

earth. A number of mathematical calculations were made in order to check this, as well as the usual observations as taken by regular explorer's instruments.

Prof. Paulsen classes the Aurorae into two divisions. Those considered in the "first class" are those which are widely extended in their formation and also quite steady. They show no streamers worth mentioning. Generally speaking, they tend to rise slowly toward the zenith, and they do not affect the magnetic or compass needle appreciably. An Aurora of this type usually appears in the form of an arch or a multitude of arches. Extended regions of the Arctic and Antarctic skies often glow with a faint light, like translucent clouds. These luminous masses are very often observed 1,000 feet above the ground.

In the "second class" in the category of Aurorae may be mentioned those characterized by streamers or very distinct rays, which may be either sharply separated or they may blend at the bottom, presenting the appearance of mighty curtains, flapping gently, now rapidly, in the breeze.

It has been noted that these rays are invariably parallel with the magnetic or compass needle and when viewed perspective, they appear to diverge from the center of a radially striped corona. Aurorae of this class are not steady, but are traversed by a series of waves, as they rise from the Northern horizon and also they deflect the compass needle to the east, but after passing the zenith they cause a westward deviation of same. From these observations, Prof. Paulsen is inclined to believe that these streamers are only rays in which negative electric charges move downward toward the earth itself.

As our illustrations indicate, the Aurora Borealis does not start from the very edge of the horizon proper, but it begins at a considerable distance above the earth. The altitude of the base of the arches formed by the *Aurora ribbon*, if we may so call it, has been measured in various ways a number of times by explorers and others making a study of the subject. From various calculations by means of trigonometry and geometry and also by measurements made direct with surveying instruments, the average altitude of the arch above the earth's surface has been found to vary from 20 to 100 miles. Perhaps the highest altitudes that have been deduced, says Alfred Angot, in his excellent work on the subject are the following: as measured by Dalton, 150 miles; Loomis, 400 to 600 miles; Bergman, 468 miles; Boskovitch, 320; Fournerin, 1,006; Twining, 1,100 miles; Boller, 1,243 miles.

The upper altitude of these arches, of course, is naturally considerably higher, depending upon the magnitude of the particular Aurora observed.

Regarding the periodicity of the Aurora Borealis it may be said that for one thing it occurs as intimated previously, with every recurrence of large sun spots. Finally and in spite of its apparent irregularity, the Aurora Borealis seems to follow a well-established routine as to its occurrence and recurrence. The periods fairly well established for its appearance may be summed up as follows:

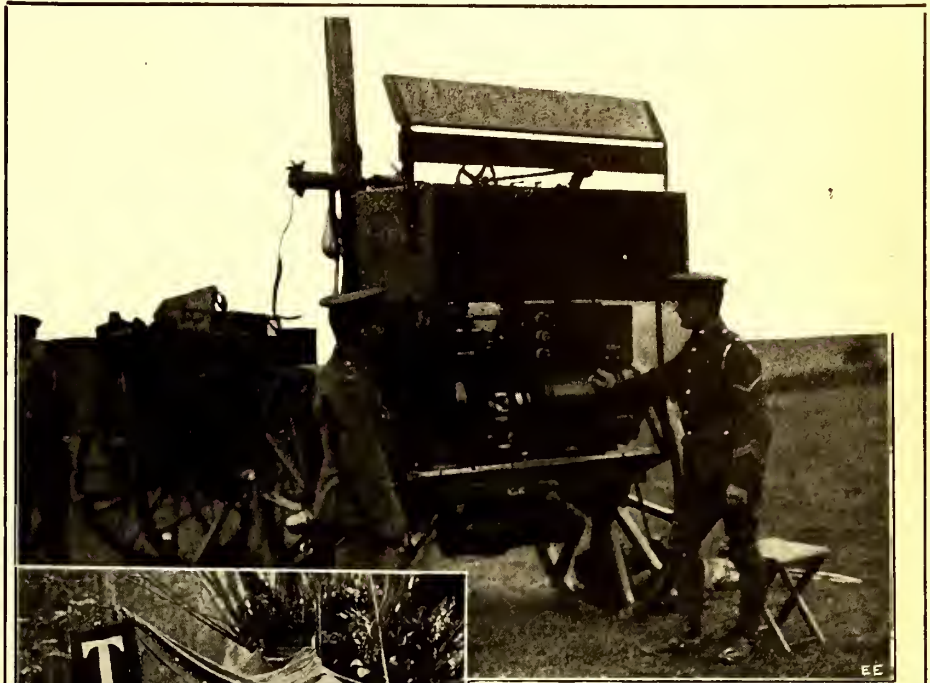
The diurnal period, the annual period and the period of a little more than 11 years. Among the occurrence periods not exactly known, but of which the existence seems to be proven, there is one of about 28 to 30 days and another of about 55½ years. Other occurrence periods have been surmised and mentioned by different authorities and investigators, especially a period of about 220 years, but they seem rather doubtful.

