was filled with pieces of polished hæmatite, and beneath this, as Mr. Morris has fully explained in his recent book, is a disc of sandstone, of very ordinary quality, but not obtainable near Chichen Itzà.

The exact meaning of all this has remained uncertain. Mr. Morris found other discs of sandstone in the foundations of the later temple, and had inferred that they must have been held sacred, without suggesting any reason beyond their position and the fact that they were carefully protected from injury. While hearing Mr. Morris lecture on this subject, it occurred to me that in all probability the discs were connected with human sacrifices. The porous stone would become largely saturated with blood, and would thus afford a means of preserving the actual blood of the sacrificial victim in the foundations of the temple. The symbolism of the covering hæmatite would then be evident; it would present the appearance, when polished, of a pool of blood. Further confirmation appears to be afforded by the discovery, in an adjacent building, of another plaque and with it, covered with turquoise, a large knife or blade. This might have been the sacred instrument used in killing the victim. It is a question whether careful analysis would reveal any traces of blood now remaining in the sandstone discs, but it seems not impossible that this might be the case.

After consulting with Mr. Morris, I offer this note to direct attention to the matter, hoping that someone may be able to supply decisive evidence.

T. D. A. COCKERELL.

University of Colorado,
Boulder.
March 6.

Recording Wireless Echoes at the Transmitting Station

RECORDS of wireless echoes by the group-retardation method of Breit and Tuve[1] show that the intensities and number of echoes diminish as the receiver is brought near the transmitter. The minimum distance from the transmitter at which we could detect echoes was 400 metres[2]. The nearest distance at which interference phenomena between direct and sky waves have ever been noticed seems to be 180 yards[3]. The difficulty experienced in

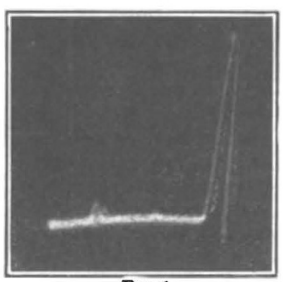

FIG. 1.

recording echoes at short distances from the transmitter is commonly supposed to be due to the enormous strength of the direct ground signal as compared with the strength of the echoes. This is undoubtedly one reason; but there is another reason to which proper attention has not been paid by investigators in this field.

In the group-retardation method, the transmitting aerial is energised for very short periods, for example, 1/5000 sec., at brief intervals of say 1/200 sec. The wave packet sent out during the active period of the aerial returns to the earth, during its quiescent period. During this latter interval, the transmitting aerial acts like a receiving aerial and collects energy from the reflected wave from over a comparatively large area surrounding it. The receiver with its small aerial, when brought within the 'collecting area' of the more efficient transmitting aerial, naturally fails to gather sufficient energy from the reflected wave and is unable to record the echoes.

It occurred to us that the difficulty mentioned above could be obviated if the transmitting aerial itself were utilised as a receiving aerial during its quiescent period when it absorbed energy from the reflected wave. Acting on this idea, the input coil of the receiver was coupled to the tuning inductance of the aerial, when echoes were recorded without much difficulty. A photograph of the echoes thus obtained is reproduced in Fig. 1. This, we believe, is the first record of echoes returned at absolutely normal incidence from the ionised layer. The direct signal of course comes out very strongly, but it can be kept down by suitable design of the receiver, such as by using an automatic volume control.

A great advantage of using the same aerial for transmitting as well as for receiving is that it dispenses with the necessity of erecting two stations, one transmitting and another receiving at two different localities, and employing two observers. A single observer is able to control and attend to both the transmitting and the receiving sides.

S. K. MITRA.
H. RAKSHIT.

Wireless Laboratory,
University College of Science,
92 Upper Circular Road,
Calcutta, March 25.

[1] Breit and Tuve, *Phys. Rev.*, **27**, 554; 1926.
[2] Mitra and Rakshit, *Phil. Mag.*, **15**, 20; 1933.
[3] Appleton and Naismith, *Proc. Roy. Soc.*, A, **137**, 36; 1932.

WE were much interested in a valuable paper by Mitra and Rakshit on "The Upper Ionized Atmosphere in Bengal"[1]. Their extension, to sub-tropical regions, of soundings of the ionosphere is very important. We are not concerned here to point out the bearing of the magneto-ionic theory on the results obtained by these authors, but the reading of the paper leads us to record one point arising from our experience of such work.

The receivers customarily used in pulse-reception at this Station are of the frequency-conversion type, with a band-width of 10 kc./sec., and with a diode as second detector. The ground distance between sender and receiver is only 120 metres, and the receiver was designed with such time-constants that the heavy overloading produced by the ground-pulse did not appear to lengthen the duration of the corresponding output-pulse as seen on the cathode ray oscillograph. This arrangement gives very satisfactory echo-patterns, and meets all our immediate requirements.

We were recently disconcerted to find, however, that the receiver as a whole was rendered relatively insensitive, for periods of many milliseconds, by the incidence of the strong ground-pulse, so that the electric forces, particularly in the earlier members of the echo pattern, were in fact higher than would have been inferred from the screen amplitudes and the steady state gain. Work towards removal of this

© 1933 Nature Publishing Group