

As results of investigations basic to the problem of transmission there have been important contributions in the field of electronic physics, including not only thermionics which is basic to vacuum tube development, but also X-rays which are not so obviously important. New substances have been originated of which the iron dust material, for the cores of loading and repeating coils, and the magnetic substance, Permalloy, are well known illustrations. Fundamental studies, in the nature and characteristics of speech and the sensitivity of the human ear and its range of audition, have found application beyond the nominal limits of telephony and are today furnishing basic information to physiologists, aurists, psychologists, and students of phonetics. New vibrating systems and methods of actuating them have been devised and are finding use in loud speaking receivers or in horns where the vibrations of columns of air are controlled by proper design. Such developments have made possible also the public address system which is such a serviceable adjunct to wire or radio communication and meets a peculiar need in banquet halls and auditoriums. Results of transmission developments have been of recognized importance in the communication or signaling equipment of our Army and Navy. Other developments of these studies are illustrated by the power-line carrier-current system which permits the transmission over a high-voltage power line of telephone messages between substation operators.

In the field of switching and controlling transmission channels the contributions have been evident by thousands of refined devices and arrangements, familiar to those acquainted with inside telephone plant, by improved designs or circuits which result in smaller size, decreased annual charges, increased reliability, and greater speed and ease of operation or maintenance. From time to time the system studies have culminated in complete central-office systems, as most recently in that of the panel-type machine-switching system. Each advance in transmis-