do. The trouble with such an in-

vestigation, as Prof. Langley pointed out, is that the price of wheat is affected by too many things quite apart from the operations of nature, such as wars and legislation, corners of the market, and the like.

Viewed with a powerful telescope, a sun-spot appears as an enormous ragged hole in what may be considered the sun's crust, followed by a number somewhat smaller in size. Clearly, the spot is a cavity and not a protuberance. Slopes are visible. The spot seems like a saucer of irregular outline; but where there should be a bottom there is nothing but the blackness of an immeasurable chasm. Considering the sizes of spots such as those which Mr. Peters observed, it is apparent that this little earth of ours might be dropped into one of them as a pea into a thimble, without even grazing the sides.

Although there may be little, if any, connection between terrestrial agricultural conditions and the appearance of sun-spots, still it cannot be denied that the appearance of the spots is attended with other disturbances upon the earth. To-day the connection between the earth's magnetic condition and sun-spots is almost incontestable. Authorities have traced a kind of coincidence between the solar changes and our cyclones, storms, droughts, and floods. But the absence of sufficiently old records prevents us from establishing more than the fact that the magnetic conditions of the earth are disturbed. Mr. Peters noted a considerable disturbance of the magnetic needle during the recently observed

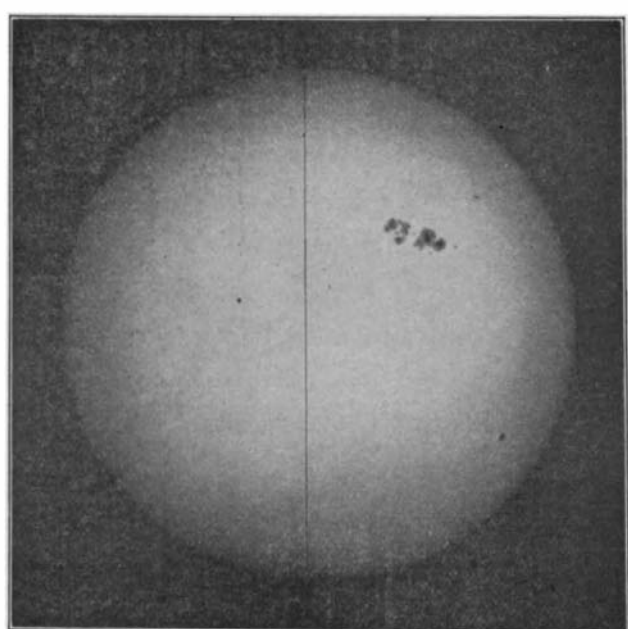
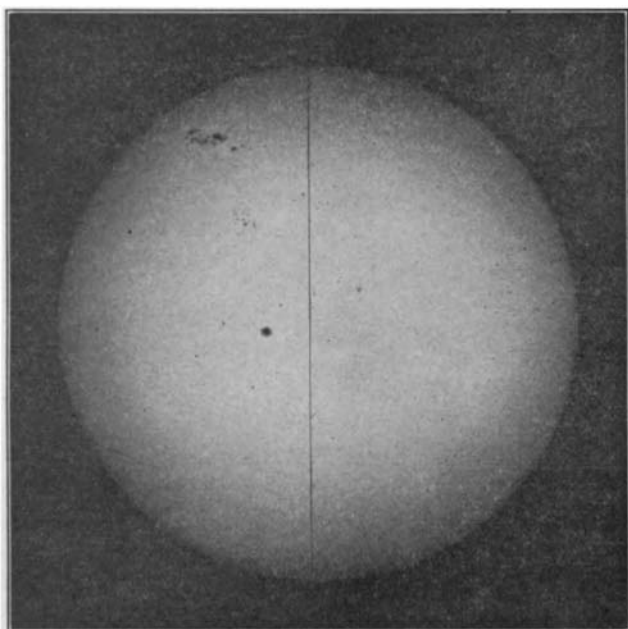
spots. It is to his courtesy that we are indebted for the two striking photographs which are herewith published.

American Bridges on the Uganda Railroad.

One of the most distinguishing features of the recently completed Uganda Railroad are the several viaducts and bridges constructed by the American Bridge Company, of Philadelphia. These viaducts are located upon that section of the railroad climbing the great Mau range. At this point the track has a rise and descent of 2,000 feet in 113½ miles between Nakuru and Kibigiri. This section was one of the most difficult to construct, necessitating abnormally heavy earthworks. Throughout this 113½ miles there are twenty-seven viaducts—nine on the ascent from Nakuru and eighteen on the descent to Kibigiri. The first bridge in the ascent is between stations Njoro and Elburgon. The summit of the climb is at mile 490, and the longest and most important bridge is one measuring 760 feet in length between abutments. It consists of thirteen spans, each of 40 feet, and twelve spans of 20 feet.

The second important bridge is at the 476½ mile post, which measures 639 feet from end to end, and comprises eleven spans of 40 feet and two spans of 20 feet. This bridge crosses a river at an altitude of 8,100 feet. On the descent the first of the eighteen bridges is located 8 miles from the summit of the escarpment, while the last is at the milepost 541. Near the station of Fort Ternan is built the most important of the various bridges in the whole 113½ miles at an altitude of 5,200 feet.

This bridge is 881 feet long between abutments, and is built in twenty-nine spans of 40 feet and 20 feet respectively. The next in point of importance, and which is the highest situated, is 560 feet in length, built in nineteen spans. At the milepost 522 is another viaduct, measuring 579 feet in length, consisting of ten 40-foot spans and nine 20-foot spans. The total cost of these twenty-seven bridges, including construction and erection, was approximately \$550,000.



SUN SPOTS PHOTOGRAPHED AT THE NAVAL OBSERVATORY, WASHINGTON, D. C., ON OCTOBER 12, 1903.