Abstracts of Technical Articles by Bell System Authors

Remaking Speech.[1] HOMER DUDLEY. Speech has been remade automatically from a buzzer-like tone and a hiss-like noise corresponding to the cord-tone and the breath-tone of normal speech. Control of pitch and spectrum obtained from a talker's speech are applied to make the synthetic speech copy the original speech sufficiently for good intelligibility although the currents used in such controls contain only low syllabic frequencies of the order of 10 cycles per second as contrasted with frequencies of 100 to 3000 cycles in the remade speech. The isolation of these speech-defining signals of pitch and spectrum makes it possible to reconstruct the speech to a wide variety of specifications. Striking demonstrations upon altering the pitch of the remade speech stress the contribution of the pitch to the emotional content of speech. Similarly the spectrum is shown to contribute most of the intelligibility to the speech.

Deviations of Short Radio Waves from the London–New York Great-Circle Path.[2] C. B. FELDMAN. During the past year experiments have been made to determine the frequency of occurrence and extent of deviations of short radio waves from the North Atlantic great-circle path. For this purpose the multiple-unit steerable antenna (Musa), described to the Institute at its 1937 convention, has been used to steer a receiving lobe horizontally. This is accomplished by arraying the unit antennas broadside to the general direction from which the waves are expected to arrive. The Musa combining equipment then provides a reception lobe in the horizontal plane, steerable over a limited range of azimuth. Two such Musas have been used, one of which possesses a wide steering range but is blunt, while the other is sharp but is restricted in range. Transmissions from England have been studied with this equipment at the Holmdel, N. J., radio laboratory of the Bell Telephone Laboratories. Comparisons of results obtained on transmission from antennas directed toward New York with those from antennas otherwise directed have, to a limited degree, given results representative of the effects of horizontally steerable transmitting directivity. Observations made on these British transmissions during the past eight months have disclosed the following characteristics:

[1] *Jour. Acous. Soc. Amer.*, October 1939.
[2] *Proc. I. R. E.*, October 1939.

1. During "all-daylight" path conditions, the usual multiplicity of waves distributed in or near the great-circle plane, which constitutes normal propagation, has been predominant. Usually neither ionosphere storms nor the catastrophic disturbances associated with short-period fade-outs seem to affect the mode of propagation.

2. In contrast to 1, during periods of dark or partially illuminated path conditions, the great-circle plane no longer provides the sole transmission path. The extent to which other paths are involved varies greatly. Propagation during inosphere storms of moderate intensity usually involves paths deviated to the south of the great circle, during afternoon and evening hours, New York time.

An Experimental Investigation of the Characteristics of Certain Types of Noise.[3] KARL G. JANSKY. The results of an investigation of the effect of the band width on the effective, average, and peak voltages of several different types of noise are given for band widths up to 122 kilocycles. For atmospheric noise and that due to the thermal agitation of electric charge in conductors, both of which consist of a large number of overlapping pulses, the peak, average, and effective voltages were all proportional to the square root of the band width. For very sharp, widely separated, clean, noise pulses, the average voltage was independent of the band width and the peak voltage was directly proportional to the band width. For noise of a type falling between these two the effect of the band width depended upon the extent of the overlapping.

The ratio of the peak to effective voltage of the noise due to the thermal agitation of electric charge in conductors was measured and found to be 4. The ratio of the average to effective voltage of this type of noise was found to be 0.85.

The experiments showed that when a linear rectifier, calibrated by a continuous-wave signal having a known effective voltage, is used to measure the effective voltage of this type of noise the measurements should be increased by ½ decibel to obtain the correct result.

Insulation of Telephone Wire with Paper Pulp.[4] J. S. LITTLE. The paper presented here covers the history and development of wood pulp insulation for telephone circuits. The development involved the study of wood pulps and their preparation, the methods of applying such pulp to wire, and the development of the necessary properties within the insulation to make it suitable for telephone use. The use

[3] *Proc. I. R. E.*, December 1939.
[4] *Wire and Wire Products*, October 1939.

of this insulation has made it possible to increase greatly the number of telephone circuits in a given cable by using finer wires and thinner insulations.

A General Radiation Formula.[5] S. A. SCHELKUNOFF. In this paper a general formula is derived for the power radiated in non-dissipative media by a given distribution of electric and magnetic currents. Magnetic currents are included not only for the sake of greater generality but also because in problems involving diffraction through apertures and radiation from electric horns, the radiation intensity can be made to depend upon fictitious electric- and magnetic-current sheets covering the apertures or horn openings.

Part I consists of an introductory discussion, summary of the formulas, and examples illustrating the convenience of the general formulas. Part II contains a mathematical derivation of the radiation formulas.

A Transmission System of Narrow Band-Width for Animated Line Images.[6] A. M. SKELLETT. A new method of transmission and reproduction of line images, e.g., drawings, is described which utilizes a cathode-ray tube for reproduction, the spot of which is made to trace out the lines of the image 20 or more times a second. The steps of the complete process are: first, the transcription of the line image into two tracks similar to sound-tracks on moving picture film; second, the production from these tracks of two varying potentials by means of photoelectric pick-up devices; third, the transmission of these potentials; and fourth, their application to the cathode-ray deflector plates to effect reproduction. Satisfactory transmission of fairly complex images, e.g., animated cartoons, could be effected within a total band-width of 10,000 cycles.

[5] *Proc. I. R. E.*, October 1939.
[6] *Jour. S. M. P. E.*, December 1939.