

Abstracts of Technical Articles by Bell System Authors

*Capacitors—Their Use in Electronic Circuits.*¹ M. BROTHERTON. This book tells how to choose and use capacitors for electronic circuits. It explains the basic factors which control the characteristics of capacitors and determine their proper operation. It helps to provide that broad understanding of the capacitor problem which is indispensable to the efficient design of circuits. It tells the circuit designer what he must understand and consider in transforming capacitance from a circuit symbol into a practical item of apparatus capable of meeting the growing severity of today's operation requirements.

*Mica Capacitors for Carrier Telephone Systems.*² A. J. CHRISTOPHER AND J. A. KATER. Silvered mica capacitors, because of their inherently high capacitance stability with temperature changes and with age, now are used widely in oscillators, networks, and other frequency determining circuits in the Bell Telephone System. Their use in place of the previous dry stack type, consisting of alternate layers of mica and foil clamped under high pressures, has made possible considerable manufacturing economies in addition to improving the transmission performance of carrier telephone circuits. These economies are the result of their relatively simple unit construction and the ease of adjustment to the very close capacitance tolerance required.

*Visible Speech Translators with External Phosphors.*³ HOMER DUDLEY AND OTTO O. GRUENZ, JR. This paper describes some experimental apparatus built to give a passing display of visible speech patterns. These patterns show the analysis of speech on an intensity-frequency-time basis and move past the reader like a printed line. The apparatus has been called a translator as it converts speech intended for aural perception into a form suitable for visual perception. The phosphor employed is not in a cathode-ray tube but in the open on a belt or drum.

*The Pitch, Loudness and Quality of Musical Tones (A demonstration-lecture introducing the new Tone Synthesizer).*⁴ HARVEY FLETCHER. Relations are given in this paper which show how the pitch of a musical tone

¹ Published by D. Van Nostrand Company, Inc., New York, N. Y., 1946.

² *Elec. Engg., Transactions Section*, October 1946.

³ *Jour. Acous. Soc. Amer.*, July 1946.

⁴ *Amer. Jour. of Physics*, July-August 1946.

depends upon the frequency, the intensity and the overtone structure of the sound wave transmitting the tone. Similar relations are also given which show how the loudness and the quality depend upon these same three physical characteristics of the sound wave. These relationships were demonstrated by using the new Tone Synthesizer. By means of this instrument one is able to imitate the quality, pitch and intensity of any musical tone and also to produce many combinations which are not now used in music.

*The Sound Spectrograph.*⁵ W. KOENIG, H. K. DUNN, AND L. Y. LACY. The sound spectrograph is a wave analyzer which produces a permanent visual record showing the distribution of energy in both frequency and time. This paper describes the operation of this device, and shows the mechanical arrangements and the electrical circuits in a particular model. Some of the problems encountered in this type of analysis are discussed, particularly those arising from the necessity for handling and portraying a wide range of component levels in a complex wave such as speech. Spectrograms are shown for a wide variety of sounds, including voice sounds, animal and bird sounds, music, frequency modulations, and miscellaneous familiar sounds.

*Geometrical Characterizations of Some Families of Dynamical Trajectories.*⁶ L. A. MACCOLL. A broad problem in differential geometry is that of characterizing, by a set of geometrical properties, the family of curves which is defined by a given system of differential equations, of a more or less special form. The problem has been studied especially by Kasner and his students, and characterizations have been obtained for various families of curves which are of geometrical or physical importance. However, the interesting problem of characterizing the family of trajectories of an electrified particle moving in a static magnetic field does not seem to have been considered heretofore. The present paper gives the principal results of a study of this problem.

*Visible Speech Cathode-Ray Translator.*⁷ R. R. RIESZ AND L. SCHOTT. A system has been developed whereby speech analysis patterns are made continuously visible on the moving luminescent screen of a special cathode-ray tube. The screen is a cylindrical band that rotates with the tube about a vertical axis. The electron beam always excites the screen in the same vertical plane. Because of the persistence of the screen phosphor and the rotation of the tube, the impressed patterns are spread out along a horizon-

⁵ *Jour. Acous. Soc. Amer.*, July 1946.

⁶ *Amer. Math. Soc. Transactions*, July 1946.

⁷ *Jour. Acous. Soc. Amer.*, July 1946.

tal time axis so that speech over an interval of a second or more is always visible. The upper portion of the screen portrays a spectrum analysis and the lower portion a pitch analysis of the speech sounds. The frequency band up to 3500 cycles is divided into 12 contiguous sub-bands by filters. The average speech energy in the sub-bands is scanned and made to control the excitation of the screen by the electron beam which is swept synchronously across the screen in the vertical direction. A pitch analyzer produces a d-c. voltage proportional to the instantaneous fundamental frequency of the speech and this controls the width of a band of luminescence that the electron beam produces in the lower part of the screen. The translator had been used in a training program to study the readability of visible speech patterns.

*Derivatives of Composite Functions.*⁸ JOHN RIORDAN. The object of this note is to show the relation of the Y polynomials of E. T. Bell, first to the formula of DiBruno for the n th derivative of a function of a function, then to the more general case of a function of many functions. The subject belongs to the algebra of analysis in the sense of Menger; all that is asked is the relation of the derivative of the composite function to the derivatives of its component functions when they exist and no questions of analysis are examined.

*The Portrayal of Visible Speech.*⁹ J. C. STEINBERG AND N. R. FRENCH. This paper discusses the objectives and requirements in the portrayal of visible patterns of speech from the viewpoint of their effects on the legibility of the patterns. The portrayal involves an intensity-frequency-time analysis of speech and the display of the results of the analysis to the eye. Procedures for accomplishing this are discussed in relation to information on the reading of print and on the characteristics of speech and its interpretation by the ear. Also methods of evaluating the legibility of the visible patterns are described.

*Short Survey of Japanese Radar—I.*¹⁰ ROGER I. WILKINSON. The result of a study made immediately following the fall of Japan and recently made available for public information, this two-part report is designed to present a quick over-all evaluation of Japanese radar, its history and development. As the Japanese army and navy developed their radar equipment independently of each other, Part I of this article concentrates on the army's contributions.

⁸ *Amer. Math. Soc. Bulletin*, August 1946.

⁹ *Jour. Acous. Soc. Amer.*, July 1946.

¹⁰ *Elec. Engg.*, Aug.-Sept. 1946.

*A Variation on the Gain Formula for Feedback Amplifiers for a Certain Driving-Impedance Configuration.*¹¹ T. W. WINTERITZ. An expression for the gain of a feedback amplifier, in which the source impedance is the only significant impedance across which the feedback voltage is developed, is derived. As examples of the use of this expression, it is then applied to three common circuits in order to obtain their response to a Heaviside unit step-voltage input.

¹¹ *Proc. I.R.E.*, September 1946.