Abstracts of Technical Articles by Bell System Authors

Notes on the Time Relation between Solar Emission and Terrestrial Disturbances.[1] Clifford N. Anderson. Although the correlation between general solar activity and terrestrial disturbances is quite evident, the association of individual storms with specific sunspot groups has never been very satisfactory. Disturbances sometimes have occurred when no sunspots were visible and at other times large sunspots have been unaccompanied by any abnormal disturbances. A possible explanation of such anomalies may lie in longer transit times for the disturbing solar emission than is usually assumed. Some indication is given in this paper that these transit times may range from periods as short as only one or two days to as much as three months. The corresponding velocities for the above transit times are of the order of 2000 and 20 kilometers per second.

Curves show the approximate relation between the angle of emission, velocity, day of emission, and the days intervening between the passage of a spot through the central meridian of the sun and the corpuscular encounter with the earth.

The Effect of the Earth's Curvature on Ground-Wave Propagation.[2] Charles R. Burrows and Marion C. Gray. Curves are presented for the rapid calculation of the ground wave for radio propagation over a spherical earth of arbitrary ground constants, antenna heights, and polarization.

Based on the pioneering work of G. N. Watson, a rigorous theory of the propagation of electromagnetic waves round a spherical earth has been developed in the past twenty years. Watson developed his method in detail only in the limiting case of an earth of infinite conductivity, but his work has since been extended by various authors to cover other values of the earth's conductivity. Theoretically, therefore, solutions are available for any values of the earth's constants (dielectric constant and conductivity) and for either vertically polarized or horizontally polarized waves. In practice, unfortunately, the computations required are lengthy and involved, and for the most part the recent theoretical papers have confined their calculations to a few specific values of the earth's constants. The present paper attempts to summarize the results so far obtained in a manner

[1] *Proc. I.R.E.*, November 1940.
[2] *Proc. I.R.E.*, January 1941.

that will make them more easily available to the practical engineer, and to fill the gaps in these results by developing a series of curves from which the field for any values of the earth's constants may be read, with all the accuracy that could be expected in engineering practice.

Electrical Breakdown of Anodically Oxidized Coatings on Aluminum: A Means of Checking Thickness of Anodized Finishes.[3] K. G. COMPTON and A. MENDIZZA. The existing methods for determining the thickness of anodically produced oxide coatings on aluminum are relatively few and are almost entirely of a destructive nature. It is a fairly well established fact that, within the thickness limits normally encountered in practice, the voltage breakdown is a linear function of thickness of oxide film. The authors have endeavored to utilize this fact in developing a test method for determining the thickness of coatings produced under known and controlled conditions with practically no injury to the finish. Data are given which show the relationship between breakdown resistance, anodizing time, thickness of coating, current density and sealing of anodically oxidized polished commercially pure aluminum. Statistical data for the values obtained are also given, indicating the good reproducibility of the breakdown values. By calibrating a particular anodic process, satisfactory results may be obtained in a relatively short time and often without destroying or marring the article. Since the oxide coating is not entirely homogeneous it is necessary to obtain a fairly large number of readings for every test condition. The authors have found that approximately twenty-five readings are usually sufficient and can be made in a relatively short time. Although only one of the many anodizing possibilities has been investigated, the applicability of this method of evaluating the thickness of oxide coatings may be extended to all commercial treatments.

Ultrasonic Absorption and Velocity Measurements in Numerous Liquids.[4] GERALD W. WILLARD. By means of ultrasonic light-diffraction phenomena the velocity and absorption of sound in some forty transparent liquids were measured in the frequency range of 6 to 30 Mc. Among the list of materials studied are mixtures of liquids in varying proportions, several solutions of solids in liquids, and a non-liquid jell. A novel-construction glass-to-metal-to-quartz cell made possible the study of highly solvent liquids. Velocity values were obtained from measurements of the diffraction spectra spacing. Absorption values were obtained by measurement of the sound radiator voltages required to produce certain color transmission effects at measured distances from the sound radiator. The use of a mercury arc light-source

[3] *A.S.T.M. Proc.*, Vol. 40, 1940.
[4] *Jour. Acous. Soc. Amer.*, January 1941.

enhanced the necessary color effects.   The relation between sound beam width (in the optical direction) and light transmission was studied.   In general, the values of velocity obtained were found to be independent of frequency, and the absorption to be proportional to frequency squared and unrelated to calculated viscous and thermal losses.   A simple calculation is proposed for estimating absorption errors caused by sound beam diffraction and spreading.   These apply as well to absorption measured in other methods than here used.