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*"Research is the effort of the mind to comprehend relationships which no one has previously known, and in its finest exemplification it is practical as well as theoretical, trending always toward worthwhile relationships, demanding common sense as well as uncommon ability."*

-- H. D. Arnold, 1925, first research director at Bell Labs

## *Bell System Technical Journal*

### *Paper Directory*

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#### *The Measurement of Acoustic Impedance and the Absorption Coefficient of Porous Materials*

E.C. Wentz and E.H. Bedell

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#### *The Rigorous and Approximate Theories of Electrical Transmission Along Wires*

John R. Carson

Problems here dealt with are to investigate conditions under which specification of system by means of itself and mutual impedances is valid and to provide general method for calculating these circuit parameters from geometry and electrical constants of system.

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#### *Some General Results of Elementary Sampling Theory for Engineering Use*

Paul P. Coggins

Problem considered is one generally known as "sampling" problems; sampling of attributes; sampling of variables; large number of charts showing sampling for various numbers of objects.

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*Electrical Measurement of Communication Apparatus*

W.J. Shackelton and J.G. Ferguson

Precision high-frequency measurements of fundamental type are described, special emphasis being placed on measuring circuits rather than on types of apparatus measured; standards of frequency, resistance, capacitance, and inductance are discussed; bridge measurements are described for measurement of frequency, inductance, effective resistance, capacitance, dielectric loss, capacitance balance and inductance balance.

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*The Diffraction of Electrons by a Crystal of Nickel*

C.J. Davisson

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*Grid Current Modulation*

Eugene Peterson and Clyde R. Keith

Discusses some of properties of type of modulator utilizing non-linear relation existing between grid voltage and grid current and advantages which recent laboratory investigations indicate that it may possess.

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*A High Efficiency Receiver of Large Power Capacity for Horn-type Loud Speakers*

E.C. Wentz and A.L. Thuras

Describes telephone receiver of moving-coil type which is particularly adaptable to horn type of loud speaker and which represents notable advance over similar devices at present available; discussion confined to operation of receiver when connected to tube of infinite length and of same cross-sectional area as throat of horn.

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*Joint Meeting of the Institution of Electrical Engineers and  
the American Institute of Electrical Engineers*

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*Transatlantic Telephony -- the Technical Problem*

O.B. Blackwell

Describes in rather nontechnical terms engineering problems involved in developing transatlantic radio trunk by means of which American telephone system can communicate with English telephone system, also with telephone systems of other European countries.

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*Transatlantic Telephony -- Service and Operating Features*

K.W. Waterson

Describes some of differences in operating practice on two sides of Atlantic and plans which were worked out for taking account of them in handling of commercial transoceanic calls.

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*Phase Distortion and Phase Distortion Correction*

Sallie Pero Mead

Analytical exposition of theory of phase distortion is followed by consideration of various methods of phase-distortion correction, with particular reference to terminal phase-compensating networks and to application of lattice network to loaded line as terminal phase corrector.

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### *High-Speed Ocean Cable Telegraphy*

Oliver E. Buckley

History of development of permalloy loaded cables, discussing certain outstanding problems concerned with their design, construction, and operation.

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### *The Present Status of Wire Transmission Theory and Some of its Outstanding Problems*

John R. Carson

Gives account, practically without mathematics, of classical transmission theory and its limitations; several ways problem may be attacked more fundamentally and rigorously, and lines along which transmission theory must be extended.

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### *Contemporary Advances in Physics, XV; The Classical Theory of Light, First Part*

Karl K. Darrow

Propagation of waves; wave equation; introduction of ideas of frequency and wave length; test of Kirchhoff's theorem; propagation of wave motion beyond apertures; diffraction from circular aperture; diffraction patterns in focal plane of lens. (See also Bell Telephone Laboratories -- Reprint, no. B-312, May 1928, 40 pp., 3 figs)

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### *Recent Developments in the Process of Manufacturing Lead-Covered Telephone Cable*

C.D. Hart

Reviews beginning of art; underwater cables; cable sheath; lead-antimony alloy sheath; cable-making machinery.

