

## Abstracts of Technical Articles From Bell System Sources.

*An Efficient Loud Speaker at the Higher Audible Frequencies.*<sup>1</sup> L. G. BOSTWICK. This paper describes a loud speaker designed for use as an adjunct to existing types for the purpose of extending the range of efficient performance to 11,000 or 12,000 cycles. A moving coil piston diaphragm structure is used in conjunction with a 2000-cycle cutoff exponential horn having a mouth diameter of about 2 inches. Motional impedance measurements on this loud speaker indicate an average absolute efficiency of about 20 per cent within the frequency range from 3000 to 11,000 cycles. The variation in response within this band does not exceed 5 db. By using a high-frequency loud speaker of this type the efficiency and power capacity of the associated low-frequency loud speaker can be improved and a uniform response-frequency curve from 50 to 12,000 cycles can be obtained.

*Results of Noise Surveys. Part I. Noise Out-of-Doors.*<sup>2</sup> ROGERS H. GALT. The purpose of a noise survey of a locality is to study the space and time distribution of noise intensity, the frequency composition of the noise, the contributions of various noise sources, the relation between the annoyance effect of the noise and its physical and auditory characteristics, and the effectiveness of methods of noise reduction. The extent to which each of these phases of the noise problem has been investigated heretofore has depended upon the point of view of the investigator and upon the apparatus employed. From one standpoint or another, any audible sound may fall within the category of noise; hence the variety of possible noise surveys is almost unlimited. Not many such surveys have been carried out, however, partly because the appropriate apparatus is of recent development; nor has any extensive comparison been published between the results obtained in different places and with different instruments. It has therefore seemed worth while to assemble such previously published results as are available, and certain new observations, in the present series of papers, of which this paper deals with noise out-of-doors.

*Microphonic Action in Telephone Transmitters.*<sup>3</sup> F. S. GOUCHER. This semi-technical article gives a brief resumé of the theories of microphonic action and describes the results of some experiments on the

<sup>1</sup> *Jour. Acous. Soc. Amer.*, July, 1930.

<sup>2</sup> *Jour. Acous. Soc. Amer.*, July, 1930.

<sup>3</sup> *Science*, Nov. 7, 1930.

contact behavior of granular carbon of the type used in commercial microphones.

A technique is described whereby contacts—either singly or in groups—may be studied under contact forces of the order of 1 dyne.

Through a study of the temperature coefficients of resistance of such contacts it is possible to conclude that the conducting portions of the contact junctions are of the nature of carbon and that new contact points are established or broken when the resistance is varied in a reversible resistance force cycle.

The experiments show that for such reversible cycles the relation between the resistance and force is of the approximate form  $R = K(F)^{-n}$ . The exponent  $n$  varies considerably from cycle to cycle but its average value depends on the force limits. The largest values of  $n$  are obtained with the aggregates of granules under such conditions of force limits that the elastic strains must be relatively large. A maximum mean value substantially independent of the force limits over a wide range closely approximates the value  $7/9$ .

This value  $7/9$  is the maximum given by a theory of contact resistance worked out by F. Gray, assuming that the contact is made between two spheres of conducting material having surface roughness equivalent to an assembly of minute spherical hills. On account of the elasticity of the material both the microscopic area of contact between the spheres and the microscopic areas of contact between the hills increase with contact force. A strained aggregate of granules may therefore be made to behave like an ideal single contact between spheres having a rough surface.

For single contacts and for aggregates at small strains the value of  $n$  falls below the minimum value  $1/3$  which is accounted for by theory. This is associated with internal contact forces, or cohesion, which render the contacts relatively insensitive to changes in the applied force. The existence of cohesion is readily demonstrated by the fact that contacts always require a finite force to break them even when no current has passed through the contact.

*The Architecture of Living Cells—Recent Advances in Methods of Biological Research—Optical Sectioning with the Ultra-Violet Microscope.*<sup>4</sup> F. F. LUCAS. In previous papers of the past few years the development and application of the ultra-violet microscope to the science of metallography have been described.

Metallography, at first thought, appears wholly unrelated to histology or other branches of biology but the two branches of science do

<sup>4</sup> *Proc. Nat. Acad. of Sciences*, Sept., 1930.

have many points in common. Both deal in the last analysis with the structure of matter and, in each, the microscope is an indispensable tool. Improvements in microscopic vision which enlarge the world of vision in one branch of science inevitably have a reflection in the other.

It is not the purpose of this paper to enter into a discussion of structures of living cells as revealed by the ultra-violet microscope. More particularly, the object is to present a tool for biological research; a tool which enables us to photograph the structure at different planes or levels within a single cell or group of cells; one which enables us to see the living cell with a degree of precision and clarity not heretofore possible by any other known means and with a potential resolving ability at least twice that of the best apochromatic system using visible light.

*Production of Plastic Molded Telephone Parts.*<sup>5</sup> A. M. LYNN. The Western Electric Company now manufactures for Bell System apparatus a large number of different phenol-plastic, shellac, and hard-rubber molded parts, the output of which varies from a few thousand to several million per year. The majority of these molded parts are produced in comparatively small quantities, but certain of them, such as the phenol-plastic molded parts used in the hand-set type of telephone, a new molded subscriber's set housing, and the receiver shell, cap, and mouthpiece used on the older type of desk-stand telephone, are heavy-running parts. The tools and press equipment used in the production of these parts are described in this paper.

*Variation of the Inductance of Coils Due to the Magnetic Shielding Effect of Eddy Currents in the Cores.*<sup>6</sup> K. L. SCOTT. An analysis is made of the shielding effect of eddy currents on the flux in the interior of cores of cylindrical or flat sheet material. It is shown that the counter voltage of self inductance of an iron-cored coil is due only to the component of flux in the core which is in phase with the flux at the surface of the core. Expressions are obtained and curves plotted showing the variations of inductance of a coil with frequency, or with the conductivity and permeability of the core material. Sample calculations and some experimental results are given. The results show that the inductances at high frequencies are actually less than the predicted values, which leads to the suspicion that some factor other than eddy currents causes the flux in the interior of the cores to decrease with increasing frequency.

<sup>5</sup> *Mech. Engg.*, Oct., 1930.

<sup>6</sup> *Proc. I. R. E.*, Oct., 1930.

*Results of Noise Surveys. Part II. Noise in Buildings.*<sup>1</sup> R. S. TUCKER. Noise experienced indoors is in one sense more important than that experienced outdoors, for, with the growth of our industrial civilization, increasing numbers of people are spending most of their waking hours indoors. They are thus exposed to indoor noise for a large part of the time, including the hours of work when noise has its opportunity to impair their working efficiency.

Certain typical values for noise in various locations in buildings have been published, and are summarized in this paper. Our knowledge of indoor noise levels is far from complete, however. Further information has been obtained in a survey of room noise in New York City and the surrounding area which was made in 1929 by the National Electric Light Association and the American Telephone and Telegraph Company in the course of the work of their Joint Subcommittee on Development and Research. Some results of the New York City measurements are given. About 70 test locations are included. It will be realized that this is only a small sample of the total number of places where indoor noise is experienced in New York City alone. The conclusions given must therefore be regarded only as suggestive rather than as holding true in any general sense.

<sup>1</sup> *Jour. Acous. Soc. America*, July, 1930.