(Continued on page 300.)

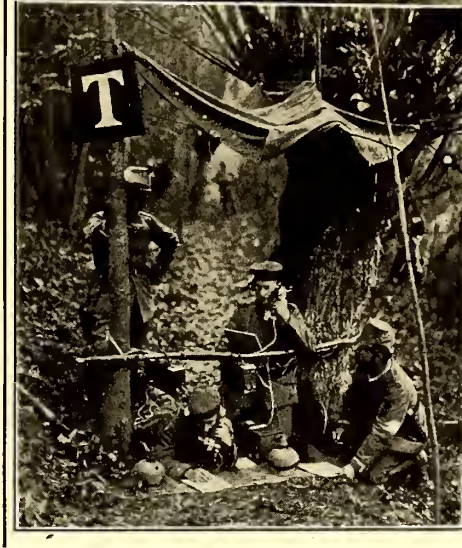
Wireless and Telephone Find Extensive Use in European Armies

Wireless telegraphy, as well as wire telephony and telephony, has found very extended application in the vast armies now battling over the face of Europe.

is surprising how quickly communication by telegraph, telephone or radio can be established between widely extended points of a mobile army. The telegraph and tele-



Photos by Paul Thompson.
Above: Modern Wireless "Cart" Set in Use by British Army in the Present Terrific European Conflict.



Below: German "Telephone" Station in Use at Advanced Posts in France.

phone wires are usually, in this case, let out from a reel carried on horseback, the horse also carrying a signal corps engineer.

It goes without saying that if it were not for the rapid and far-reaching means of communication now available, thanks to electricity, the rapid movement of troops could never be attempted with the success now attending such manoeuvres under actual battle conditions, as demonstrated time and again by the Germans as well as by the Allies' forces.

EXPORTERS ARE TOLD TO USE WIRELESS.

The American State Department, through the Atlanta Chamber of Commerce, recently notified Southern exporters to handle their foreign communications by wireless telegraphy to avoid the strict censorship which the belligerent nations have maintained on all cablegrams from the United States since the outbreak of the war.

This information was sent from Washington by Second Assistant Secretary of State Alvey A. Adee, following a protest from the chamber recently that a number of Atlanta exporting houses had been unable to communicate with their foreign agents on commercial matters by cablegram.

It has been advised by the State Department that the Postal Telegraph lines be used when wireless messages are sent via the Sayville radio station, and that the Western Union wires be used in the transmission of air messages from the Tucker-ton radio station.

Our first photograph shows a modern wireless "cart" set as used in the British army. These sets are very compact and can be unpacked and set up, ready for operation in transmitting radiograms over sections of several hundred miles, in a few minutes' time.

An oil or a gasoline engine is usually employed to drive an alternating-current generator, and the transformers in the radio transmitting set are thus supplied with current. These sets, as here shown, are usually rated at 1½ to 2 kw. and utilize a collapsible steel or wooden mast having a total height of 80 to 90 feet.

The second illustration shows the field "wire" telephone apparatus in actual use by the signal corps of the German army. This particular photograph was taken at one of the outlying advance posts of the German army near the Aisne. These telephone stations are indicated by a large letter "T" hung on the tree, as perceived. This is for the guidance only, of course, of members of the local regiment to which the instruments belong.

As may be seen, the apparatus is quite heavy in its make-up, and it is extremely necessary that such apparatus shall be very rugged, so as to withstand the severe wear and tear of military requirements. It

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