Abstracts of Technical Articles by Bell System Authors

Thermionic Emission, Migration, and Evaporation of Barium on Tungsten.[1] J. A. BECKER and G. E. MOORE. When barium is deposited on tungsten, the thermionic activity of the tungsten increases, comes to a maximum, and then decreases. It has frequently been found by emission measurements that this optimum corresponds to about a monomolecular layer. However, data obtained in this work show that some regions of the filament require more than five times as much barium as others for optimum emission.

Photographs are presented which show that the rates of both migration and evaporation depend on the crystal surface, the temperature, and amount of barium on the surface. Barium migration on tungsten can be observed at temperatures as low as 970° K., is readily observed at 1025° K., and is rapid at 1070° K. Evaporation is observed on some crystals at temperatures as low as 1025° K., while on others it is slow even at 1260° K. At 1300° K. it is rapid for all crystals. These temperatures probably vary with the oxygen contamination which comes over to the filament with the barium. For barium concentrations near the optimum there exists a range of temperature over which migration is readily observed, but where evaporation is not noticeable.

Measurements of electron emission after all the barium is evaporated show that the filament was contaminated by an electronegative material, probably oxygen.

Barium tends to migrate toward the negative end of the filament, thus indicating ionization of adatoms.

A mechanism for migration is suggested.

The Vocoder—Electrical Re-creation of Speech.[2] HOMER DUDLEY. In the Bell Telephone Laboratories have been developed electrical circuits for the artificial production of speech. One form of the device is itself voice-controlled, thus differing fundamentally from the Voder of the World's Fair which is controlled by keys and pedals. It has been christened the "Vocoder" or "voice coder."

Many startling effects are possible when the code is varied, for the Vocoder then re-creates sounds quite different from those used by the person speaking. Cadences may become monotones, rising inflections may be turned to falling inflections, a vigorous voice may become a

[1] *Philosophical Magazine*, February 1940.
[2] *Jour. S. M. P. E.*, March 1940.

quaver, or a single voice may accompany itself at any desired musical interval—thus converting a solo into a duet, etc. Also non-speech sounds may be coded into intelligible speech and instrumental music into vocal music.

Statistical Measurements on Conversational Speech.[3] H. K. DUNN and S. D. WHITE. Using apparatus designed to collect a large number of data in a short time, the following measurements have been made: peak and r.m.s. pressures in one-eighth-second intervals, and in various bands of frequencies up to 12,000 cycles per second, from the voices of six men and five women; comparison of r.m.s. pressures in one-eighth- and one-fourth-second intervals, from a single male voice; and distribution of the instantaneous pressures in whole speech, from a single voice. Derived from these data are peak factors in one-eighth-second intervals, and frequency distribution of speech energy in long intervals. Both the absolute value and the distribution of energy are found somewhat different from previously published results.

Auditory Patterns.[4] HARVEY FLETCHER. During the last two decades considerable progress has been made in understanding the hearing processes taking place when we sense a sound. The application of the same instrumentalities that have brought such a wonderful development in the radio and sound pictures to this problem is largely responsible for this progress. Such instrumentalities have made it possible to make accurate measurements which are the basis for understanding any physical process.

To understand this problem then we need to know first how to describe and measure the sound reaching the ears; then we need to know how to describe and measure the sensations of hearing produced by such a sound upon a listener. To do this quantitatively we must also know the degree and kind of hearing ability possessed by the listener. It is with these three phases of the problem that this paper deals.

[3] *Jour. Acous. Soc. of America*, January 1940.
[4] *Reviews of Modern Physics*, January 1940.