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### *Bridge for Measuring Small Time Intervals*

J. Herman

Bridge circuit for measuring time intervals from about one ten-thousandth of second up to several seconds is described and its operation explained; device is fairly accurate and easy to operate and gives results of measurements in fractions of second directly. (see also Bell Telephone Laboratories -- Reprint, no. B314, May 1928, 7 pp., 4 figs.)

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### *A Method of Rating Manufactured Product*

H.F. Dodge

Outlines method of rating manufactured product; while primary object is control of quality of finished product it is proving useful for measuring workmanship of individual operators and groups of operators engaged in similar production work; particular attention is directed to statistical aspects of rate to show how it can assist in controlling quality. (see also Mfg. Industries, vol. 16, no. 8, Dec. 1928, pp. 613-615, 5 figs)

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### *Abstracts of Technical Papers*

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### *Precision Tool Making for the Manufacture of Telephone Apparatus*

J.H. Kasley and F.P. Hutchison

Article outlines some of refinements of toolmaking art as practiced by this company; methods employed and precision necessary in building tools.

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### *The Natural Period of Linear Conductors*

C.R. Englund

Paper describes experimental determination of frequency of free electrical oscillation of straight rods and circular loops; results agree more closely with formula of Abraham than with that of MacDonald.

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*The Measurement of Capacitance in Terms of Resistance and Frequency*

J.G. Ferguson and B.W. Bartlett

Adaptation of bridge circuit due to M. Wien, together with apparatus and procedure, which permits measurement of capacitance in terms of resistance and frequency with accuracy comparable to that of primary standards; method is also applicable to determination of inductance.

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*Distortion Correction in Electrical Circuits with Constant Resistance Recurrent Networks*

Otto J. Zobel

General problem of distortion correction; method of correction and its application.

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*Transmission of Information*

R.V.L. Hartley

Quantitative measure of information is developed, based on physical as contrasted with psychological considerations; how rate of transmission of this information over system is limited by distortion resulting from storage of energy is discussed from transient viewpoint; several illustrations of application of this principle to practical systems; in case of picture transmission and television, special variation of intensity is analyzed by steady-state method.

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*Carrier Systems on Long Distance Telephone Lines*

H.A. Affel, C.S. Demarest, and C.W. Green

Describe recent activities of Bell System in development of long-distance multiplex telephone systems using carrier-current methods; new, so-called type C system which supplants earlier types of equipment is described, together with suitable repeaters and pilot-channel apparatus for insuring stability of operation; line problems are considered and typical installations pictured; growth of application of carrier-telephone systems and their increasingly important part in providing long-distance telephone service on open-wire lines. (See also Am. Inst. Elec. Engrs. -- JI vol. 47, no. 12, Dec. 1928 pp 868-872, 6 figs)

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### *The Practical Application of the Fourier Integral*

George A. Campbell

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### *Automatic Machine Gaging*

C.W. Robbins

Paper discusses advantages to be gained in certain types of large-scale production by substitution of automatic machine gaging for hand testing; machine will effect saving of \$8000 per year over cost of hand gaging on output of 4,500,000 blocks; author points out that in some instances automatic-machine gaging of entire product will cost less than sampling inspection.

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### *Contemporary Advances in Physics, XVI; The Classical Theory of Light, Second Part*

Karl K. Darrow

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*Harmonic Production in Ferromagnetic Materials at Low Frequencies and Low Flux Densities*

Eugene Peterson

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*Airways Communication Service*

Edward B. Craft

Collecting weather data and distributing local weather reports by special radiotelegraph network, commercial telegraph, and long-distance telephone; communication between fields necessary; advantages of telephone-typewriter; one and two-way radiotelephony for communication with airplanes; radio direction finding; flying radio laboratory of Bell Telephone Laboratories and development of two-way radiotelephony on short wave in cooperation with Boeing Air Transport Co. (See also Aviation vol. 25, no. 15, Oct. 6, 1928 pp. 1090-1091, 1136, 1138, 1140, 1142, 1144 and 1146, 5 figs; Bell Laboratories Rec., vol. 7, no. 2, Oct. 1928, pp. 33-37, 3 figs.)

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