

## Abstracts of Recent Technical Papers from Bell System Sources

*Loading for Telephone Cable Circuits.*<sup>1</sup> D. W. WHITNEY. This paper summarizes the principal characteristics of the loaded telephone line and discusses the major improvements in loading. Up to 1900 there was a general avoidance of the use of cable in the toll telephone plant, due to the high attenuation and distortion of speech currents not experienced in open wire lines. By the use of the loading coil and the telephone repeater, a network of toll cables has grown very rapidly which now connects the large population centers of the Atlantic seaboard and the upper Mississippi Valley region.

*Electric Annealing of Magnetic Materials for Telephone Apparatus.*<sup>2</sup> W. A. TIMM. This paper briefly describes the annealing equipment used by the Western Electric Company prior to 1909 and some years afterward at the Hawthorne plant, in contrast to the more recently installed electrical equipment.

*The Problem of Secondary Metals in World Affairs.*<sup>3</sup> F. W. WILLARD. Preliminary to the discussion of the secondary metal industry, the author gives a brief statistical survey of the rate of depletion of the world's primary metal resources along with a study of metal production in the United States.

The rapid rate of exhaustion of known resources is emphasized. Graphs also show the relation of prices and production of copper and lead in the United States over a period of 40 years.

Each important economic metal is discussed briefly showing how its present commercial uses affect its return through the secondary market. Attention is directed to the degradation of metals in use, forever eliminating them for re-use. Platinum, though not generally classified among economic metals, is treated briefly because of its key importance in certain industries. The seriousness of the present trend of using platinum in jewelry is indicated.

The growing importance of the secondary metal industry is shown graphically and briefly discussed, leading to an emphasis of the need

<sup>1</sup> To be published in the *Proceedings* of the Telephone and Telegraph Section of the American Railway Association.

<sup>2</sup> *Trans. American Soc. Steel Treat.*, p. 782, Nov. 1926.

<sup>3</sup> *Industrial and Eng. Chemistry*, p. 1178, Nov. 1926. Presented at the Round Table Conference on the rôle of chemistry in the world's affairs at Williamstown, Mass., Aug. 1926.

for encouragement of scientific research to increase metal recovery. The United States is favored above most nations in being largely self-contained with respect to original sources of economic metals, yet it has no source for tin and platinum and inadequate sources for manganese, chromium and other less common metals essential to present-day steels.

The work of a joint commission of the American Institute of Mining and Metallurgical Engineers and the Mining and Metallurgical Society of America is outlined, giving briefly their recommendations for international control of minerals.

The paper is concluded by emphasis of the importance of secondary metal recovery to national existence in times of stress when the nation may be thrown entirely upon its own resources. The conclusion also makes an appeal for the consideration of international conventions on economic metal exchanges and suggests that competent technical men be taken more into political councils in the treatment of a problem of this kind.

*Tone Reproduction in the "Halftone" Photo-Engraving Process.*<sup>4</sup>

HERBERT E. IVES. The "halftone" photo-engraving process was invented, and its technique developed, prior to the days of what is commonly called "photographic sensitometry." The necessary conditions and the appropriate operations for securing "highlight" and "shadow detail" were found by empirical studies guided by the appearance of the result, as appraised by the unaided eye. No comprehensive sensitometric study of the halftone reproduction process appears to have been made, at any rate none have been published. The work described is a rough survey of the problem, but, due largely to the use of accurate photometric measurements, and the correlation of these measurements with other sensitometric data, rather decisive conclusions have been possible as to the essential characteristics of the process in question, and on the procedures necessary for its complete success.

*Frequency Measurements with the Cathode Ray Oscillograph.*<sup>5</sup>

FREDERICK J. RASMUSSEN. The cathode ray oscillograph frequency measurement circuit described, differs from previous circuits in the use of by-pass condensers and plate leaks which permit the connection of the oscillograph to a.-c. circuits having large d.-c. components and which permit the use of biasing controls for shifting the position of patterns on the screen.

<sup>4</sup> *J. O. S. A. and R. S. I.*, March, 1926, p. 537.

<sup>5</sup> Presented before the *A. I. E. E.*, New York, N. Y., Nov. 1926.

Reference oscillators are used in conjunction with the frequency standards. They are of a type chosen for their high stability.

The well-known properties of Lissajous' figures are reviewed briefly and then are developed more fully for the cases in which only one term of their ratios may be determined from the oscillograph pattern. Following a general discussion of the accuracy of syntonization, there is discussed a detailed method of calibrating oscillators. The patterns used may be interpreted from one term of their ratio.

Several special circuits are described for use in frequency measurement work with the cathode ray oscillograph.

The methods and apparatus described are suitable not only for the technical measurements of a development and research nature but are equally adaptable for routine commercial work. The advantages which particularly commend themselves are the rapidity with which such work may be done and the ease with which the average man can learn the work.