

RADIO—AERONAUTICS

Two New Methods of Gaging Altitude of Airplanes

Frequency Modulation Used in One System for Telling Distance From Ground; Low Frequency Used in Other

TWO METHODS of radio distance measurement, enabling pilots of airplanes to tell not only their distance above the ground, but also, in the case of one of the inventions, that from some reference station as well, are included in the patents issued recently by the U. S. Patent Office.

To Dr. Ernst F. W. Alexanderson, General Electric Company engineer, who has made many inventions pertaining to radio and television, was granted patent 2,248,599, which he assigned to his employers.

Frequency modulation, which is making possible static-free broadcasting, is used in this system. However, Dr. Alexanderson describes it as "a new and fundamentally different method" for distance measurement. Very simple apparatus, compared with some of the complicated devices that have been used for a similar purpose, is required.

From the airplane is sent out a high frequency radio signal, which is reflected back from the ground so as to create a series of standing waves below the aircraft. The frequency, or rate of vibration, of the transmitted wave is varied with great rapidity—so fast, in fact, that when the reflected wave has returned to the plane, and is picked up by a receiver, the frequency change has made a complete cycle. The transmitter is then sending out signals of the same frequency as when the wave left—or at least of some definitely related frequency.

The farther away the ground, the longer it takes the reflected wave to return, and the more slowly need the frequency be changed. The receiver picks up both the original wave, which has travelled but a few feet, and the reflected one. If the two frequencies are the same, there is none of the beat frequency between them that would occur if the two were out of step. In use, the control knob of the transmitter is graduated in terms of altitude. It is turned until the beat disappears, and then the height above the ground is indicated.

The other radio distance device won

patent 2,248,215 for Horace T. Budenbom, who assigned his rights to the Bell Telephone Laboratories, of New York City. Instead of using a high frequency, or short wave, he uses a low frequency, with a very long wave. The wave, in fact, is somewhat longer than the distance to be measured. By receiving it with two different receivers, each with its own special aerial, it is possible to determine the distance between the transmitter and the receivers, in terms of the length of the wave. The indications are made on a phase indicator, of which various types can be used. This can be calibrated in terms of one or more of the wavelengths used at the transmitter so as to show directly the actual distance.

In a modification of the device, the airplane sends out a signal from a

transmitter, to a receiver on the ground. This automatically retransmits it, and it is received back at the plane. Then the apparatus tells the time that was taken. In one form of Mr. Budenbom's invention, the altitude as well as the distance from the ground station are given with the same receiver. Since the ground-reflected wave that tells height comes back much sooner than the retransmitted one for distance measurement, it is possible to separate them by electrical filters, so each is indicated on its own dial.

Science News Letter, July 26, 1941

A 4,000-year-old *spearhead* used in the Stone Age has been found near Kemi, in northern Finland.

The New York Zoo is exhibiting famous breeds of beef dairy *cattle* in a special exhibit beside the world's wild and primitive cattle.

The *Chinese Dragon* is sometimes explained as having the "nine resemblances": deer horns, camel head, devil eyes, snake neck, sea serpent body, carp scales, hawk claws, tiger paws, and ox ears.



ORDINARY PHOTOGRAPHY

Show this picture and the one on the facing page to a photographer and ask him the difference between them. He will probably tell you that this one was taken with the diaphragm—the adjustable lens opening—opened to the limit. The one on the facing page, he will doubtless tell you, was made with the lens "stopped down," using a very small opening, to focus sharply on the foreground and the distant background in the mirror at the same time. As a matter of fact, both were made at the same lens opening of F. 2.7, with a motion picture camera. This picture was taken in the usual manner. The man in the foreground, 8 feet 6 inches away, is sharp, but the men in the distance, at 48 feet, are blurred.