part of the second recording (Fig. 2) the F-1 layer is composed of a wide band of reflections extending nearly up to the F-2 region. The boundary line of the E layer is quite distinct at all times, but this is not true of the F layers on the second recording. Rapid changes in signal strength and fluctuations of layer height were the causes of this condition. In other words, there was no sharp boundary existing at the time mentioned.

The heights of the layers are obtained from the recordings by measuring the distance between the edges of the unexposed portions of the film with a traveling microscope. The edges from which measurements are made are indicated in Fig. 2 by the letters Gnd, E, F_1, F_2. It is preferable to use the negatives directly for this purpose, since they are somewhat sharper than the positives.

This recording system has one inherent error which is common to all others with which the writers are familiar, namely, that changes in the strength of a received reflection produce what appears to be a change in the virtual height of the layer. This error arises because the time taken for the signal to pass through the receiver changes with input signal strength. The time lag is measured as shown in Fig. 3 by impressing the radio frequency pulse directly upon the deflecting plates of the oscilloscope. The pulse, after passing through the receiver, appears slightly to the right of the r.f. pulse. The distance D-1 is a measure of the time lag of a strong pulse and the distances D-2, and D-3 those of weaker ones.

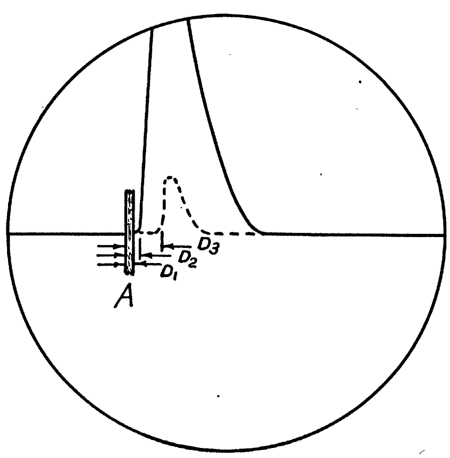

FIG. 3. *A* marks the position of a pulse which is impressed directly upon the oscilloscope itself. D-1, D-2, D-3 represent the distances to the right of pulses of different strengths which have passed through the receiver.

In the case of the National Fb-7 receiver, which is generally considered to be very satisfactory for ionospheric work, the lag is about 5 km for a strong pulse and about 20 km for a weak one. The effect of layer height apparently changing with variations in signal strength is clearly shown in Fig. 2 at the point indicated by the arrow. In this case the reflection became very weak and vanished for a short period of time. The height apparently changed from 127 km to 119 km in less than half a minute, but actually very little if any change took place.

This error may be largely eliminated by calibrating the receiver so that the lag for any value of signal strength is known. A correction can then be applied to the recorded data.

The error just discussed has seemingly been neglected by many investigators. A recent paper by E. C. Halliday[1] is of interest due to the high accuracy claimed ($\pm$ 0.5 km). In the method described, the time scale was greatly expanded to permit ease of measurement and the front edges of the pulses were caused to intersect the sweep line at a definite angle. While these are decided improvements, they do not correct the error due to receiver lag. Statements have been made that the layer heights will change as much as ten kilometers in less than one minute. Such changes are probably caused by variations in the signal strength of the reflections and not by sudden fluctuations in the height of the layer.

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[1] E. C. Halliday, *Proc. Phys. Soc. London*, 48: 421, 1936.

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