

## Standardisation of Telephone Apparatus.

FOR many years it has been customary to test the efficiency of telephone receivers and microphones by comparisons against instruments selected as standards. The international committee on long-distance telephony has now specified a standard which is based on scientific principles. The European master standard will be kept in a special laboratory in Paris and will be available to any European administration or manufacturer for standardising instruments. The apparatus will also be available for researches on telephone phonetics, such as, for example, the comparative articulation efficiencies of the European languages.

In a paper read by Mr. B. S. Cohen to the Institution of Electrical Engineers on Nov. 17, a record is given of the methods hitherto employed for telephone apparatus and line transmission standardisation. He also describes the new methods and the modifications of the old methods now being introduced. The paper is largely based on the results obtained in the research laboratories of the Post Office.

Mr. Cohen adopts a nomenclature used by the Post Office which is becoming standardised. By the volume of a sound is meant its loudness or amplitude, and by distortion is meant imperfection in the reproduction of wave form. A distinction is made between articulation and intelligibility. Articulation means the comparative perfection in the reception of sounds not conveying ideas, whilst intelligibility means the comparative perfection in the reception of sounds conveying ideas. These depend on the volume and distortion of the sound as well as on external and extraneous noises.

It is not easy to understand what telephone engineers mean by a 'transmission unit.' Formerly it meant 'miles of standard cable.' This has become obsolescent and the transmission unit is now generally defined either as the logarithmic ratio of two powers

or of two currents, the former being a logarithm to the base 10 and the latter being to the Napierian base. It is proposed to call the former the 'bel' after the inventor of the telephone, and the latter the 'néper.' Feeling runs so high between the advocates of these two units that, *faute de mieux*, it has been decided to sanction the use of both.

The method of testing articulation is to send twenty-five different sounds to a recording observer slowly and uniformly. The percentage of the sounds received correctly measures the articulation. It is satisfactory to learn that with good, solid back microphones there is practically no ageing effect. New microphones have to pass a comparative test against a standard. One of the tests of the new telephone receiver was to jar it by dropping it from a definite height on to a steel plate 100,000 times. This had little if any effect on its efficiency.

In the latter half of Mr. Cohen's paper he discusses the kind of apparatus most suitable as a telephone standard. He also discusses the frequency range for broadcasting, etc., recommended by the international committee. The 'ideal' range covers perfect reproduction of speech, music, and most noises. In this case all sounds having frequencies lying between 30 and 10,000 cycles per second must come through the apparatus. For 'high quality' speech and music, the necessary range includes all sounds having frequencies between 100 and 5000; whilst for 'good quality' articulate speech, only sounds having frequencies between 200 and 3000 are required. From the point of view of articulation, the mean speech frequency is 1500 cycles. This means that the removal of all the components of the sound which have frequencies above 1500 gives the same quality of articulation as the removal of all the frequencies below 1500 would give.

## The Mellon Institute.

INTERESTING developments of the work of the Mellon Institute of the University of Pittsburgh, recorded in the last annual report, are the new departments for analytical chemistry under Dr. G. D. Beal and for 'pure chemistry' under Dr. L. H. Cretcher. When the Institute was originally established, the question of the position of research in 'pure' chemistry and other subjects was considered. No one will contradict the director's statement that "to the pure science investigator, who is the father of all our efforts in industrial research, falls the glory of making those discoveries that lie at the groundwork of all our knowledge of nature, and of all our powers of utilising natural products." But the practical question is whether 'pure' research should be centralised in another department of the University, under the control of a director specially interested in abstract science, and, if so, what *liaison* should exist between such department and the Institute; or whether an Institute primarily dedicated to industrial research should make provision also for 'pure' research. Apparently the original decision has been reversed, or perhaps it would be truer to say that the development of the work of the Institute has rendered necessary some provision for pure research. In a research institute of this magnitude, the need for advisory and consultative work both in analytical chemistry and in pure chemistry can readily be understood.

The progress of the Institute is exhibited in the

No. 3030, Vol. 120]

report in the form of curves showing steady progress except for perturbations during the War period. The fellows, at present 102 in number, are at work in connexion with 58 industrial fellowships, and a sum of nearly £120,000 was paid during the last fiscal year in support of research in the Institute by the fellowship donors; and the total amount of money appropriated by companies and associations to the Institute during the first sixteen years of its work is approaching a million pounds, all of which was disbursed in sustaining fellowship research. These astonishing figures would have gratified the originator of the scheme, the late Prof. Duncan, and must give great satisfaction to the benefactor whose honoured name is associated with the Institute.

The Institute has published a bibliography of books, bulletins, journal contributions and patents issued from the Institute from the inauguration of the Industrial Fellowship system (March 1, 1911) to January 1, 1927. The director, Dr. E. R. Weidlein, expresses the hope that the list will serve a useful purpose, especially in libraries of other research laboratories. Incidentally, the publication gives convincing evidence of the success of the work initiated by Prof. Kennedy Duncan, of which particulars have been published from time to time in NATURE. The researches conducted in the Institute, with the financial support of industrial firms, cover a wide field in applied chemistry, physics, biology, metallurgy, and other subjects, and the long list of