Abstracts of Articles from Bell System Sources

North Atlantic Ship-Shore Radio Telephone Transmission During 1932–1933.[1] CLIFFORD N. ANDERSON. This paper extends the analysis of ship-shore radio transmission data for an additional two-year period beyond that reported on in a previous paper. Contour diagrams show the variation of signal field with time of day and distance for the winter, summer, spring, and fall seasons and for the approximate frequencies 4, 8, and 13 megacycles.

A comparison is made with the data obtained during 1930 and 1931. In general, transmission during 1932–1933 tends to be somewhat better on frequencies below about 9 megacycles and somewhat poorer on frequencies above 9 megacycles. At 4 megacycles the increase is of the order of 10 decibels, and for 13 and 17 megacycles, the decreases are about 6 and 10 decibels, respectively.

Loudness, Pitch and the Timbre of Musical Tones and Their Relation to the Intensity, the Frequency and the Overtone Structure.[2] HARVEY FLETCHER. It is generally supposed that the three psychological characteristics of a musical tone, namely, loudness, pitch and timbre, are each directly dependent upon the corresponding physical characteristics of the sound wave producing the tone, namely, intensity, frequency of vibration and overtone structure. In this paper it is shown that each of the psychological characteristics is not dependent upon a single one but upon all three of the above mentioned physical characteristics. Quantitative measurements of these relationships have been made using a large number of observers. For example, it was found that one tone may have the same pitch and loudness as another and yet have an intensity 100 times as great, the difference being due to the difference in the overtone structure; or two tones may have the same pitch and overtone structure and yet have frequencies of vibration that differ as much as 5 per cent, the difference being due to the different intensity of the two tones. An empirical formula showing the dependence of loudness upon the three physical characteristics mentioned has been formulated although no such formula has been found for showing a similar relationship for pitch. Such a relationship is shown graphically for pure tones. Also some very marked effects upon

[1] *Proc. I. R. E.*, October, 1934.
[2] *Jour. Acous. Soc. Am.*, October, 1934.

the pitch of a musical tone due to the changes of overtone structure are described.

Overvoltages on Transmission Lines.[3] C. L. GILKESON and P. A. JEANNE. Observations of line-to-ground voltages have been made under routine operating conditions on an isolated neutral system, a Petersen coil system, 3 neutral resistance grounded systems, and 2 directly grounded systems. Results of these observations are given in this paper. Measurements were made with oscillographs supplemented, on all but 2 systems, by surge recorders.

An Acoustic Spectrometer.[4] C. N. HICKMAN. A series of tuned reeds are mounted so that they may be electromagnetically driven. Each reed carries a small concave mirror with which light from an illuminated slit is brought to a focus on a screen. These slit images are lined up in the order of the reed frequencies. When a current having a complex wave, such as the speech current from a microphone, is passed through the electromagnet, the reeds and in consequence the slit images on the screen will oscillate. The driving system and the reeds are so designed that the amplitude of oscillation of each image is proportional to the strength of the corresponding harmonic component in the driving current. Therefore, by observing or photographing the slit image amplitudes, the frequencies and the relative energy content of the components of a complex current may be determined. A spectrometer of this type covering a small frequency range (50 to 3109 cycles) was built for demonstration purposes. The range of such an instrument can be extended to higher and lower frequencies.

The Measurement of Harmonic Power Output of a Radio Transmitter.[5] P. M. HONNELL and E. B. FERRELL. A method of determining the harmonic power output of a high-frequency radio transmitter is described. It is a method for measuring the power delivered by the transmitter to the antenna system, as distinguished from the more common method of measuring harmonic field strengths at specified locations. It is essentially a comparison method. The unknown harmonic power, present with the fundamental, is compared by means of a sufficiently selective receiving set with a known comparison power which is supplied in the absence of the fundamental. The method in practice seems to be accurate within about one decibel. It is applicable to the measurement of power other than harmonic power.

[3] *Elec. Engg.*, September, 1934.
[4] *Jour. Acous. Soc. Am.*, October, 1934.
[5] *Proc. I. R. E.*, October, 1934.

Piezoelectric Frequency Control.[6] F. R. LACK. This paper discusses the use made of the piezoelectric effect in designing sub-standard timekeepers and frequency generators. The nature of the piezoelectric effect is outlined and mention is made of the various classes of crystals in which it is found. The technic of setting up, electrically, various types of mechanical vibrations in piezoelectric crystals is described together with methods of obtaining very high frequencies. Other applications of the piezoelectric effect, such as to loud speakers, submarine signaling, etc., are briefly reviewed.

Reverberation Measurements in Auditoriums.[7] G. T. STANTON, F. C. SCHMID and W. J. BROWN, JR. This paper presents some of the problems encountered in attempts to measure the reverberation time in auditoriums, and indicates certain procedures found helpful in their solution. In addition, comparison is offered between results obtained with two step-by-step methods and a continuous decay.

[6] *Jour. S. M. P. E.*, October, 1934.
[7] *Jour. Acous. Soc. Am.*, October, 1934.