employed for the production of the continuous trains of waves a high frequency alternator of his own invention (see *The Electrician,* 1907, 58, pp. 675, 701). Much work has been done on this matter by E. Ruhmer, for which the reader must be referred to his work, *Drahtlose Telephonic,* Berlin, 1907. There is no doubt that the transmission of articulate sounds and speech over long distances without wires by means of electric waves is not only possible as an experimental feat but may perhaps come to be commercially em­ployed. In connexion with this part of the subject a brief reference should also be made to Μ. Wien’s method of impact excitation by employing a form of spark gap which quenches the primary discharge instantly and excites the free oscillations in the antenna by impact or shock.

*Instruments and Appliances for making Measurements in Con­nexion with Wireless Telegraphy.*—The scientific study of electric wave telegraphy has necessitated the introduction of many new processes and methods of electrical measurement. One im­portant measurement is that of the wave-length emitted from an antenna. In all cases of wave motion the wave-length is connected with the velocity of propagation of the radiation by the relation *v=n*λ*,* where *n* is the frequency of the oscilla­tions and λ is the wave-length. The velocity of propagation of electric waves is the same as that of light, viz., about 1000 million feet, or 300 million metres, per second. If therefore we can measure the frequency of the oscillations in an antenna we arc able to tell the wave-length emitted. Instruments for doing this are called wave meters and are of two kinds, open circuit and closed circuit. Forms of open circuit wave meter have been devised by Slaby and by Fleming. Slaby’s wave meter consists of a helix of non-insulated wire wound on a glass tube. This helix is presented or held near to the antenna, and the length of it shortened until oscillations of the greatest intensity are produced in the helix as indicated by the use of an indicator of fluorescent paper.

Closed circuit wave meters have been also devised by J. Dönitz@@1 and by Fleming.@@2 In Dönitz’s wave meter a condenser of variable capacity is associated with inductance coils of various sizes, and the wave meter is placed near the antenna so that its inductance coils have induced currents created in them. The capacity of the condenser is then altered until the maximum current, as indicated by a hot wire ammeter, is produced in the circuit. From the known value of the capacity in that position and the inductance the frequency can be calculated. The Fleming closed circuit wave meter, called by him a cymometer, consists of a sliding tube con­denser and a long helix of wire forming an inductance; these are connected together and to a copper bar in such a manner that by one movement of a handle the capacity of the tubular condenser is altered in the same proportion as the amount of the spiral inductance which is included in the circuit. If, then, a long copper bar which forms part of this circuit is placed in proximity to the transmitting antenna and the handle moved, some position can be found in which the natural time period of the cymometer circuit is made equal to the actual time period of the telegraphic antenna. When this is the case the amplitude of the potential difference of the surfaces of the tubular condenser becomes a maximum, and this is indicated by connecting a vacuum tube filled with neon to the surfaces of the condenser. The neon tube glows with a bright orange light when the adjustments of the cymometer circuit are such that it is in resonance with the wireless telegraph antenna. The scale on the cymometer then shows directly the wave-length and frequency of the oscillations.@@3

An immense mass of information has been gathered on the scientific processes which are involved in electric wave telegraphy. Even on fundamental questions such as the function of the earth interconnexion with it physicists differ in opinion to a considerable extent. Starting from an observation of Marconi's, a number of interesting facts have been accumulated on the absorbing effect of sunlight on the propagation of long Hertzian waves through space, and on the disturbing effects of atmospheric electricity as well as upon the influence of earth curvature and obstacles of various kinds interposed in the line between the sending and transmitting stations.@@4

Electric wave telegraphy has revolutionized our means of communication from place to place on the surface of the earth, making it possible to communicate instantly, and certainly between places separated by several thousand miles, whilst

at the same time it has taken a position of the greatest import­ance in connexion with naval strategy and communication between ships and ships and the shore in time of peace. It is now generally recognized that Hertzian wave telegraphy, or radio-telegraphy, as it is sometimes called, has a special field of operations of its own, and that the anticipations which were at one time excited by uninformed persons that it would speedily annihilate all telegraphy conducted with wires have been dispersed by experience. Nevertheless, transoceanic wireless telegraphy over long distances, such as those across the Atlantic and Pacific oceans, is a matter to be reckoned with in the future, but it remains to be seen whether the present means are suffi­cient to render possible communication to the antipodes. The fact that it has become necessary to introduce regulations for its control by national legislation and international conferences shows the supremely important position which it has taken in the short interval of one decade as a means of communicating human intelligence from place to place over the surface of the globe. An important International Conference on radio­telegraphy was held in Berlin in 1906, and as a result of its de­liberations international regulations have been adopted by the chief Powers of the world. The decisions of the Conference were ratified for Great Britain by the British government on July 1, 1908.

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**TELEMACHUS,** in Greek legend *(Odyssey* i.-iv., xv.-xxiv.; Hyginus, *Fab.* 127), son of Odysseus and Penelope. When he reached manhood, he visited Pylos and Sparta to make inquiries about his father, who had been absent for nearly twenty years. On his return, he found that Odysseus had reached home before him. Then father and son, aided by Eumaeus and Philoetius, slew or drove out the suitors of Penelope (see Odysseus). According to later tradition, Telemachus became the husband of Circe and by her the father of Latinus and of a daughter Roma, afterwards the wife of Aeneas. In another story, he married a daughter of Circe, named Cassiphone; having slain his mother-in-law in a quarrel, he was himself killed by his wife. This is the only notice of the death of Telemachus. The foundation of Clusium in Etruria was attributed to him.

**TELEMARK,** or Thelemark, a district of southern Norway, wholly comprised in the *amt* (county) of Bratsberg. It covers the uplands and fjelds of the southward projection of the country, having its highest point in the Gaustafjeld (6200 ft.); and contains several large and beautiful lakes, as Nordsjö, Bandaksvand, Tinsjö, Mjösvand and Totakvand. The two

*@@@1 The Electrician,* 1904, 52, p. 407, or *German Pat. Spec.,* No. 149350.

*@@@2 Brit Pat. Spec.,* No. 27683 of 1904.

@@@3 J. A. Fleming, *Phil. Mag.,* 1905 [6], 9, p. 758.

@@@4 See Admiral Sir H. B. Jackson, F.R.S., *Proc. Roy. Soc.,* 1902, 70, p. 254: G. Marconi, *ib.,* 1902, 70, p. 344.